Appendix F - Federal Agency MCAs

U.S. Air Force (USAF)

The mission of the United States Air Force is to fly, fight and win in air, space and cyberspace. Our rich history and our vision guide our Airmen as we pursue our mission with excellence and integrity to become leaders, innovators, and warriors.

The Air Force primarily uses lidar data for several aspects of construction planning and management. The data also serve the Air Force needs for managing its real property as well as environmental modeling. Data are used for site analysis, facility and roadway planning and construction, storm water modeling, utility system planning, and force protection.

The Air Force collects and manages GIS data in a centralized repository, available to all bases. Imagery and lidar are generally collected on a three- to five-year cycle. A new project requirement could speed up the refresh rate, and if suitable data are available from a state or local entity, the refresh rate may be less frequent. The Air Force standard lidar collect is eight points per square meter, and the data is made available as 0.5-meter DEMs and surface models. Few installations are on the coast; bathymetry requirements are minimal and available data are typically used. Nearshore bathymetry is used for assessment of real property risks from sea level rise along with shoreline erosion and dredging analysis. Base real property inventories also require building lowest floor elevations.

Additional potential future benefits could be realized by the Air Force for numerous Business Uses that require inland topography and nearshore bathymetry at various Quality Levels and update frequencies.

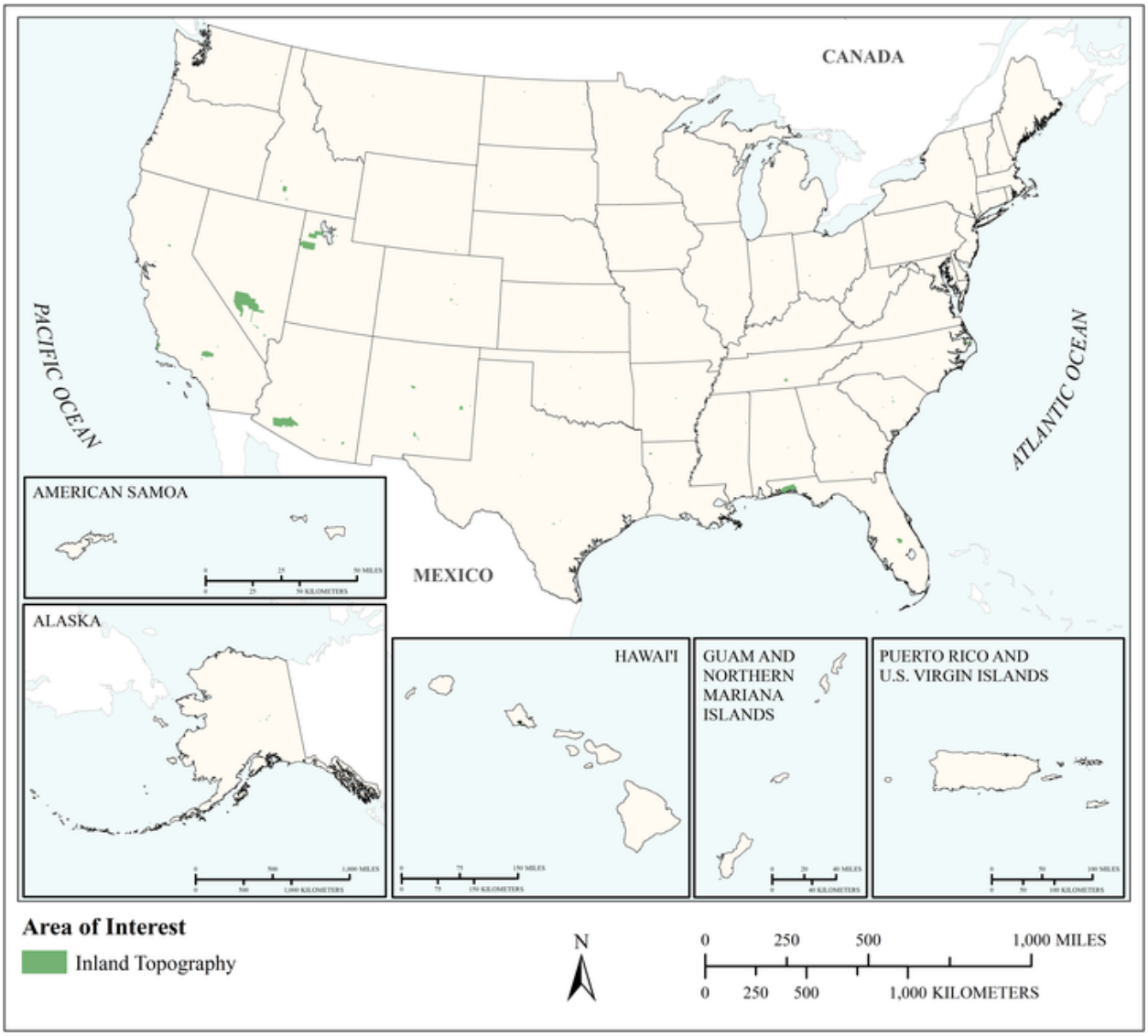
The Air Force has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	DoD: Department of the Air Force (USAF)	60627	Water Supply and Quality	Inland Topo	QL2	4-5 years	$47,020	$5,396	Moderate	Major	Moderate
BU 06 – Natural Resource Management	DoD: Department of the Air Force (USAF)	60628	Natural Resources Conservation	Inland Topo	QL2	4-5 years	$245,902	$345,926	Major	Major	Major
BU 07 – Wildlife and Habitat Management	DoD: Department of the Air Force (USAF)	60629	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$11,387	$2,312	Moderate	Major	Moderate
BU 12 – Renewable Energy Resources	DoD: Department of the Air Force (USAF)	60630	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	None
BU 13 – Oil and Gas Resources	DoD: Department of the Air Force (USAF)	60631	Oil and Gas Resources	Inland Topo	QL2	Annually	$4,075	Unable to quantify	Minor	Major	Major
BU 14 – Cultural Resource Management	DoD: Department of the Air Force (USAF)	60632	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$4,335	$744	Moderate	Moderate	Minor
BU 15 – Flood Risk Management	DoD: Department of the Air Force (USAF)	60633	Flood Risk Management	Inland Topo	QL1	3-5 years	$1,144,455	$94,792	Major	Moderate	Major
BU 16 – Sea Level Rise and Subsidence	DoD: Department of the Air Force (USAF)	60634	Sea Level Rise and Subsidence	Inland Topo	QL1	4-5 years	$488,879	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
BU 17 – Wildfire Management	DoD: Department of the Air Force (USAF)	60635	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$38,186	Unable to quantify	Major	Major	Major

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 18 – Homeland Security	DoD: Department of the Air Force (USAF)	60636	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL1	3-5 years	$167,159	$1,320	Moderate	Moderate	Major
BU 19 – Land Navigation	DoD: Department of the Air Force (USAF)	60637	Land Navigation and Safety	Inland Topo	QL1	3-5 years	$120,293	$4,857	Minor	Major	Major
BU 21 – Aviation Navigation	DoD: Department of the Air Force (USAF)	60638	Aviation Navigation and Safety	Inland Topo	QL2	3-5 years	$40,231	$23,422	Minor	Moderate	Major
BU 22 – Infrastructure Management	DoD: Department of the Air Force (USAF)	1065	Air Force Installation Management and Airborne Collection	Inland Topo	QL1	3-5 years	$1,000,000	$236,175	None	Moderate	Major
BU 28 – Telecom-munications	DoD: Department of the Air Force (USAF)	60639	Telecommunications	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	Minor	Minor	Minor
BU 29 – Military	DoD: Department of the Air Force (USAF)	60640	Military	Inland Topo	QL1/QL2	3-5 years	$27,697	Unable to quantify	Major	Major	Major

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federal Review AOIs			
Sub Area Requirements	Air Force installations			

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60627
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Department of the Air Force (USAF)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

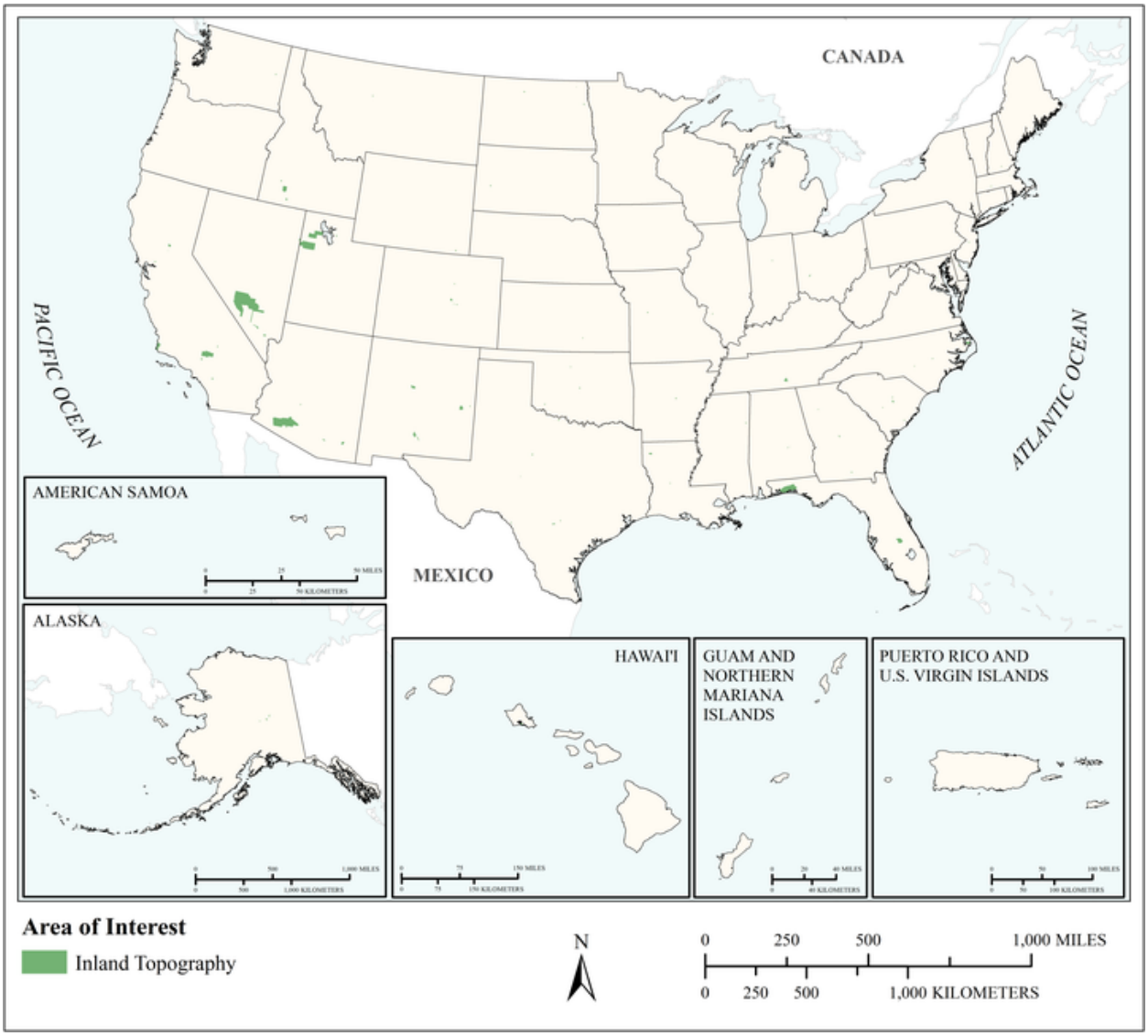
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$47,020									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$5,396									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federal Review AOIs			
Sub Area Requirements	Air Force installations			

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60628
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Department of the Air Force (USAF)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

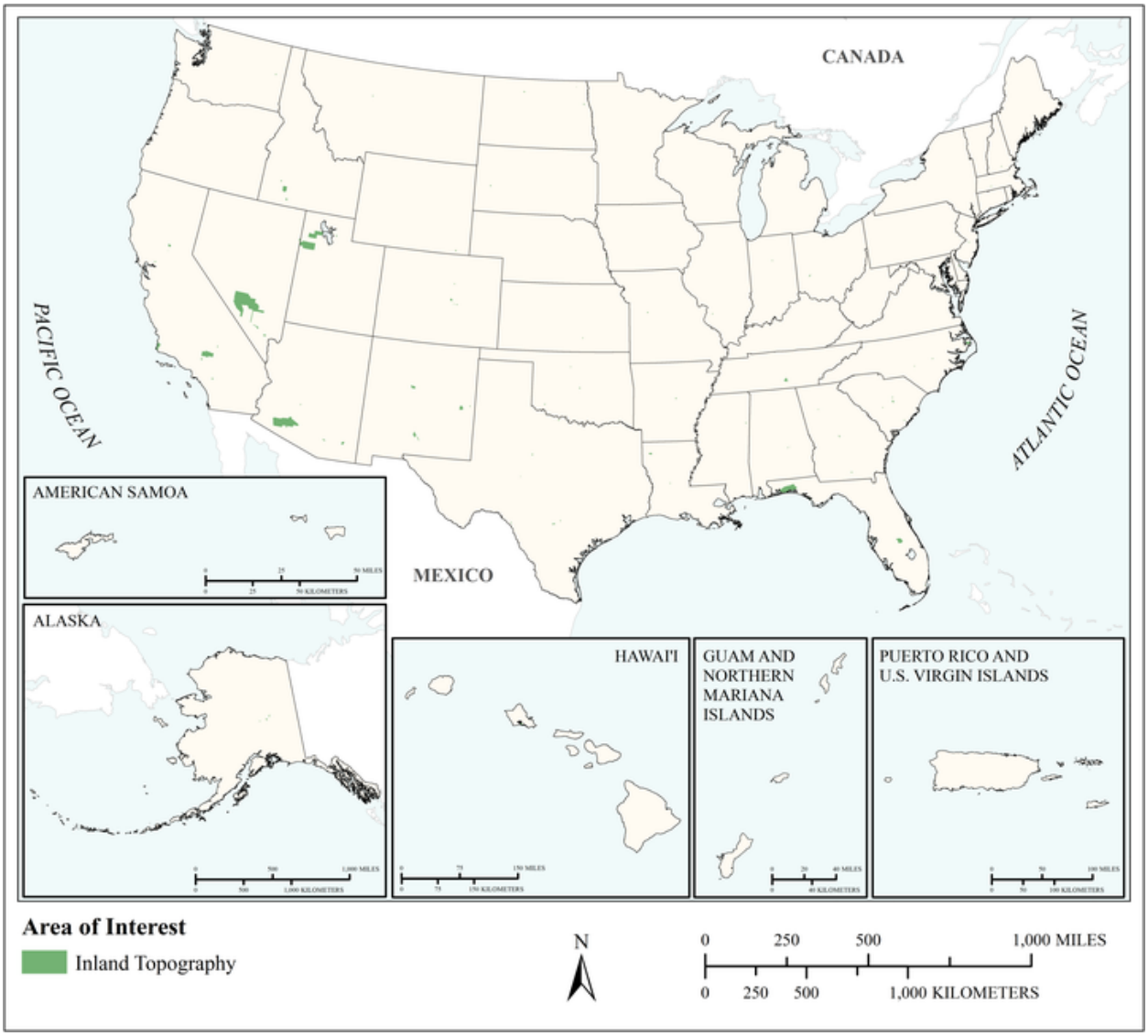
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$245,902									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$345,926									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federal Review AOIs			
Sub Area Requirements	Air Force installations			

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60629
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Department of the Air Force (USAF)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

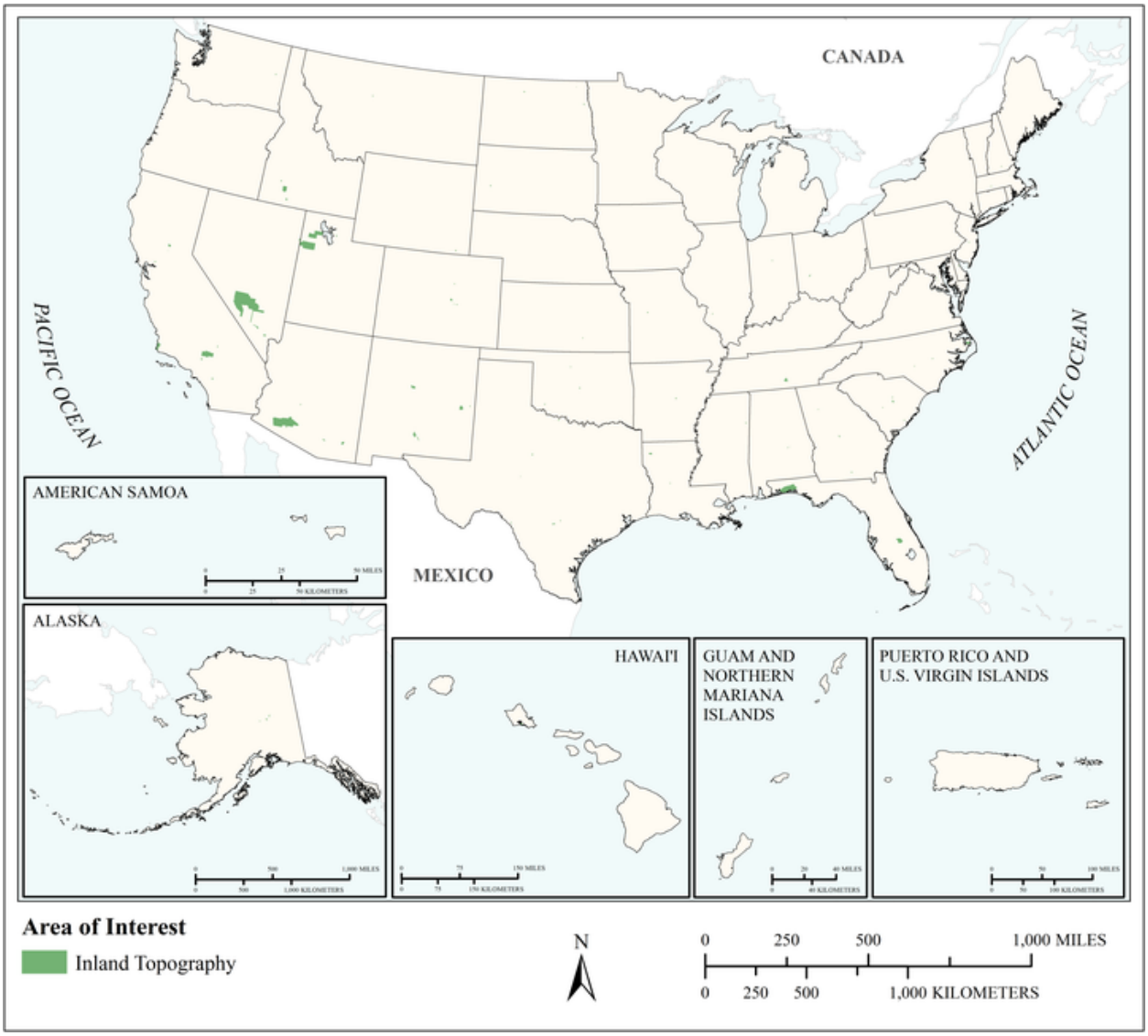
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Major			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$11,387									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,312									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federal Review AOIs			
Sub Area Requirements	Air Force installations			

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60630
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Department of the Air Force (USAF)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			

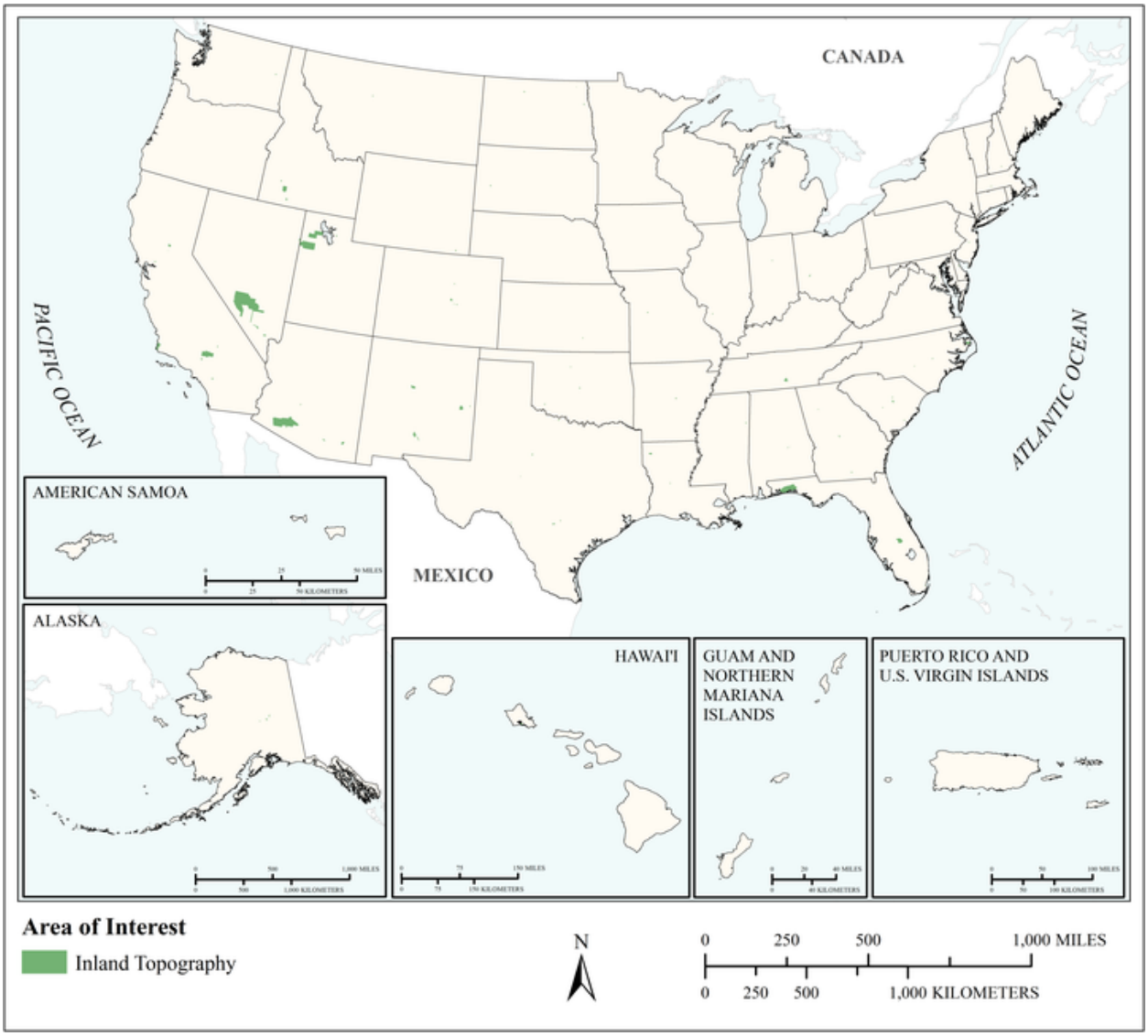
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Major			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Minor	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Oil and Gas Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federal Review AOIs			
Sub Area Requirements	Air Force installations			

MCA Description	Response
Mission Critical Activity	Oil and gas exploration and production. Pipeline and route selection. Facility siting to mitigate geologic hazards. Construction planning. Environmental impact assessment and mitigation. Regulatory compliance.
MCA Title	Oil and Gas Resources
MCA ID	60631
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Department of the Air Force (USAF)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor			
Cost savings/cost reduction	Minor			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

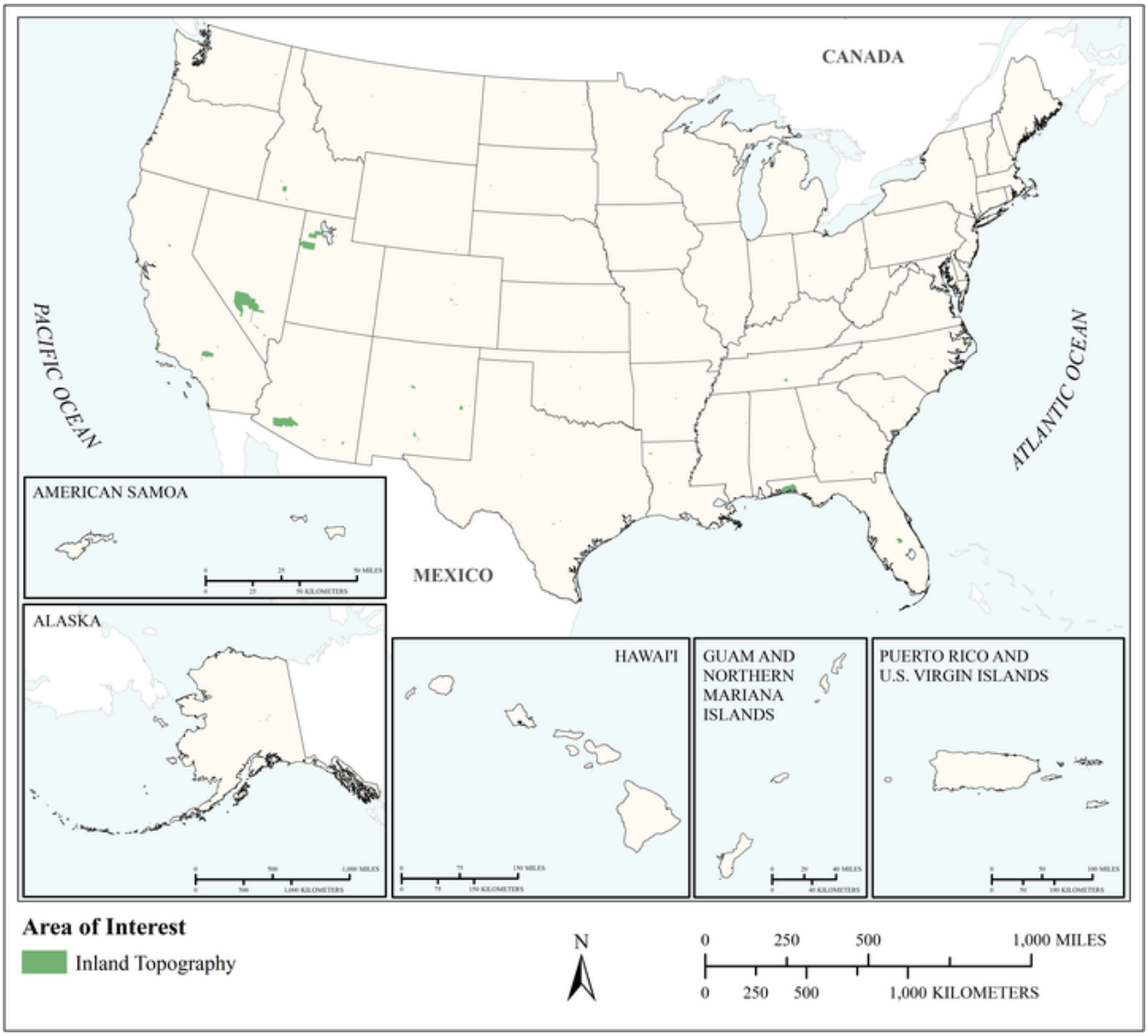
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$4,075									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Minor	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federal Review AOIs			
Sub Area Requirements	Air Force installations			

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60632
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Department of the Air Force (USAF)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	Minor			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

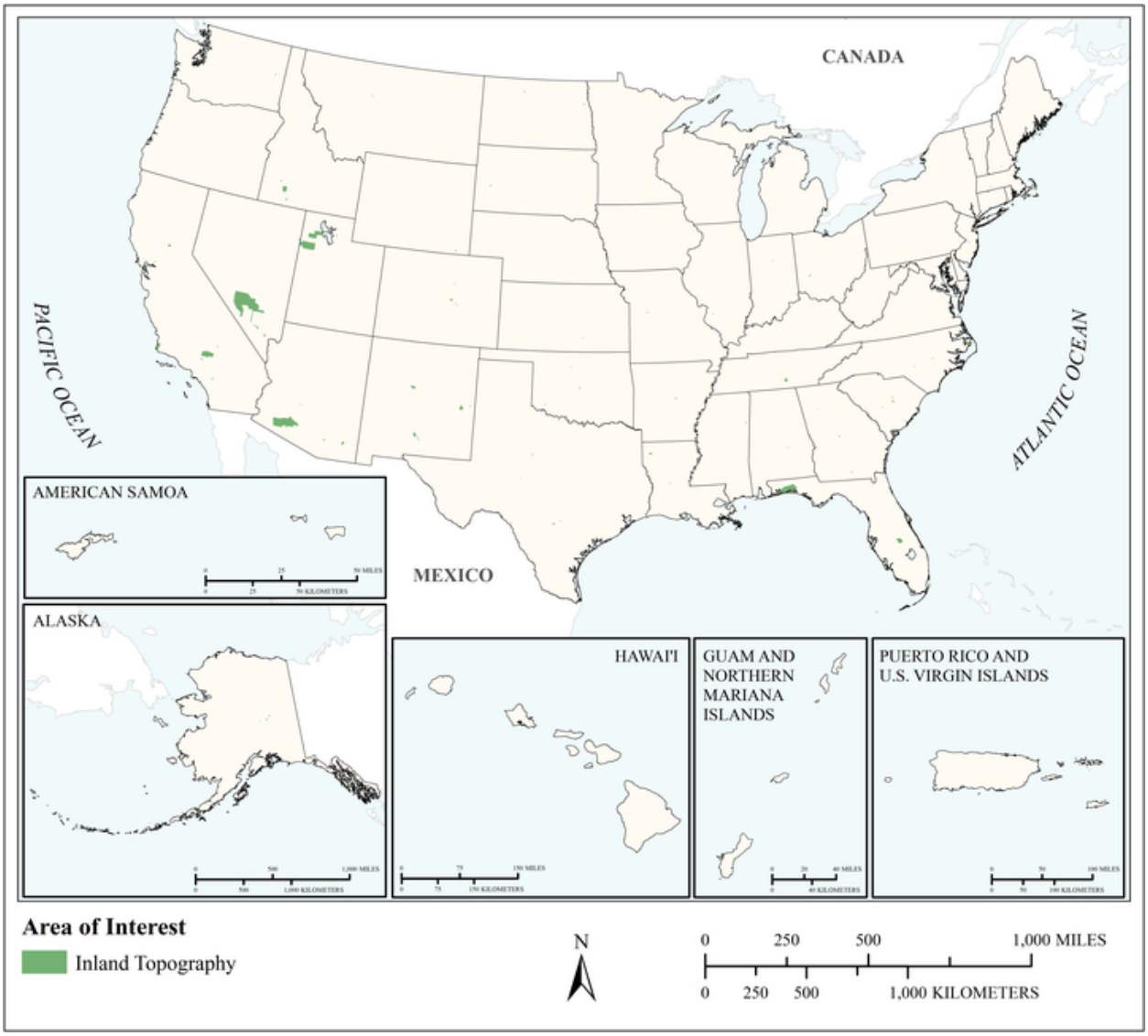
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Minor	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$4,335									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$744									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federal Review AOIs			
Sub Area Requirements	Air Force installations			

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60633
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Department of the Air Force (USAF)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	3-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

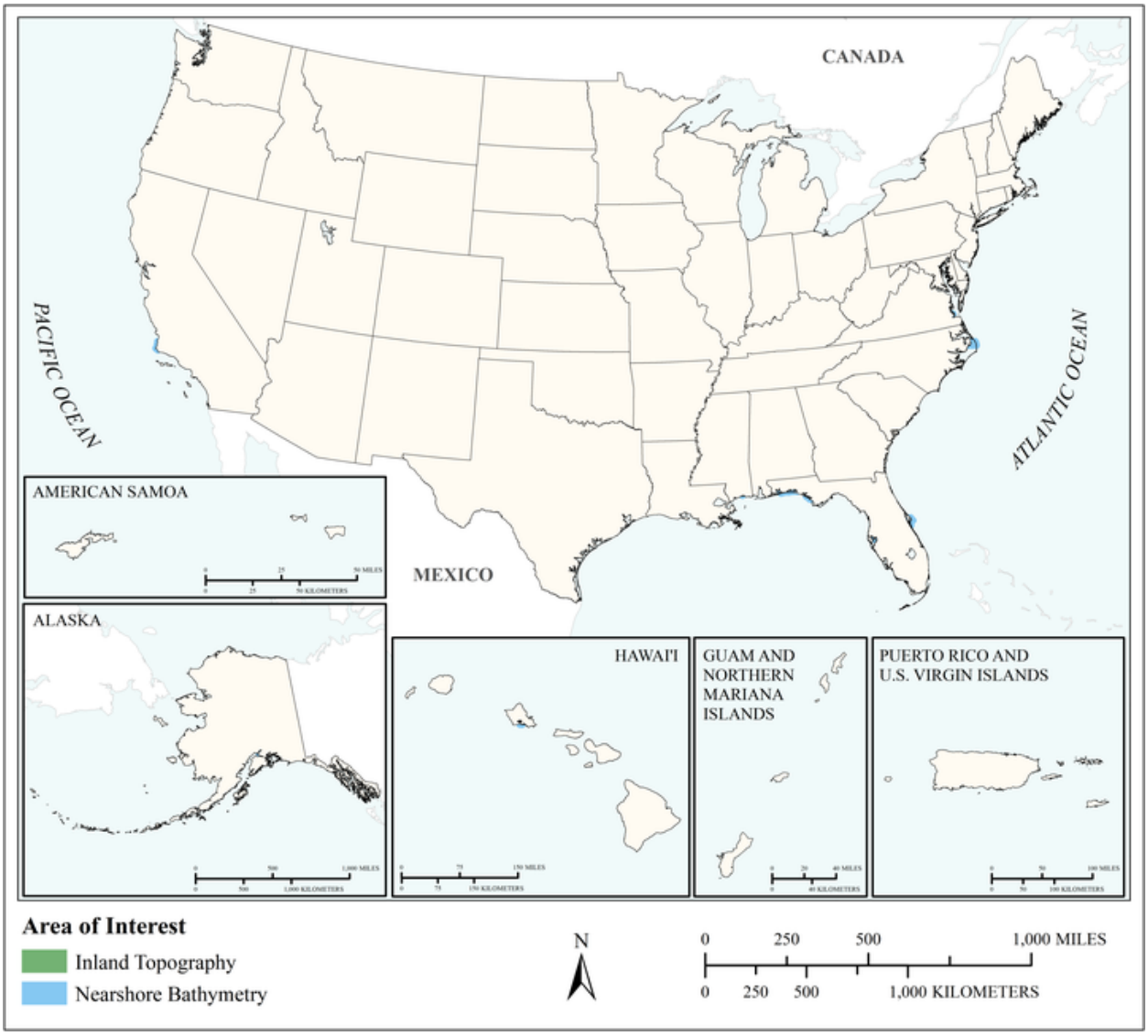
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,144,455									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$94,792									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	Custom description		Federal Review AOIs	
Sub Area Requirements	Air Force installations near the coast		Nearshore off Air Force installations	

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60634
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Department of the Air Force (USAF)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1		QL1B	
Update Frequency	4-5 years		2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm		Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm		Up to 30 cm	
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Required			Required
Entire AOI under same environmental conditions	Highly desirable		Required			Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required			Required
DEM for entire AOI needs to be seamless	Required		Required			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Required		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Highly desirable		Nice to have	
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Not required	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Not required	
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	
Ground control/ground truthing	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required		Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have		Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required		Required	
Land use/land cover	Required		Highly desirable	
Wetlands	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Highly desirable		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Required		Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Major	
Cost savings/cost reduction	Major		Major	
Cost avoidance	Major		Major	
Increased revenues	None		Minor	
Mission-driven performance improvements	Major		Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	

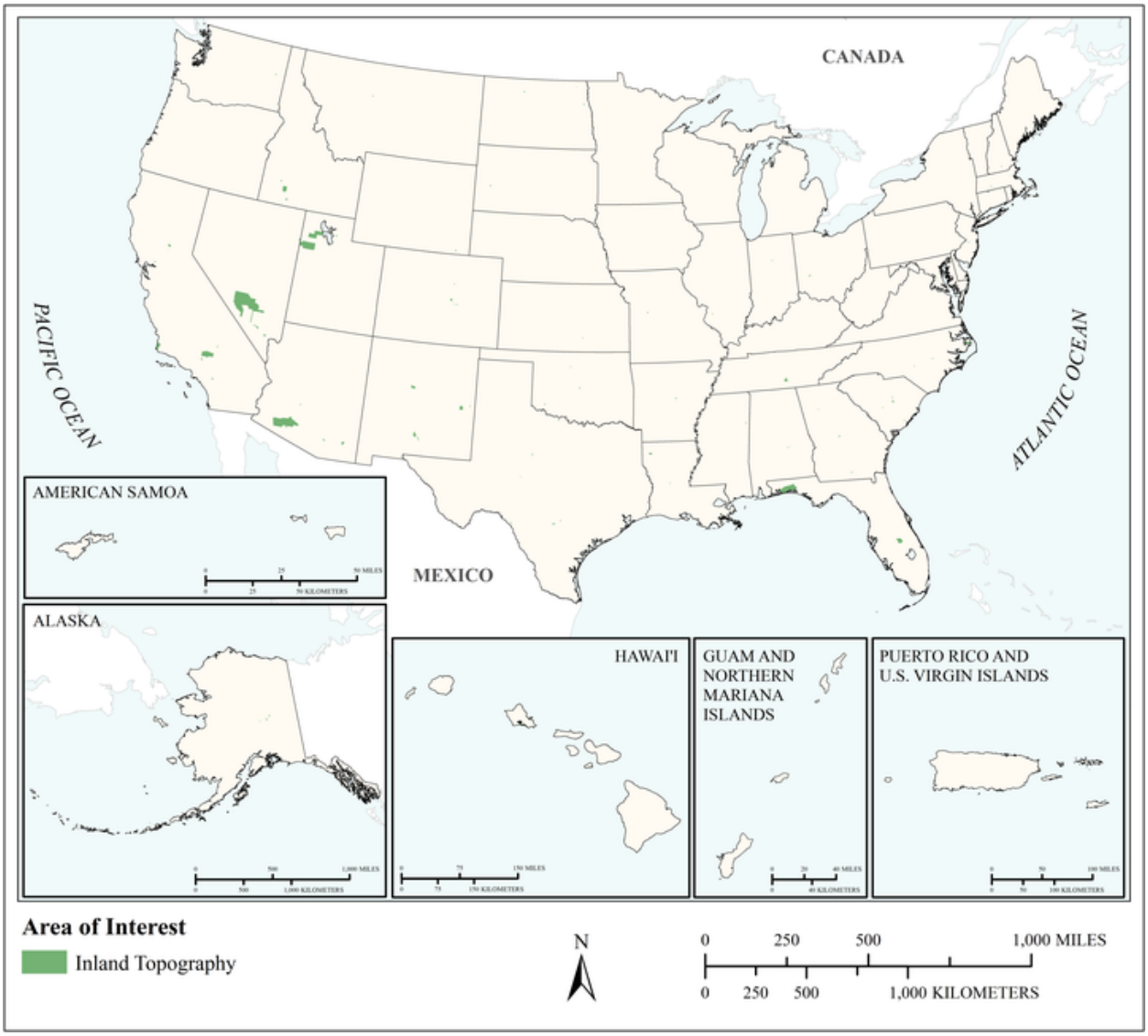
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate		Moderate	
Improved customer experience	Moderate		Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Moderate	
Environmental	Major		Major	
Public safety, including life and property	Major		Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					Major	Unable to provide				
Cost avoidance	Major	Unable to provide					Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide					Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$488,879									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Major					
Environmental	Moderate						Major					
Public safety, including life and property	Moderate						Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours	Yes		Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes		Yes	
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federal Review AOIs			
Sub Area Requirements	Air Force installations			

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60635
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Department of the Air Force (USAF)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 15 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

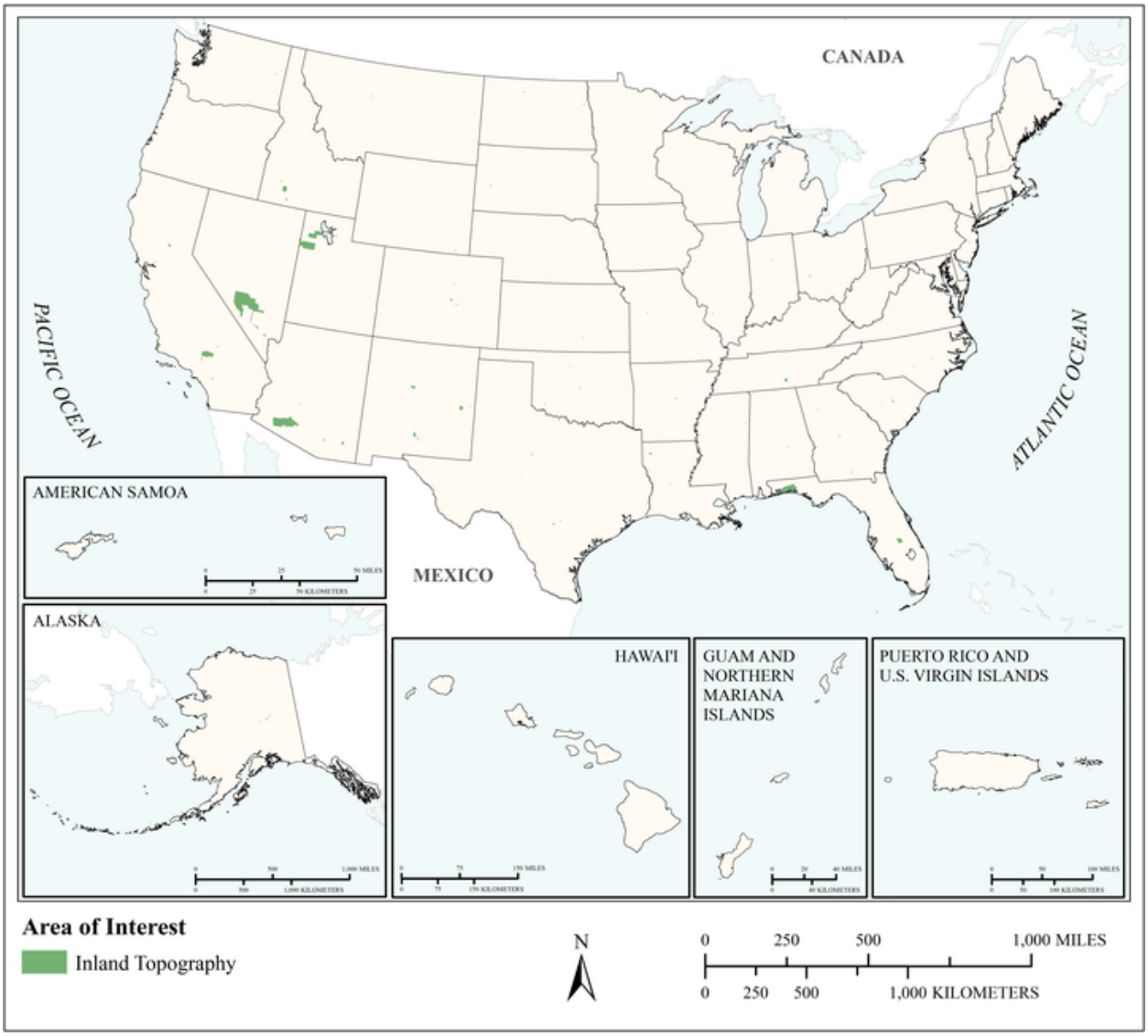
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$38,186									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federal Review AOIs			
Sub Area Requirements	Air Force installations			

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60636
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Department of the Air Force (USAF)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	3-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

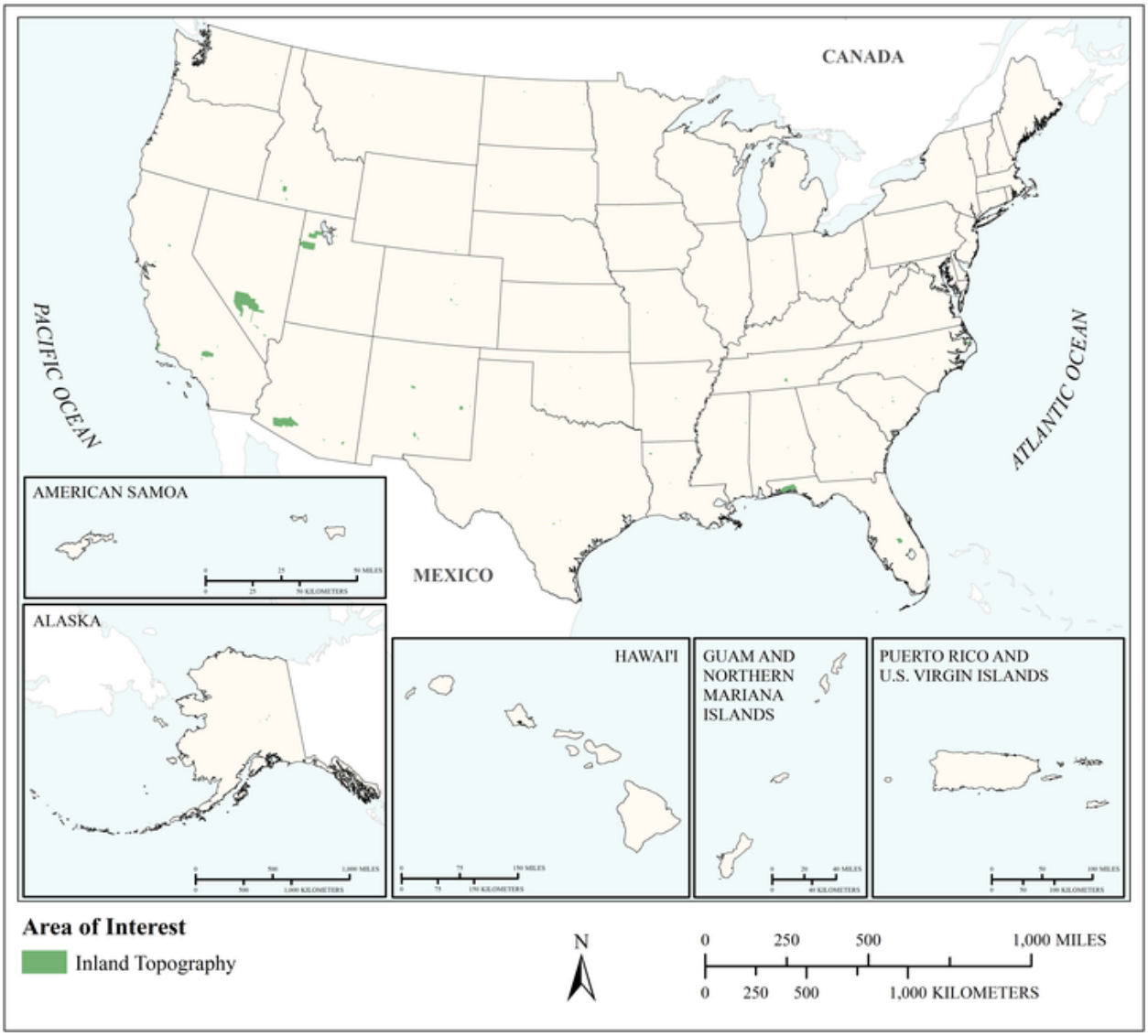
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$167,159									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,320									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federal Review AOIs			
Sub Area Requirements	Air Force installations			

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60637
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Department of the Air Force (USAF)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Day-to-day is not needed
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	3-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 15 cm			
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

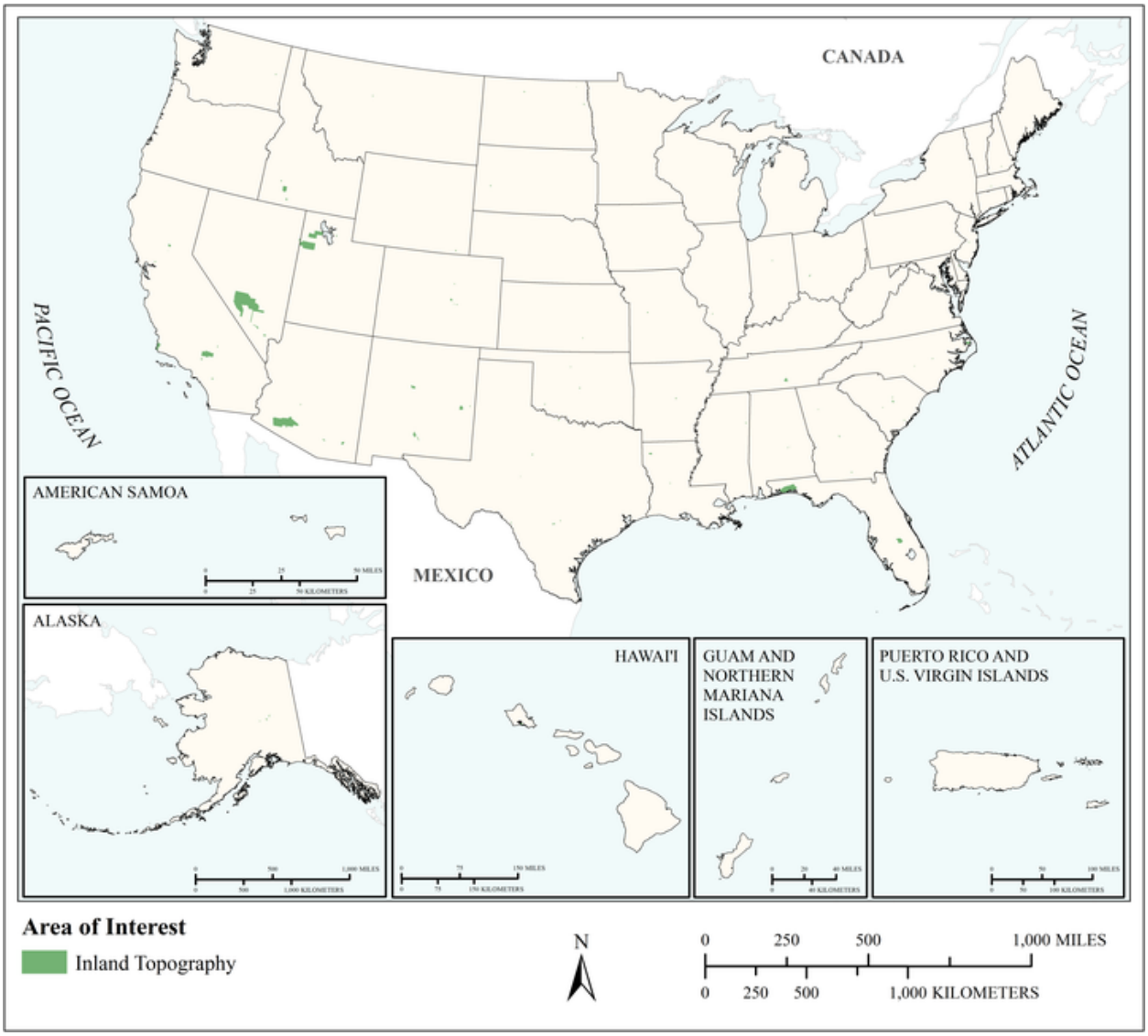
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$120,293									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$4,857									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federal Review AOIs			
Sub Area Requirements	Air Force installations			

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60638
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Department of the Air Force (USAF)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Worldwide
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	3-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Required			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

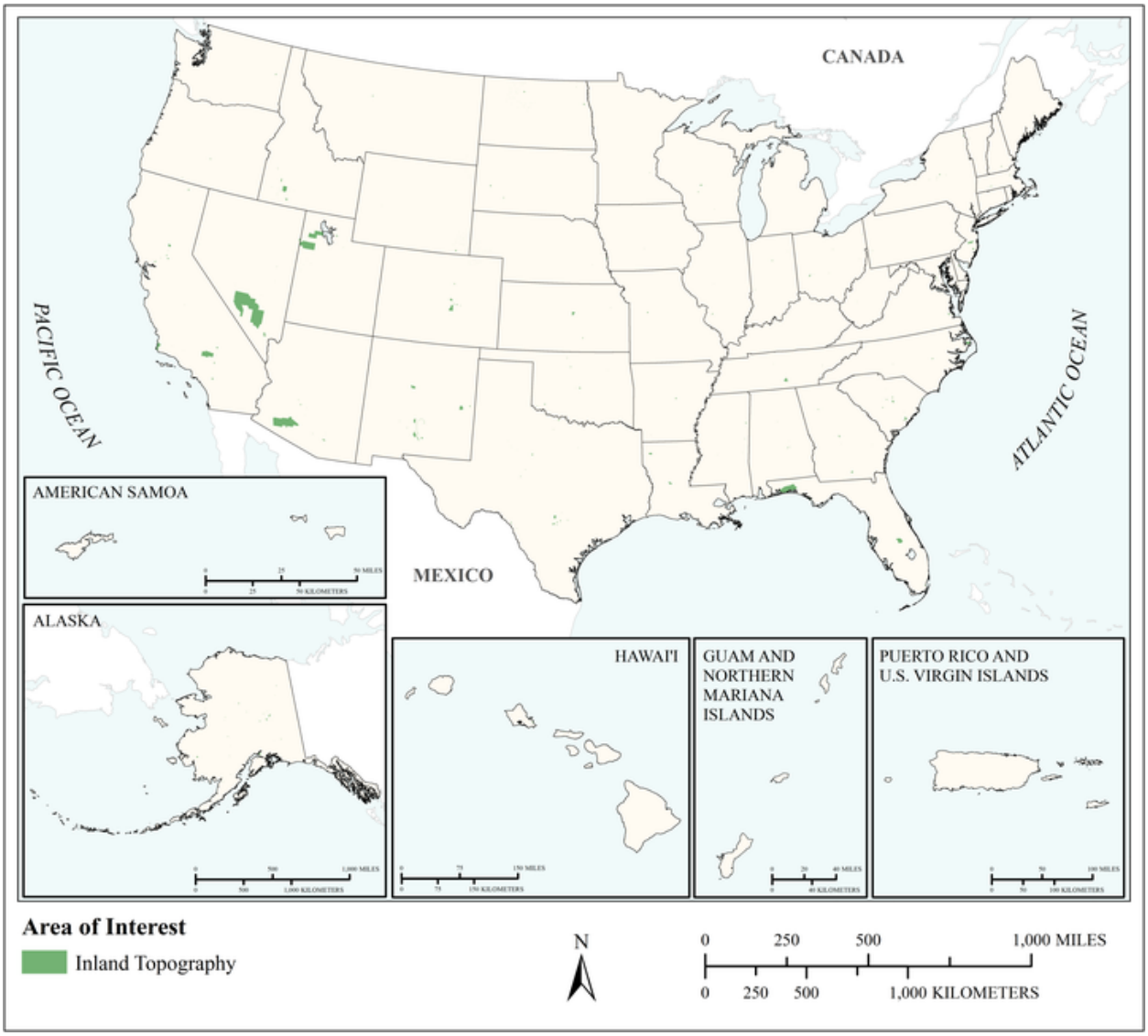
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$40,231									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$23,422									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Air Force Installation Management and Airborne Collection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase			
Sub Area Requirements	Air Force Installations			

MCA Description	Response
Mission Critical Activity	Site Analysis, facility, runway and road planning and construction. Stormwater modelling. Utility system planning and installation. Elevation data are needed for environmental analyses including stormwater modeling and spill response, site planning and analysis of obstructions, and construction management.
MCA Title	Air Force Installation Management and Airborne Collection
MCA ID	1065
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Department of the Air Force (USAF)
Sub-Agency or Division	Air Force Installation and Mission Support Center (AFIMSC)
Organization Mission	Deliver installation and mission support capabilities to 147 air bases, installations and ranges within the boundary of the USA
Program Name	Installation and Mission Support
Total Annual Program Budget	$10,000,000,000
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 21 - Aviation Navigation and Safety
Tertiary Business Use	BU 29 - Military

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Antennas and utility features

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	3-5 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	Some areas that are not developed could be collected with less frequency. Practice ranges could be less frequent. Any development activities would trigger collection. Funding availability drives update frequency also. County data may be used if available.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Required					
Other	Required					
Other description	An AOI would be an installation, such that the entire installation is collected at one time, not necessarily all installations at once.					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Required			
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL1 LIDAR			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

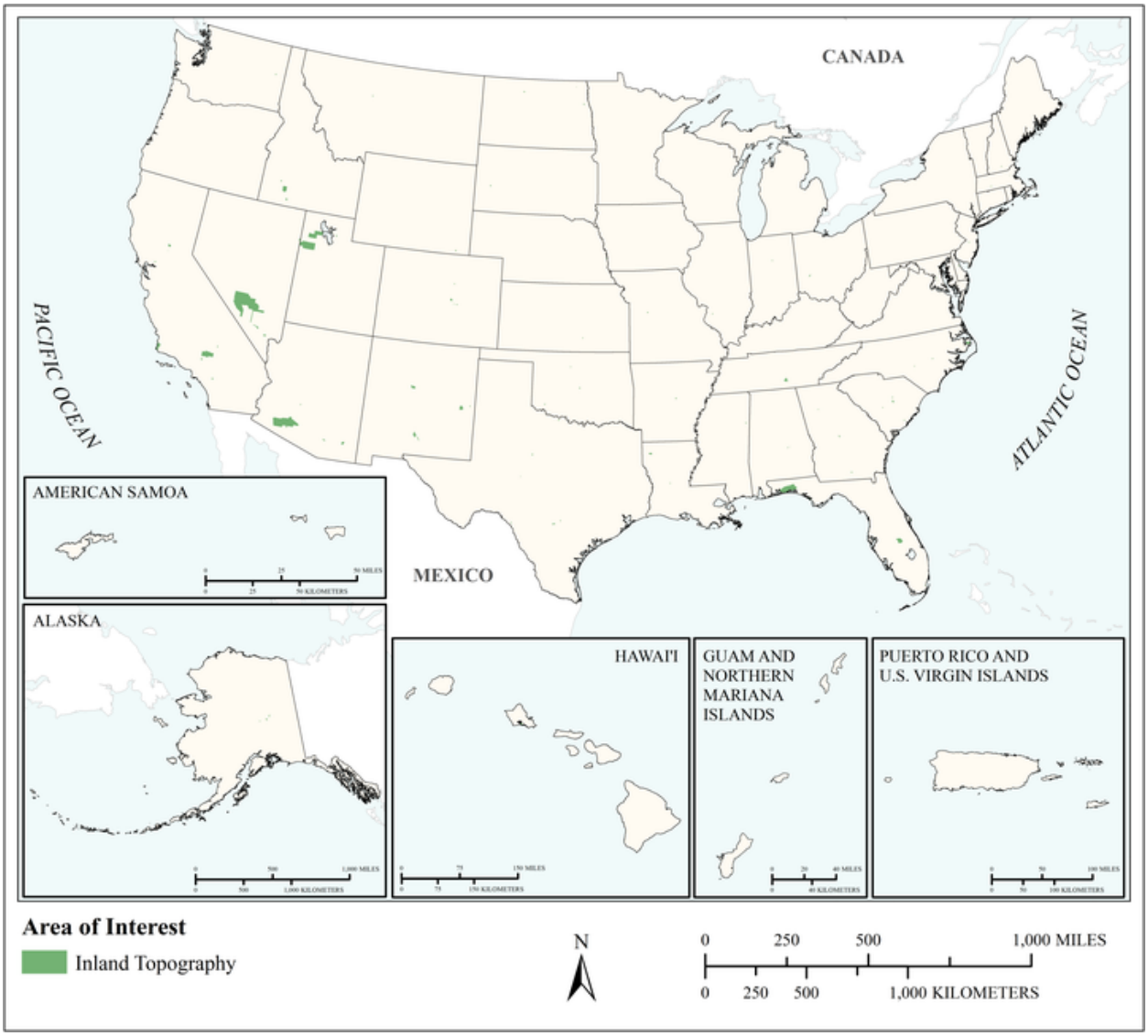
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes			
Other description	AF Collection, GRID, Local county agency if available			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Minor			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			
Improved response or timeliness	Moderate			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Moderate			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	Airfield obstructions. Spill response, floodplain modelling. Initial site selection planning - facilities, solar panel siting.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$1,000,000									
Cost savings/cost reduction description	Approximate amount spent on LiDAR.											
Cost avoidance	Major	Unable to provide										
Cost avoidance description	Air field obstructions. Costs associated with processing of LiDAR imagery.											
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved response or timeliness description	Flooding prediction.											
Improved customer experience	Moderate	Unable to provide										
Improved customer experience description	3-D Rendering of facilities.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$236,175									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	Moderate											
Environmental description	Improved modelling of spills, flooding, risk management											
Public safety, including life and property	Major											
Public safety, including life and property description	Line of sight modelling - Active shooter, modelling of blast effects for facility hardening											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federal Review AOIs			
Sub Area Requirements	Air Force installations			

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60639
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Department of the Air Force (USAF)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Highly desirable			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

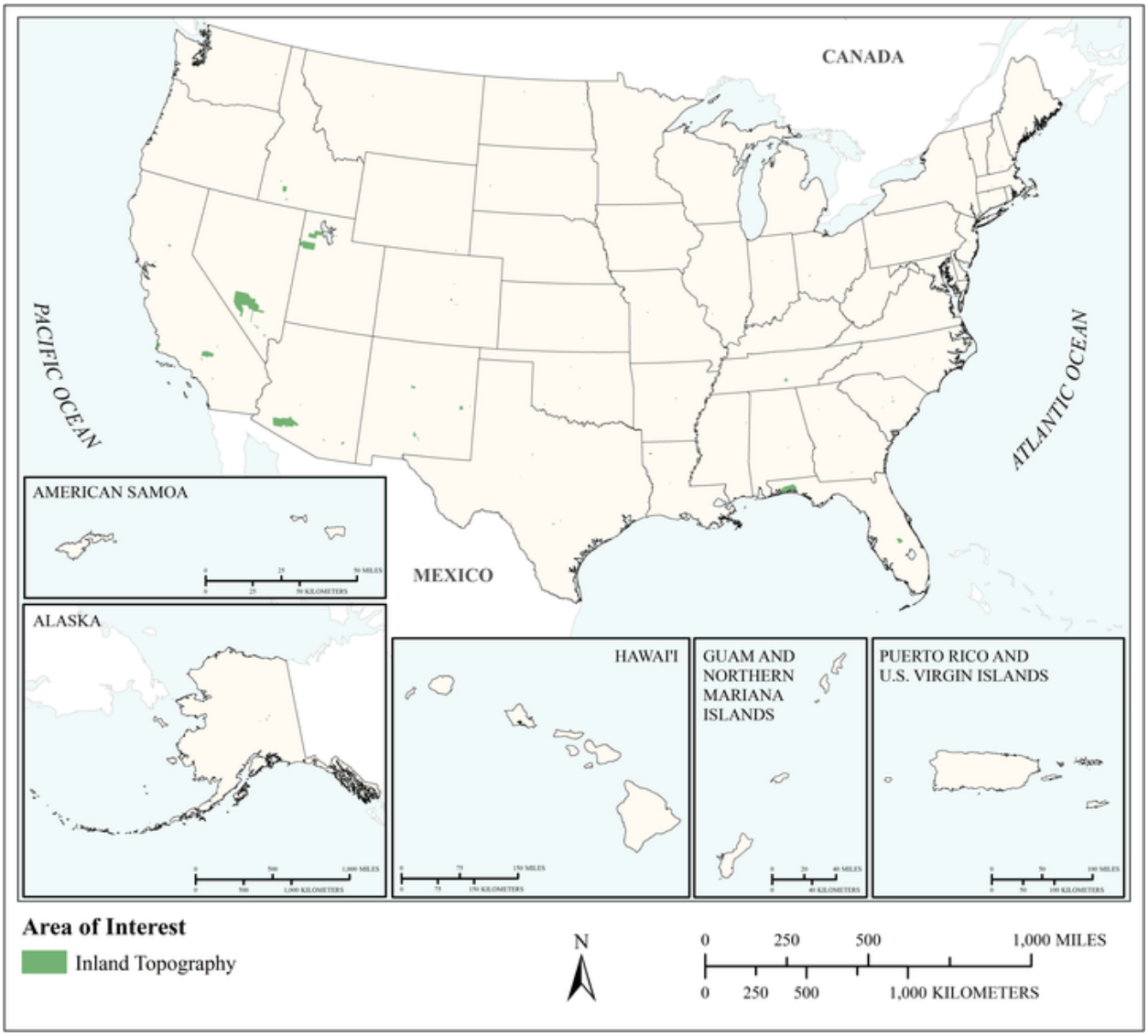
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	Minor											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Military



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federal Review AOIs			
Sub Area Requirements	Air Force installations			

MCA Description	Response
Mission Critical Activity	Tactical military operations. Strategic defense. Amphibious landings and logistics over-the-shore. Operation of ships and submarines. Weapons system testing. Management of flight facilities and offshore launch or target areas.
MCA Title	Military
MCA ID	60640
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Department of the Air Force (USAF)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 29 - Military
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1/QL2			
Update Frequency	3-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI	Yes			
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$27,697									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

Animal and Plant Health Inspection Service (APHIS)

The mission of APHIS is to protect the health and value of American agriculture and natural resources. The Wildlife Services (WS) division provides Federal leadership and expertise to resolve wildlife conflicts to allow people and wildlife to coexist. WS conducts program delivery, research, and other activities through its Regional and State Offices, the National Wildlife Research Center and its Field Stations, as well as through its National Programs.

APHIS is a multi-faceted agency with a broad mission area that includes protecting and promoting U.S. agricultural health, regulating genetically engineered organisms, administering the Animal Welfare Act and carrying out wildlife damage management activities. These efforts support the overall mission of USDA, which is to protect and promote food, agriculture, natural resources, and related issues.

- To protect agricultural health, APHIS works to defend America's animal and plant resources from agricultural pests and diseases.
- In the event that a pest or disease of concern is detected, APHIS implements emergency protocols and partners with affected states to quickly manage or eradicate the outbreak. This aggressive approach has enabled APHIS to successfully prevent and respond to potential pest and disease threats to U.S. agriculture.
- To promote the health of U.S. agriculture in the international trade arena, APHIS develops and advances science-based standards with trading partners to ensure America's agricultural exports, worth more than $50 billion annually, are protected from unjustified restrictions.

In response to needs expressed by the American people and Congress, APHIS' mission has expanded over the years to include such issues as wildlife damage and disease management, regulation of genetically engineered crops and animal welfare, and protection of public health and safety as well as natural resources that are vulnerable to invasive pests and pathogens. While carrying out its diverse protection responsibilities, APHIS makes every effort to address the needs of all stakeholders involved in the U.S. agricultural sector.

APHIS WS protects humans and agriculture from conflicts with wildlife. Some activities can include wildlife rabies vaccinations, protecting airports and air travel from wildlife strikes, protecting threatened and endangered species from invasive species, and protecting livestock from predation. Elevation data are primarily used for research, site location, and habitat mapping. Data can be required on a project-by-project basis but are not a daily requirement.

APHIS expressed the need for nationwide Quality Level 2 (QL2) inland topography updated every 4-5 years for wildlife and habitat management.

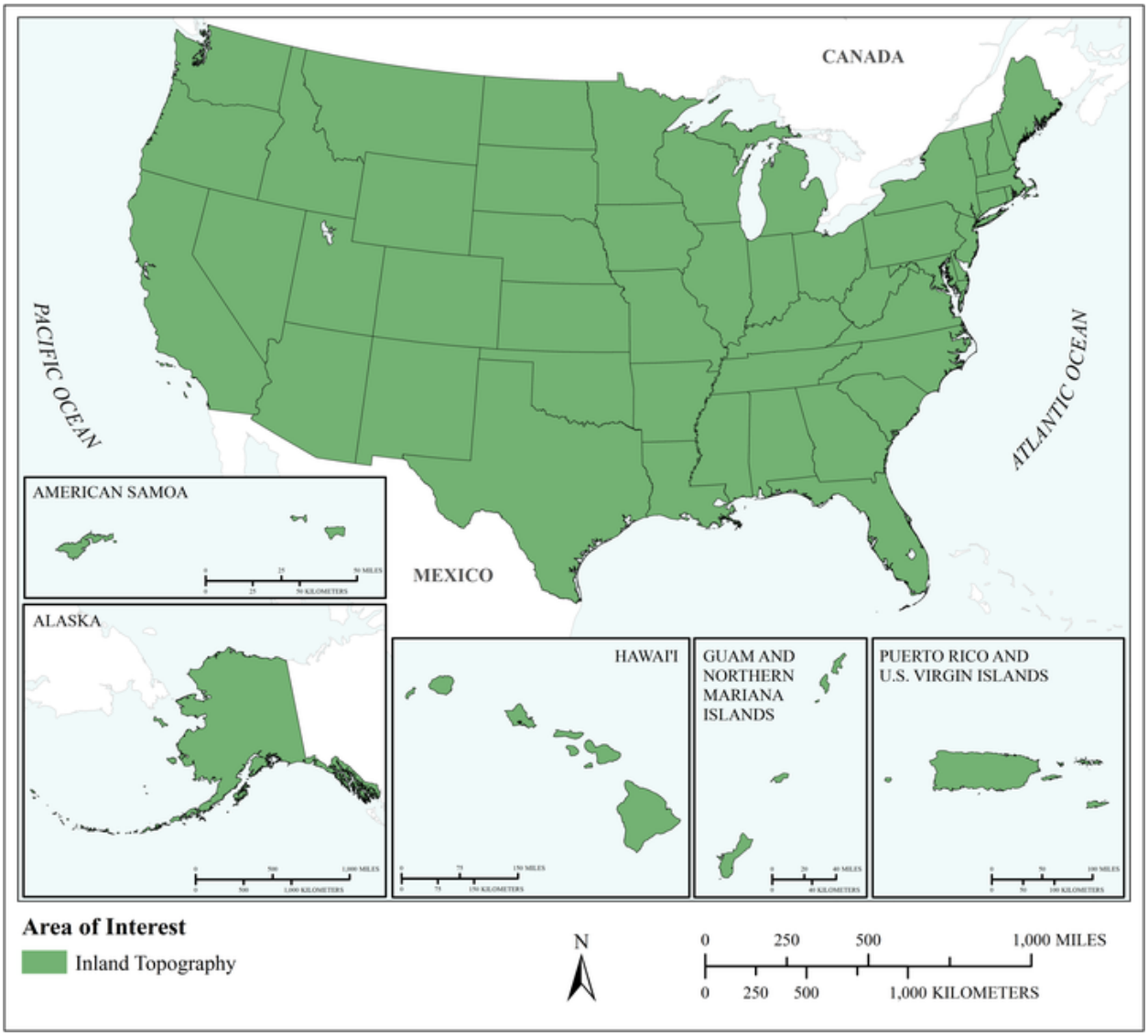
Future benefits of more accurate elevation data are minor in the category of Operational Benefits from mission driven performance improvements.

APHIS has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 07 – Wildlife and Habitat Management	USDA: Animal and Plant Health Inspection Service (APHIS)	1117	Wildlife Services and Plant Protection	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	None	None	None

MCA Title: Wildlife Services and Plant Protection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Nice to have			
Geographic Area Requirements	States and/or Territories			
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau			

MCA Description	Response
Mission Critical Activity	In APHIS Wildlife Services we protect humans and agriculture from conflicts with wildlife. Some activities can include wildlife rabies vaccinations, protecting airports and air travel from wildlife strikes, protecting threatened and endangered species from invasive species, and protecting livestock from predation. Elevation data support Wildlife Services activities, primarily through research and visualization. Elevation data are generally not used for day to day activities. Elevation data are also used for Plant Protection and Quarantine activities for research, visualization, and habitat identification.
MCA Title	Wildlife Services and Plant Protection
MCA ID	1117
Organization Type	Federal Agencies and Commissions
Organization Name	USDA: Animal and Plant Health Inspection Service (APHIS)
Sub-Agency or Division	Wildlife Services
Organization Mission	The mission of USDA APHIS Wildlife Services (WS) is to provide Federal leadership and expertise to resolve wildlife conflicts to allow people and wildlife to coexist. WS conducts program delivery, research, and other activities through its Regional and State Offices, the National Wildlife Research Center (NWRC) and its Field Stations, as well as through its National Programs.
Program Name	Wildlife Services
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Habitat features such as trees or shrubs.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 20 meters			
Acceptable Vertical Error	Up to 1 meter			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Not required			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Not required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Esri			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	None			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	I don't know	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Minor	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None											
Improved response or timeliness	None											
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	None											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

Agriculture Research Service (ARS)

ARS delivers scientific solutions to national and global agricultural challenges. ARS conducts research to develop and transfer solutions to agricultural problems of high national priority and provide information access and dissemination to:

- ensure high-quality, safe food, and other agricultural products;
- assess the nutritional needs of Americans;
- sustain a competitive agricultural economy;
- enhance the natural resource base and the environment; and
- provide economic opportunities for rural citizens, communities, and society as a whole.

To achieve these objectives, ARS identifies critical problems affecting American agriculture and plans and executes the strategies needed to address these problems by mobilizing resources (both human and financial); fostering multi-disciplinary research; linking research to program and policy objectives; and communicating and interacting with customers, stakeholders, partners, and beneficiaries to ensure program relevancy. ARS seeks to broaden public understanding of the value of agriculture and agricultural research to ensure the continued primacy of U.S. agriculture in the 21st century.

Input to this study was provided by the National Laboratory for Agriculture and the Environment (NLAE) and ARS's Long-Term Agroecosystem Research (LTAR). The NLAE is focused on integrating the fundamental principles in soil, water, and air into animal, cropping and watershed systems that lead to improved environmental quality, sustainability, and enhanced agricultural system efficiency. Transdisciplinary NLAE teams conduct coordinated research in abiotic and biotic systems.

ARS created the LTAR network to both assess and enable sustainable production systems under changing environmental, technological, and policy conditions. LTAR consists of 18 research sites across the country shown on the map below. These sites consist of rangeland and farm watersheds that represent major U.S. agricultural production regions. Scientists examine all aspects of agricultural production systems—genetics, the environment and management—as well as their interactions. They also look for ways to improve natural resources and economic returns for farmers. Long-term data gathered will help address questions about the sustainability of U.S. agricultural production systems and landscapes. This will allow LTAR partners to build future systems that increase production, assure producer economic viability and protect the nation's natural resources.

Figure 1. Long-Term Agro-ecosystem Research Sites and Farm Resource Regions

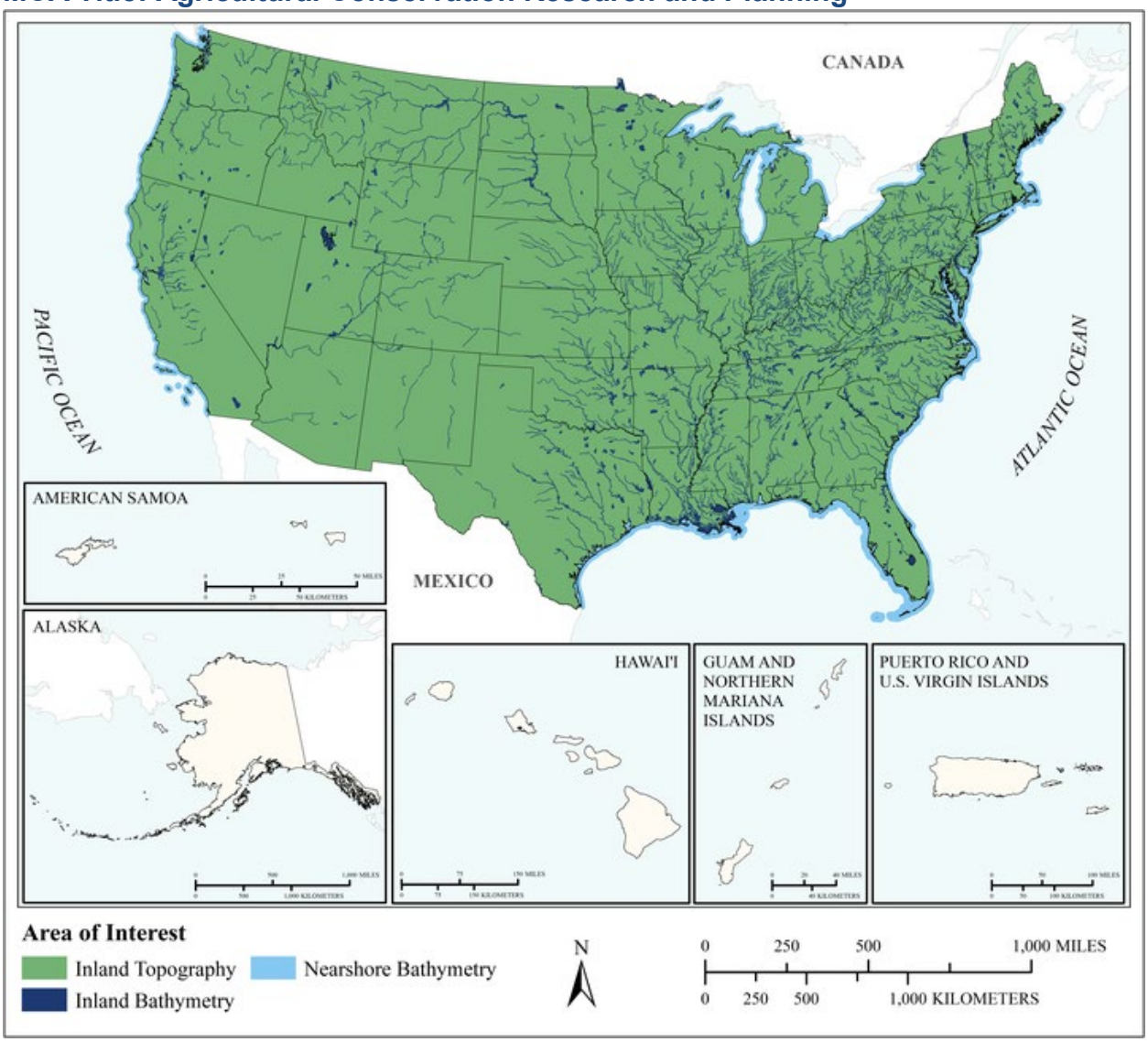
ARS considers a seamless national integrated topographic dataset using standard collection protocols and data specifications essential to meeting its research priorities and critical research efforts. Quality Level 2 (QL2) lidar data are needed by ARS for the 48 conterminous states, but QL1 data are needed for smaller LTAR boundary regions, and QL0 data are needed for even smaller experimental research areas. QL2B inland and nearshore bathymetry is needed for modeling, analysis, and mapping of water quality, water supply, and erosion. Inland bathymetry as important for being able to estimate inland water storage capacity, for example in flood risk mitigation and irrigation management. In general, data should be updated every 6-10 years. Future benefits from improved elevation data include significant time and cost savings and overall mission-driven performance improvements.

ARS has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	USDA: Agricultural Research Service (ARS)	21718	Agricultural Conservation Research and Planning	Inland Topo	(a) QL2 (b) QL1 (c) QL0	(a) 6-10 years (b) 6-10 years (c) 4-5 years	$167,031	Unable to quantify	Major	Major	I don't know
				Inland Bathy	QL2B	6-10 years	$3,618	Unable to quantify	I don't know	Moderate	I don't know
				Nearshore Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Agricultural Conservation Research and Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Area split by varying quality level or update frequency	Nationwide, inland areas	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	48 conterminous States			

MCA Description	Response
Mission Critical Activity	Agricultural conservation research and planning. Sustainable agriculture research. Simulating alternative agricultural design and management scenarios at local, landscape and regional scales. Watershed scale hydrologic modeling. Water quality analysis, including edge of field, enterprise and watershed scales. Nutrient and carbon stocks modeling from field to enterprise to region. Sediment erosion modeling from wind and water action at local, landscape and regional scales. Water Supply and Quality. Fate and transport of contaminants and runoff and sedimentation analyses from rotational cropping and grazing systems. Point- or non-point source pollution modeling. Assessment of rangeland health. Mapping for soil erosion potential due to grazing. Inland bathymetry as important for being able to estimate inland water storage capacity, for example in flood risk mitigation and irrigation management.
MCA Title	Agricultural Conservation Research and Planning
MCA ID	21718
Organization Type	Federal Agencies and Commissions
Organization Name	USDA: Agricultural Research Service (ARS)
Sub-Agency or Division	Agricultural Research Service
Organization Mission	ARS conducts research to develop and transfer solutions to agricultural problems of high national priority and provide information access and dissemination to: ensure high-quality, safe food, and other agricultural products. Assess the nutritional needs of Americans.
Program Name	Natural Resources and Sustainable Agricultural Systems National Program
Total Annual Program Budget	$2,000,000,000
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 08 - Agriculture and Precision Farming

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Ranges from less than 1 sq mi to 2 million sq mi
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)

General Geographic Area and Size	
Description of smallest 3D features	Discrete landform features. Storage capacity of small impoundments used for irrigation and flood mitigation. Underwater bathymetry – accurate measurement of the waterbody contours. Small swales and divides in very flat landscapes, where sheet flow and subsurface flows influence and define the movement of water. For example, in some parts of the southeastern US, we require accurate mapping of swales to model the flow of water from fields edges to streams.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL2 (b) QL1 (c) QL0	QL2B	QL2B	
Update Frequency	(a) 6-10 years (b) 6-10 years (c) 4-5 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	We require QL2 data for the 48 conterminous states, but require QL1 data updated every 6-10 years for smaller LTAR boundary regions, and QL0 data for even smaller experimental research areas updated every 5 years.			
Acceptable Horizontal Error	Up to 10 cm	Up to 40 cm	Up to 40 cm	
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm	Up to 40 cm	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed			To Mean Lower Low Water (MLLW)	
How far down the beach profile needed	To MLLW		None	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	Vertical accuracy of ~ 10 cm, longitudinal sampling density ~ per 1 m			

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Nice to have		Required	Nice to have
Other	Highly desirable	Highly desirable			Highly desirable	
Other description	For this question, we are considering the LTAR network boundaries as our AOI, not the CONUS. Similar environmental conditions are highly desirable within each individual LTAR site, not the entire network.	For this question, we are considering the LTAR network boundaries as our AOI, not the CONUS. Similar environmental conditions are highly desirable within each individual LTAR site, not the entire network.			For this question, we are considering the LTAR network boundaries as our AOI, not the CONUS. Similar environmental conditions are highly desirable within each individual LTAR site, not the entire network.	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Nice to have		Required	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
Other	Required					

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Other description	For this question, we are considering the LTAR network boundaries as our AOI, not the CONUS. Seamless point clouds and DEM are required within the boundaries of each LTAR site.					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Highly desirable	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Highly desirable	
Raw point cloud data	Not required	Nice to have	Nice to have	
Classified point cloud	Nice to have	Highly desirable	Nice to have	
Edited/cube XYZ		Not required	Not required	
Full waveform	Nice to have	Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Not required	
Ground control/ground truthing	Highly desirable	Highly desirable	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Not required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Not required	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Not required	
Land use/land cover	Required	Required	Not required	
Wetlands	Required	Required	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Not required	
Inland surface water features	Required	Required	Not required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Nice to have	Nice to have	Not required	
Cultural resources	Highly desirable	Nice to have	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			
Other	Highly desirable			
Other description	Irrigation features such as wells, channels, gates, locks, pivots, pond dams, overflow pipes and spillways			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Classified LAS points, 1-2m DEM - Iowa 2007-2010 - Minnesota 2013-2015; NOAA Data Access Viewer for LIDAR data, any available; Across the LTAR network, the 3D topographic data sources vary. For local work, some sites have acquired LiDAR DTMs through the NEON network, contracted flights, or from UAV SfM data. Or, they have benefited from 1m LiDAR elevation data produced under the 3DEP announcements. For regional projects, most efforts make use of the existing USGS 10m resolution National Elevation datasets; USGS & various state LIDAR, ~ 1 m resolution.	Currently we have spotty inland bathymetric data, which is very local, usually produced in-house. This is one of the most important data gaps in our data holdings across the LTAR network; Acquiring bathymetry data via Acoustic Profiling System (APS).	None	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI	Yes			
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	PASDA, Maryland iMAP			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes	Yes	Yes	
Other description	In-house; NEON AOP for a few LTAR sites (Colorado, New Mexico, Arizona); NRCS Data Gateway	Data that meets my needs is not available; locally produced inland bathymetry of ponds in our watershed areas.	None	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	I don't know	
Cost savings/cost reduction	Major	Inland bathy data not available	I don't know	
Cost avoidance	Major	Inland bathy data not available	I don't know	
Increased revenues	None	Inland bathy data not available	I don't know	
Mission-driven performance improvements	Major	Inland bathy data not available	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available	I don't know	
Improved response or timeliness	Major	Inland bathy data not available	I don't know	
Improved customer experience	Moderate	Inland bathy data not available	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available	I don't know	
Environmental	Major	Inland bathy data not available	I don't know	
Public safety, including life and property	Minor	Inland bathy data not available	I don't know	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major	Minor		
Other description	As a research agency, benefits of currently available inland data are primarily in the improvement of our models and model outputs, which are used by others	We have been able to use our locally produced inland bathymetric data to support some modeling on a local scale		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$167,031	Major	Annual dollars saved/realized	$3,618	I don't know	Unable to provide				
Time savings description	Having authoritative data readily downloadable from a single site would save work hours, 4 hours weekly searching for data for 50 weeks = 200 hours; In cross-network LTAR research projects, having one common data source for high quality 3D elevation data will save major amounts of time (estimate a savings of 80 hours per site x however many sites are included in a project -- max number 19). Across the LTAR network, having the needed data at the appropriate scale will save researchers time by avoiding field campaigns to collect survey data over research fields and plots; Having authoritative data readily downloadable from a single site would save work hours, 2 hours weekly searching for data for 50 weeks = 100 hours. Across the LTAR network, having accurate 3D topographic elevation data will streamline modeling, providing a common standard for modeling across the network, increasing the modeling efficiency and accuracy; Having authoritative data readily downloadable from a single site would save work hours, 4 hours weekly searching for data for 50 weeks = 200 hours. To the extent that an individual LTAR site may run repeated analyses over months or years, a dependable, accurate 3D dataset may help with streamlining operations. However, in general, ARS does not provide operational products such as those provided in the examples. It is possible that, once there is a stable, authoritative, accurate elevation dataset available across the CONUS, the discussions about how to incorporate elevation will become less complex, in much the same way that land cover has become less complicated following the regular publication of the NLCD and CDL nationwide datasets. The amount of time for QA/QC of elevation data will be reduced (estimate a savings of 40 hours per site x 19 sites (max)).			Hours saved from field work. 2 weeks, 40 hours/week = 80 hours. Hours saved from office planning. 1 week, 40 hours.								
Cost savings/cost reduction	Major	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction description	The amount varies from one LTAR location to the next. However, in general, each site spends some dollars on surveying terrain. To the extent that the 3D elevation data provides an adequate substitute, the LTAR site and network will experience cost savings.											
Cost avoidance	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance description	The amount varies from one LTAR location to the next. However, in general, each site spends some dollars on processing terrain data. To the extent that the 3D elevation data provides an adequate substitute, the LTAR site and network will experience cost savings.											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements description	I'm not sure how to estimate this for the LTAR network. To fully carry out its program at the network level, standardized datasets such as the 3D inland topography are required. Once those data become available, we along with other national networks will be able to better fulfill our missions. I'm not sure how to estimate this for the LTAR network. To fully carry out its program at the network level, standardized datasets such as the 3D inland topography are required. Once those data become available at finer resolutions in the nested hierarchy of LTAR boundaries and experimental fields, we along with other national networks will be able to better fulfill our missions.			The incorporation of inland bathymetric data integrated with inland topography, for watershed and regional scale hydrologic modeling will greatly improve the accuracy and results of our models at all scales of analysis.								
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Coordinated modeling efforts.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Value added to products or services description	The major products from LTAR consist of research findings, which are disseminated to the Agricultural applications community. To the extent that new applications we might develop, such as models that form part of decision tools, use 3D data then our products will provide benefits to users. However, this is hard to quantify directly.											
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness description	The major products from LTAR consist of research findings, which are disseminated to the Agricultural applications community. To the extent that new applications we might develop, such as models that form part of decision tools, use 3D data then our products will provide benefits to users. However, this is hard to quantify directly.											
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience description	The major products from LTAR consist of research findings, which are disseminated to the Agricultural applications community. To the extent that new applications we might develop, such as models that form part of decision tools, use 3D data then our products will provide benefits to users. However, this is hard to quantify directly.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			I don't know			I don't know					

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Education or outreach description	Improved quality modeling will result in more effective outreach to stakeholders			
Environmental	Major	Moderate	I don't know	
Environmental description	With the enhanced 3D elevation data, the LTAR network will be able to provide more accurate models of environmental conditions resulting from agricultural management practices; Improved quality modeling will result in better quality results of future conservation effects analysis	With 3D inland bathymetric data, the LTAR network would be able to contribute to national scale hydrologic modeling and modeling the effects of alternative agricultural management practices on water quality		
Public safety, including life and property	I don't know	I don't know	I don't know	

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Bureau of Indian Affairs (BIA)

Established in 1824, BIA currently provides services to approximately 1.9 million American Indians and Alaska Natives. There are 573 federally recognized American Indian tribes and Alaska Native Villages in the United States. BIA is responsible for the administration and management of 55 million surface acres and 57 million acres of subsurface minerals estates held in trust by the United States for American Indian, Indian tribes, and Alaska Natives. Bureau of Indian Education (BIE) provides education services to approximately 42,000 Indian students.

The BIA mission is to: "… enhance the quality of life, to promote economic opportunity, and to carry out the responsibility to protect and improve the trust assets of American Indians, Indian tribes, and Alaska Natives."

Current status of elevation data for BIA

The Branch of Geospatial Support, which is under the Office of Trust Services, Division of Land Titles and Records, provides Geographic Information Systems (GIS) software, training, and system support for the management of natural resources on Indian lands, such as irrigation flood plain analysis, forest harvesting, wildland fire analysis, oil and gas management, and other economic analyses. This is accomplished by providing expert technical support in geospatial data technologies to BIA and tribal government GIS employees. The Branch of Geospatial Support is the sole technical support office to BIA and all tribes for GIS. The support activities include software distribution, customer license accounting, geospatial and technical software support, remote sensing, and GIS training and workshop sessions.

BIA does not acquire elevation data but relies on the best available data from other sources. BIA researches available data on behalf of tribes and may make limited imagery acquisitions during fire season.

Importance of elevation data to BIA

Accurate and current elevation data are especially mission-critical for management of forest and water resources. It is the mission of BIA's programs to promote self-determination, economic opportunities, and public safety through the sound management of irrigation and dam and power facilities owned by the BIA. This program generates revenues for the irrigation and power projects of $80 million to $90 million annually. Additionally, water rights, mitigation, and all that goes along with water from forestry to fishing, are very important to Native Peoples, and any increase in knowledge of those water sources, watersheds, and waterways is invaluable.

Similarly, forest products on Native lands are harvested and sold through permits. Forest inventories are conducted to determine and record the volume and value of forest products harvested by ownership and to maintain records to document compliance. With timber sales exceeding $100 million annually, the wise stewardship of forests on American Indian Trust lands is critical. Forest and Fire management plans rely on lidar data for calculating slope, timber/biomass metrics, and to meet the minimum sampling error guidelines established by Realty. Timber is real property; volumes and fair market values of the timber must be determined with a minimum sampling error of 15% as a part of Realty appraisal and to enhance sustainable forest product sales.

High-level summary of elevation data requirements

BIA not only performs activities related to its management of lands but also provides data to tribes for their use in all aspects of government. Elevation data are needed by BIA for flood risk assessment, dam safety, forestry, fire management, natural resources, assessment of impacts to Indian lands, and general GIS activities including modeling for appraisals of lands for land buyback. Tribal uses would also include

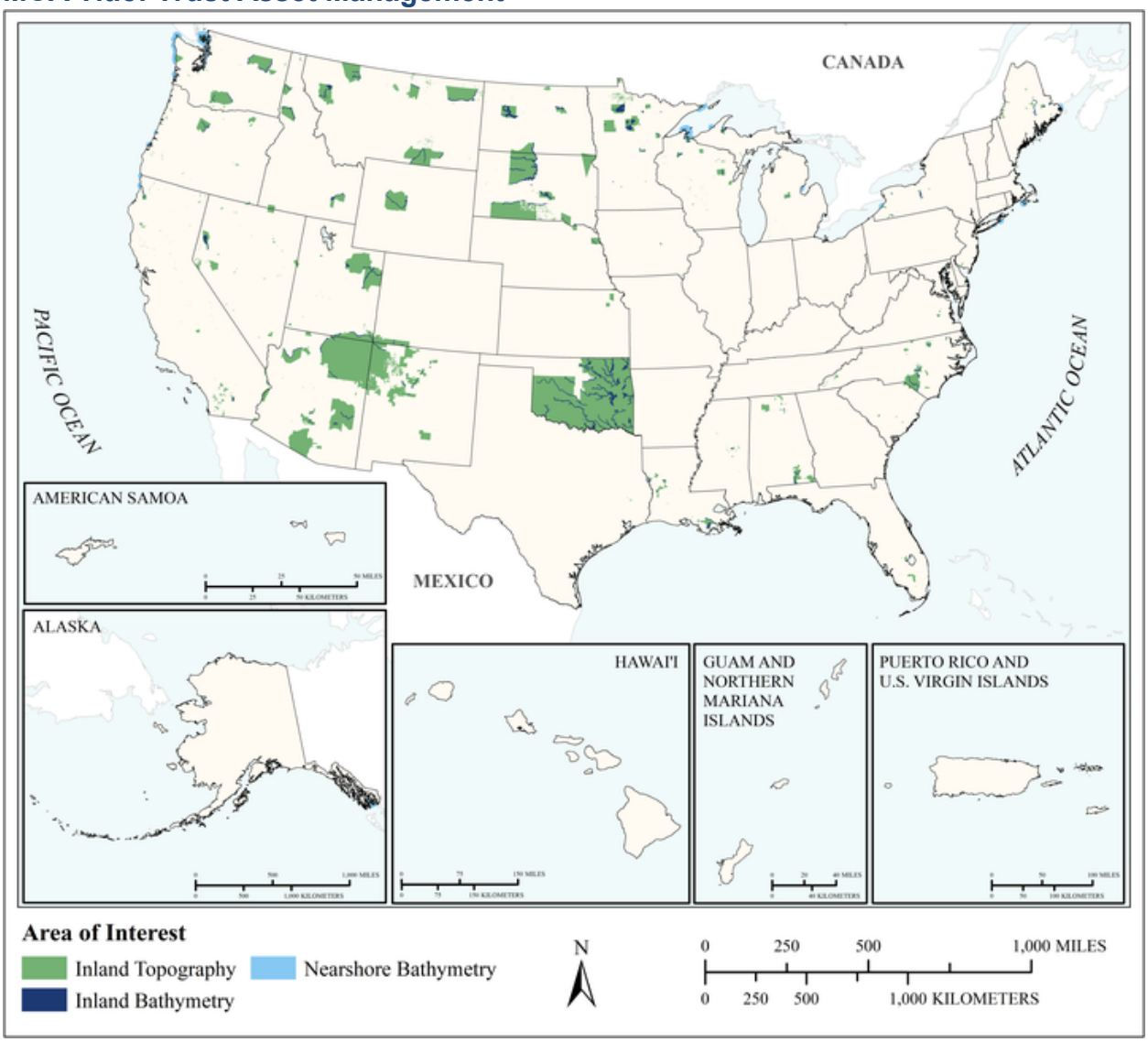
management of historical and cultural resources as well as infrastructure and construction management. Bathymetry are needed for fishing rights, tribal water rights, and identification of submerged artifacts. In order to perform these activities, BIA requires nationwide Quality Level 2 (QL2) inland topography and QL1B inland and nearshore bathymetry all updated every 6-10 years.

BIA has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 06 – Natural Resource Management	DoI: Bureau of Indian Affairs (BIA)	21524	Trust Asset Management	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Trust Asset Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Custom description	Custom description	Custom description	
Sub Area Requirements	Tribal lands in the 48 conterminous States and Annette Island, AK	Tribal lands in the 48 conterminous States and Annette Island, AK	Tribal lands in the 48 conterminous States and Annette Island, AK	

MCA Description	Response
Mission Critical Activity	Trust Asset management of natural resources. BIA performs activities related to its management of lands but also provides data to tribes for their use in all aspects of government – akin to whatever any other local government would use the data for. Elevation data are needed by BIA for flood risk assessment, dam safety, forestry, fire management, natural resources, assessment of impacts to Indian lands, and general GIS activities including modeling for appraisals of lands for land buyback. Tribal uses would also include management of historical and cultural resources as well as infrastructure and construction management. Bathymetry are needed for fishing rights, Tribal water rights, and identification of submerged artifacts.
MCA Title	Trust Asset Management
MCA ID	21524
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: Bureau of Indian Affairs (BIA)
Sub-Agency or Division	Branch of Geospatial Support (BOGS)
Organization Mission	The Bureau of Indian Affairs' mission is to enhance the quality of life, to promote economic opportunity, and to carry out the responsibility to protect and improve the trust assets of American Indians, Indian tribes and Alaska Natives.
Program Name	Office of Trust Services
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 04 - Forest Resources Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Survey level features, submerged artifacts and submerged lands.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	
Update Frequency	6-10 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	Require tribal approval to fly across tribal lands, NGA lidar and IfSAR in AK			
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed			500 meters inland	
How far down the beach profile needed			To MHHW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	
DTM	Nice to have	Nice to have	Nice to have	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Nice to have	Nice to have	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Nice to have	Nice to have	Nice to have	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Nice to have	Nice to have	Nice to have	
Land use/land cover	Nice to have	Nice to have	Nice to have	
Wetlands	Nice to have	Nice to have	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	
Inland surface water features	Nice to have	Nice to have	Nice to have	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Nice to have	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available including USGS, NGA, other resources. BIA researches for tribes, limited imagery acquisition during fire season via Digital Globe and Eagle Vision (USAF). Also use NAIP and NGA imagery.	Best available including USGS, NGA, other resources. BIA researches for tribes	Best available including USGS, NOAA other resources. BIA researches for tribes.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	Any available	Any available	Any available	
Other	Yes		Yes	
Other description	Indian lands		Indian lands	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	I don't know	
Cost savings/cost reduction	Major	I don't know	I don't know	
Cost avoidance	Major	I don't know	I don't know	
Increased revenues	None	I don't know	I don't know	
Mission-driven performance improvements	Major	I don't know	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	I don't know	
Improved response or timeliness	Major	I don't know	I don't know	
Improved customer experience	Major	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	I don't know	I don't know	
Environmental	Major	I don't know	I don't know	
Public safety, including life and property	Major	I don't know	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know					
Environmental	I don't know			I don't know			I don't know					
Public safety, including life and property	I don't know			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps	Yes	Yes	Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes	Yes	Yes	
Viewshed maps	Yes	Yes	Yes	
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Bureau of Land Management (BLM)

The BLM's mission is to sustain the health, diversity, and productivity of public lands for the use and enjoyment of present and future generations.

Congress tasked the BLM with a mandate of managing public lands for a variety of uses such as energy development, livestock grazing, recreation, and timber harvesting while ensuring natural, cultural, and historic resources are maintained for present and future use. The BLM manages public lands to maximize opportunities for commercial, recreational, and conservation activities. This promotes healthy and productive public lands that create jobs in local communities while supporting traditional land uses such as responsible energy development, timber harvesting, grazing, and recreation, including hunting and fishing.

Elevation data are used for a variety of purposes including forestry, rangeland, wildlife and habitat, cultural resources, and inland boundary management. The Mineral Production Verification Program uses elevation data to review of surface mining and mineral extraction activities. The Abandoned Mine Lands (AML) and Hazardous Material Program uses lidar to assist with the large workload in the discovery and inventory efforts for presently unknown AML features, confirm previously discovered features, initiate field characterization efforts (cultural, biological, reclamation/engineering, soil/water sampling), improve conceptual site modeling, and help prioritize hazard abatement actions. Lidar-facilitated inventory of AMLs is proven to be safer, faster, more accurate, more efficient, and more cost-effective than traditional literature review and field-based inventory protocols, yielding results ranging from 100-300% greater than conventional methods.

Elevation data reduce field visits for assessment of forest structure metrics for forestry management. Elevation data are also used to identify vegetation structure, heights of shrubs, etc. for management of vegetation on rangelands for cattle grazing, sage-grouse habitat, feral horses, and other wildlife. Inland bathymetry is needed for managing fish species. The Mineral Production Verification Program uses elevation data for review of surface mining and mineral extraction activities on BLM lands as well as for BLM’s minerals responsibilities underneath non-BLM lands. BLM also manages trust holdings and land under USBR reservoirs, including boat ramps and underwater cultural resources. Elevation data are needed for preservation and management of these cultural resources to inventory, identify, document, map, and preserve sites. Finally, Public Land Survey System (PLSS) cadastral surveys are BLM’s responsibility. Surveys are done when land exchanges to/from federal agencies occur. Physical field surveys are required, but elevation data can help plan the field work.

Elevation data requirements range from Quality Level 0 (QL0) to QL2 for inland topography with most Mission Critical Activities indicating a need for QL2 data. Most activities that require inland bathymetry require QL0B data. The update frequency of the elevation data varies from quarterly for surface mining and mineral extraction activities, to every 6-10 years for aerial remote sensing and mapping.

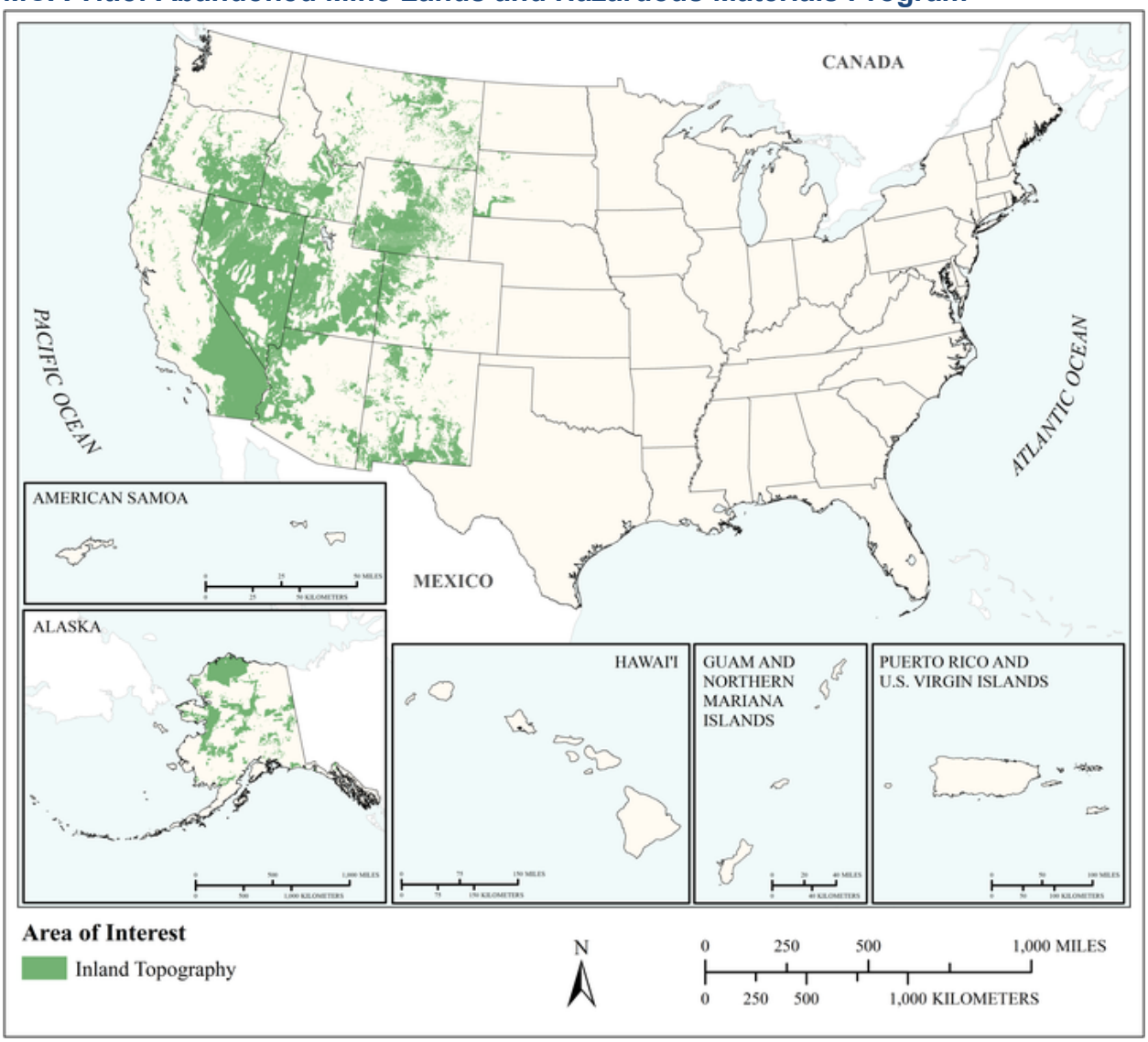
Benefits of having improved elevation data include major cost avoidance (data processing avoided, avoided property loss due to natural hazards, and avoided accidents caused by human error), faster reviews and field inspections, improved projections of at-risk areas, and future public safety and environmental benefits. Enhanced elevation data would also allow for better decision making and modeling while saving data acquisition costs.

The BLM has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	DoI: Bureau of Land Management (BLM)	22190	Abandoned Mine Lands and Hazardous Materials Program	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 02 – Riverine Ecosystem Management	DoI: Bureau of Land Management (BLM)	22183	Stream and River Water Quality and Habitat Monitoring and Assessment	Inland Topo	QL1 HD	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Minor
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Minor
BU 04 – Forest Resource Management	DoI: Bureau of Land Management (BLM)	21707	Forestry Management	Inland Topo	QL0	2-3 years	$4,120,500	Unable to quantify	Major	Major	Major
				Inland Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 05 – Rangeland Management	DoI: Bureau of Land Management (BLM)	1301	Rangeland Management	Inland Topo	QL1	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
BU 06 – Natural Resource Management	DoI: Bureau of Land Management (BLM)	1342	Aerial Remote Sensing and Mapping	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 07 – Wildlife and Habitat Management	DoI: Bureau of Land Management (BLM)	21992	Wildlife and Habitat Management	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	Cross sections and/or transects meet needs	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 11 – Geologic Resource Extraction	DoI: Bureau of Land Management (BLM)	1331	Mineral Production Verification	Inland Topo	QL1	Quarterly	Unable to quantify	Unable to quantify	None	None	None
BU 14 – Cultural Resource Management	DoI: Bureau of Land Management (BLM)	22134	Cultural Resources Preservation and Management	Inland Topo	QL0 HD	Event driven	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	Event driven	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
BU 30 – Maritime and Land Boundary Management	DoI: Bureau of Land Management (BLM)	22109	Cadastral Survey and Inland Boundary Management	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	None	None	None

MCA Title: Abandoned Mine Lands and Hazardous Materials Program



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies			
Sub Area Requirements	BLM			

MCA Description	Response
Mission Critical Activity	Abandoned Mine Lands and Hazardous Materials Program. Elevation data are needed to inventory and identify potential sites, secure land, mitigate safety, and potentially remediate impacted lands. QL2 elevation data is the minimum requirement, some areas may require higher quality data. The AML program uses lidar to assist with the large workload in the discovery and inventory efforts for presently unknown AML features, confirm previously discovered features, initiate field characterization efforts (cultural, biological, reclamation/engineering, soil/water sampling), improving conceptual site modeling, and help prioritize hazard abatement actions. Lidar- facilitated inventory of AMLs is proven to be safer, faster, more accurate, more efficient, and more cost-effective than traditional literature review plus field-based inventory protocols, yielding results ranging from 100-300% greater than conventional methods.
MCA Title	Abandoned Mine Lands and Hazardous Materials Program
MCA ID	22190
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: Bureau of Land Management (BLM)
Sub-Agency or Division	
Organization Mission	Multiple Use and Sustained Yield of Public Lands
Program Name	Abandoned Mine Lands
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Mining claim posts to survey markers or steel drums.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	10m spacing, up to 20cm vertical accuracy			

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Highly desirable			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Site specific, collected at varying quality levels and dates			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	ID Historical Society, various state mine agencies, various state geological surveys			

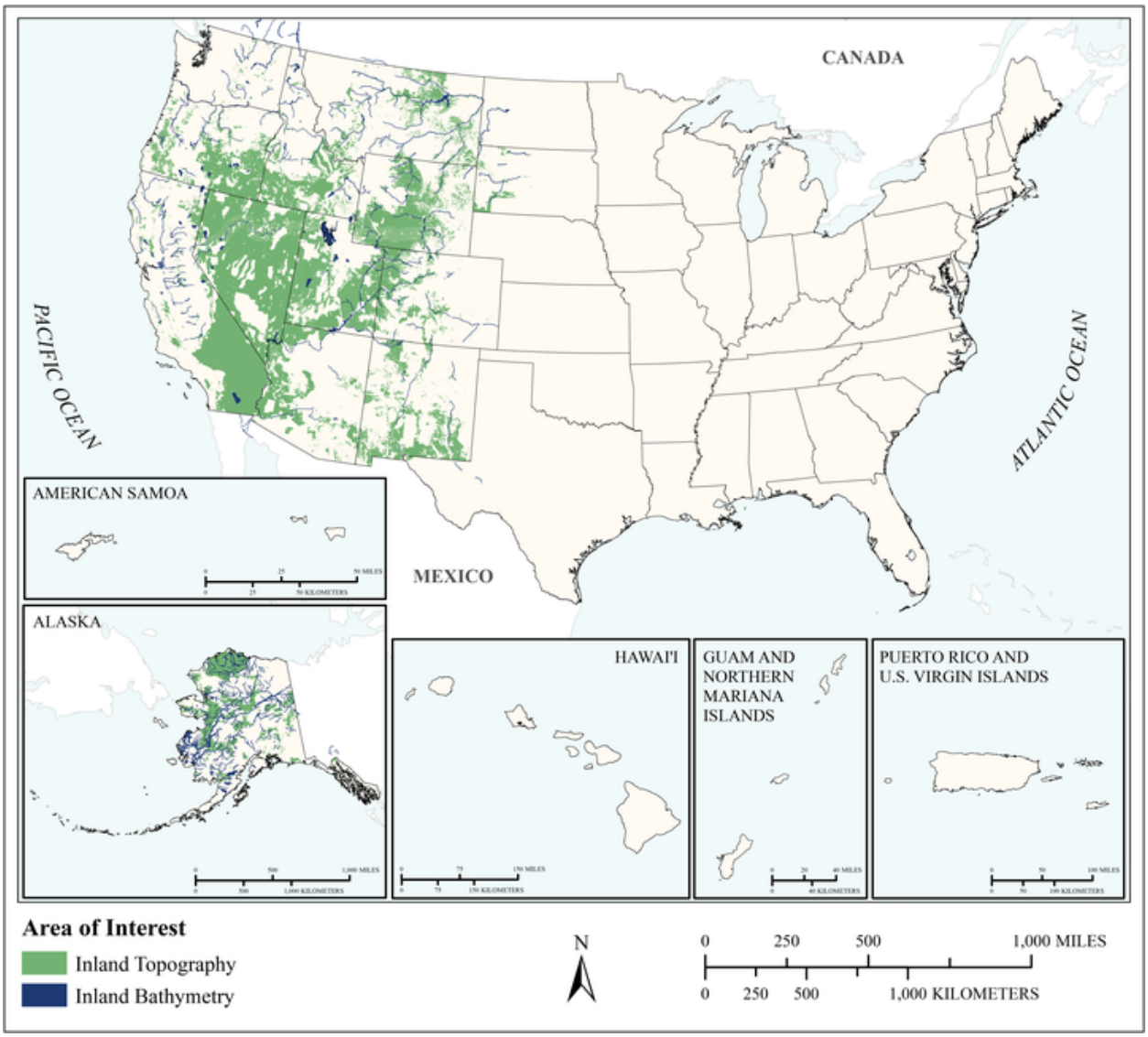
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes			
Other description	Historical mine maps, Private collection maps			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Minor			
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Moderate	Annual percent improvement	200%									
Mission-driven performance improvements description	The AML program uses LIDAR to assist with the large workload in the discovery and inventory efforts for presently unknown AML features, confirm previously discovered features, initiate field characterization efforts (cultural, biological, reclamation/engineering, soil/water sampling), improving conceptual site modeling, and help prioritize hazard abatement actions. LIDAR- facilitated inventory of AMLs is proven to be safer, faster, more accurate, more efficient, and more cost- effective than traditional literature review + field-based inventory protocols, yielding results ranging from 100-300% greater than conventional methods.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Stream and River Water Quality and Habitat Monitoring and Assessment



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Custom description		
Sub Area Requirements	BLM	HUC8s that cover BLM lands		

MCA Description	Response
Mission Critical Activity	Stream channel species and habitat assessment and management. Water quality assessment and management. Fisheries and riparian management. Linking upland conditions to stream and river condition and trend. BLM inventories rivers and streams nationally.
MCA Title	Stream and River Water Quality and Habitat Monitoring and Assessment
MCA ID	22183
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: Bureau of Land Management (BLM)
Sub-Agency or Division	Branch of Assessment and Monitoring
Organization Mission	It is the mission of the Bureau of Land Management to sustain the health, diversity and productivity of the public lands for the use and enjoyment of present and future generation
Program Name	Soil, Water, and Air Program; Riparian Program; Fisheries and Aquatic Habitat Program
Total Annual Program Budget	$55,650,000
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	BU 09 - Fisheries Management and Aquaculture
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Mapping current state and changes in things like: vegetation, stream and river planform and cross-sectional area, other hydrogeomorphic features.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Other	Required

Inland Bathy Feature Size Requirements	Response
Other description	Wetlands
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Less than 50 cm		
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		Vertical: up to 20 cm Horizontal: < 50 cm; cross section spacing may vary with field activity		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Required	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Required	Highly desirable		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Not required	Nice to have		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Given spatial scale at which we work and the paucity of 3D topographic data, we do not work with it for much of our mission critical work. Exceptions include where topographic lidar (10 cm vertical accuracy with 0.7 m point spacing) are available. HOWEVER, having this information in the future would allow us to revolutionize how we conduct stream, river and wetland inventories and assessments.	Given spatial scale at which we work and the paucity of 3D topographic data, we do not work with it for much of our mission critical work. Exceptions include where topographic lidar (10 cm vertical accuracy with 0.7 m point spacing) are available. HOWEVER, having this information in the future would allow us to revolutionize how we conduct stream, river and wetland inventories and assessments.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				

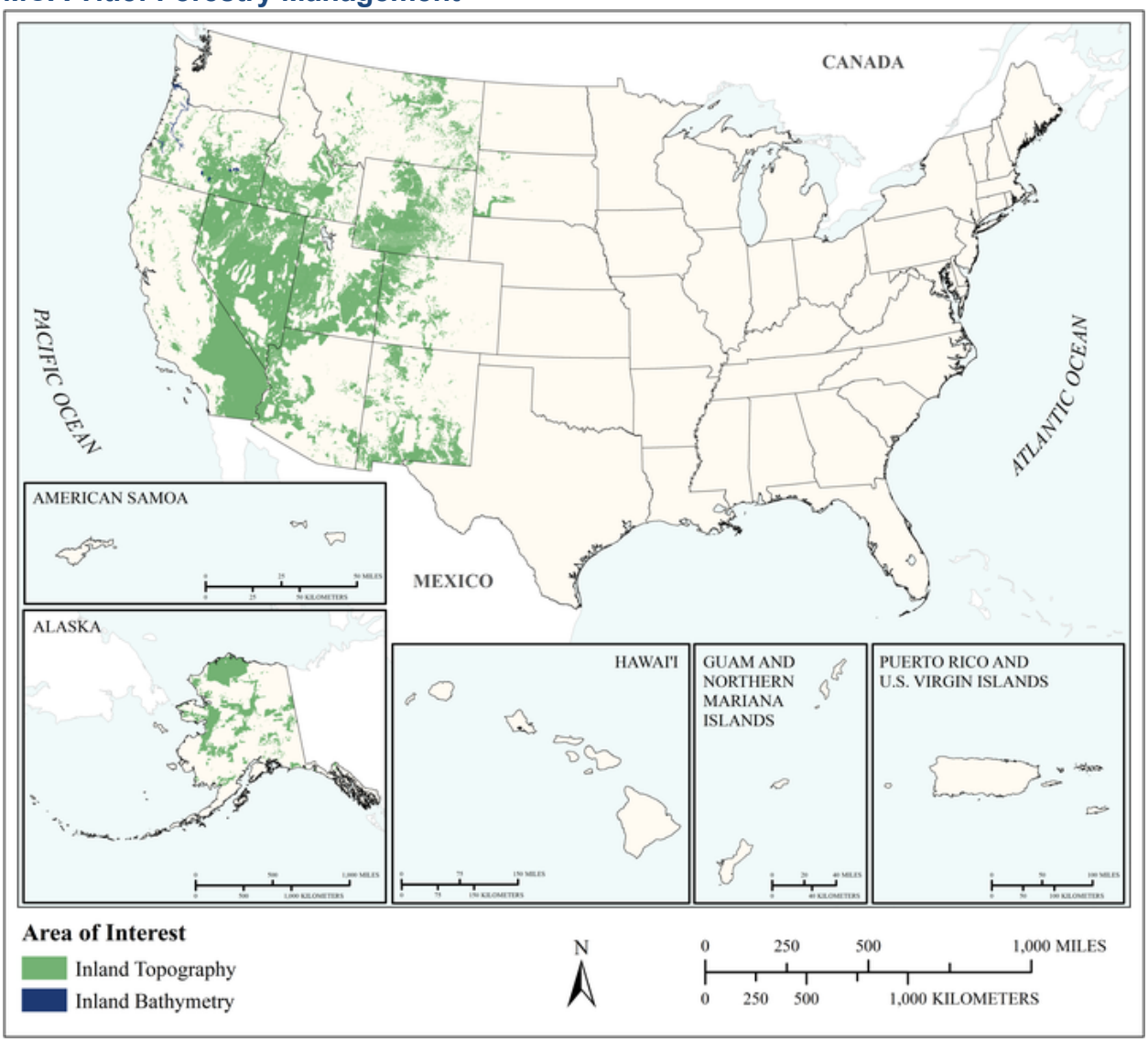
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	Moderate		
Cost savings/cost reduction	I don't know	Moderate		
Cost avoidance	I don't know	Moderate		
Increased revenues	None	None		
Mission-driven performance improvements	Moderate	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate		
Improved response or timeliness	I don't know	Minor		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Moderate	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		Moderate	Unable to provide							
Time savings description	Having this information in the future would allow us to revolutionize how we conduct stream, river and wetland inventories and assessments.			Having this information in the future would allow us to revolutionize how we conduct stream, river and wetland inventories and assessments.								
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide							
Increased revenues	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Annual percent improvement	23%						
Mission-driven performance improvements description	Having this information in the future would allow us to revolutionize how we conduct stream, river and wetland inventories and assessments.			Having this information in the future would allow us to revolutionize how we conduct stream, river and wetland inventories and assessments.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Minor			Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Forestry Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	One or more Hydrologic Units (HUC4s)		
Sub Area Requirements	BLM			

MCA Description	Response
Mission Critical Activity	Timber harvest and reforestation, Wildfire fighting, Wildlife habitat restoration, and Aquatic conservation. Inland bathy data is needed for forestry activities in Oregon. Elevation data is used for forest structure metrics. Having good quality elevation data reduces field visits.
MCA Title	Forestry Management
MCA ID	21707
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: Bureau of Land Management (BLM)
Sub-Agency or Division	
Organization Mission	Management of federal public lands and resources
Program Name	Mission critical activity is to implement western Oregon Resource Management Plans and the Sage Grouse Management plans.
Total Annual Program Budget	$200,000,000
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 05 - Rangeland Management
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required
Other	Required
Other description	Canopy cover and veg structure

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual trees, Headwater streams, Landslides, Road and culvert locations, Timber harvest yarding corridors

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL2B		
Update Frequency	2-3 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 30 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		Vertical and horizontal accuracy should be 1 meter or less; cross section spacing varies		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Nice to have	
Other	Required					
Other description	LiDAR shadowing reduced					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Nice to have	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Required		
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	FUSION vegetation metrics in 10 meter grid cells, Raw point cloud data, 1 meter DEM, Stand level habitat metrics, Stream and road locations, less than 1 meter accuracy	We have little bathymetry data		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	BLM internal topographic data sets	We use data from the Oregon Department of Geology and Mineral Industries coastal data base		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	None		
Cost savings/cost reduction	Moderate	None		
Cost avoidance	Moderate	None		
Increased revenues	Minor	None		
Mission-driven performance improvements	Major	None		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	None		
Improved response or timeliness	Major	None		
Improved customer experience	Minor	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	None		
Environmental	Major	None		
Public safety, including life and property	Major	None		
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major			
Other description	Environment planning			

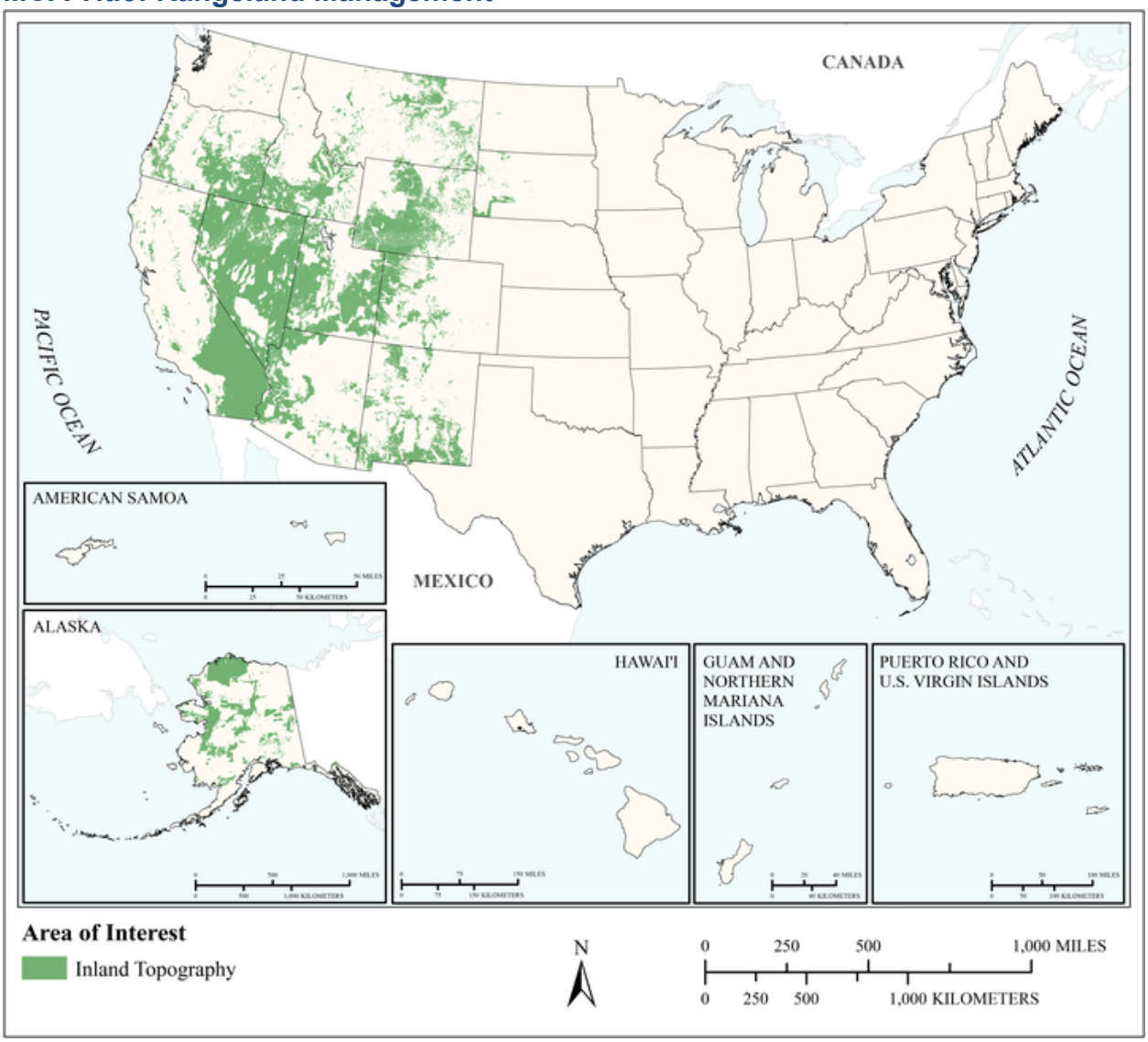
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$2,110,500	I don't know	Unable to provide							
Time savings description	We can use models we could not use without 3D Data. 5FTE's saved by reporting monitoring results from existing data sets. We do things not possible without data thus there is no comparison. 5 FTE's saved by avoiding conflicting data sets. It does not save 20 FTE's it lets them be used elsewhere to complete mission. 5 FTE's saved by having data available and not having to create.											
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$2,010,000	I don't know	Unable to provide							
Cost savings/cost reduction description	We design better roads that can be built cheaper with better fish passage. 5 FTE's saved. We provide a wider variety of data for each project so we do more to meet mission.											
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide							
Cost avoidance description	Could be millions of dollars if we avoid landslides, e.g. Oso Landslide in Washington. We process more data so data processing goes up. BIG DATA is an issue. We use safe practices but mission does not generally involve hazardous activities. Once initial application developed to process data errors should not occur.											
Increased revenues	None			I don't know	Unable to provide							
Increased revenues description	Data does not improve yields it reduces cost to extract. Better roads will lead to lower hauling costs. Our mission does not typically expand.											
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements description	Easier to assess activity impacts so as to better explaining impacts of different alternatives. Data creates better communication of proposed activities. Better and more complete information should lead to better decisions with more social support.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			I don't know	Unable to provide							
Value added to products or services description	Our products do not typically change. We are better able to comply and monitor our activities but we don't expand them.											
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Avoid road construction in unstable areas can be a tremendous savings. We can monitor better but Mother Nature sets timeline. Our products, i.e. timber, do not change. We don't normally assist our timber purchasers, it will help our recreation users. Data helps with firefighting and emergency response, could be big. EA and EIS preparation still follow same timeline they just have better data.											
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience description	Public is more confident in our decisions. Time saving in analysis is great if we can use existing data instead of creating new data. We develop many new applications to provide more and better information to public and decision makers.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			I don't know								
Education or outreach description	Better data makes for a better informed public											
Environmental	Major			I don't know								
Environmental description	Better designed activities help the sale of timber and to protect natural resources, i.e. fish and wildlife											
Public safety, including life and property	Major			I don't know								
Public safety, including life and property description	Avoid activities in unstable areas											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Rangeland Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies			
Sub Area Requirements	BLM			

MCA Description	Response
Mission Critical Activity	Vegetation management on rangelands for cattle grazing, sage-grouse habitat, other wildlife, and feral horses. QL1 point density is needed to be able to identify vegetation structure, heights of shrubs, etc. Point density is more important than vertical accuracy.
MCA Title	Rangeland Management
MCA ID	1301
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: Bureau of Land Management (BLM)
Sub-Agency or Division	
Organization Mission	Protect, conserve and manage the system of public lands and the natural and cultural resources they contain and support, and allowing for multiple uses of those lands where appropriate. In short, we manage recreation, endangered species, cattle grazing, mineral extraction, and oil and gas leasing, and are responsible for the largest land base of any agency in the U.S.
Program Name	Rangeland, Riparian and Plant Conservation Fish and Wildlife Conservation; Mineral Resources - Solid and Liquid
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 05 - Rangeland Management
Secondary Business Use	BU 07 - Wildlife and Habitat Management
Tertiary Business Use	BU 13 - Oil and Gas Resources

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual sagebrush, pinyon pine, juniper, other shrubs and trees

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	Up to 50 cm			
Acceptable Vertical Error	Up to 50 cm			
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Highly desirable			
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Unknown as to specifics, since I am a very-end user, but I know our geospatial division has access to those data that are available, and regularly acquire project-specific data as needed using various platforms, from space-borne to UAV.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				

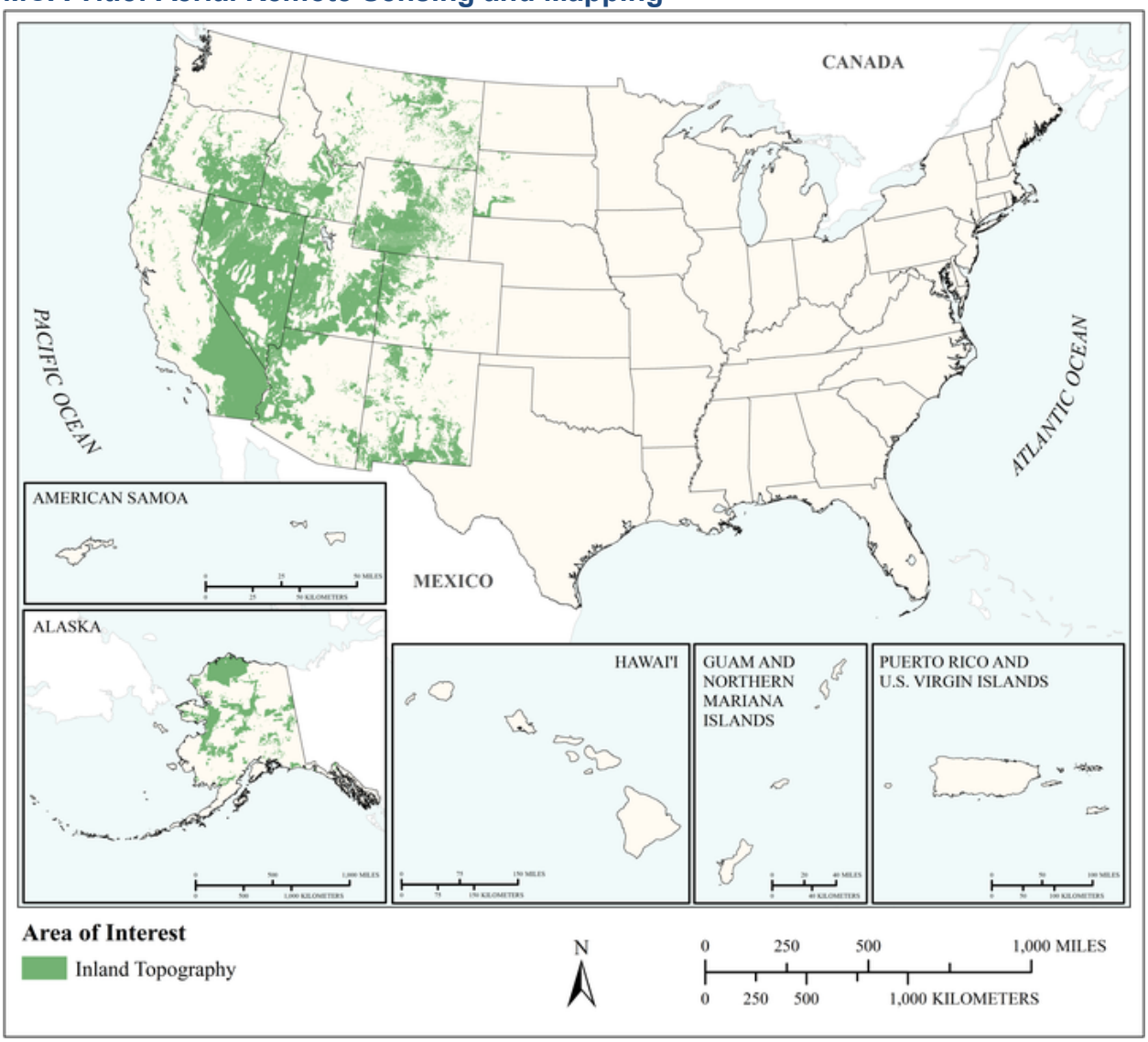
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State Repositories				
State repositories used				
Other	Yes			
Other description	Unknown as to specifics, Since I am a very-end user, But I know our geospatial division has access to those data that are available, And regularly acquire project-specific data as needed using various platforms, From space-borne to UAV.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	Given travel distances and areal extents, all of these items will save us time, major or minor.											
Cost savings/cost reduction	Major	Unable to provide										
Cost savings/cost reduction description	Given travel distances and areal extents, all of these items will save us time, major or minor.											
Cost avoidance	Major	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Aerial Remote Sensing and Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies			
Sub Area Requirements	BLM			

MCA Description	Response
Mission Critical Activity	Aerial remote sensing and mapping to support BLM activities in field offices. Includes UAS collection of project specific areas at QL0 or higher.
MCA Title	Aerial Remote Sensing and Mapping
MCA ID	1342
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: Bureau of Land Management (BLM)
Sub-Agency or Division	
Organization Mission	To sustain the health, diversity, and productivity of public lands for the use and enjoyment of present and future generations.
Program Name	Soil, Water and Air
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 05 - Rangeland Management
Tertiary Business Use	BU 14 - Cultural Resources Preservation and Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Hummocks, incised channels, headcuts

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI	Project specific area requirements			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 20 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Highly desirable			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2013 National Elevation Dataset			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	BLM self-collected UAS data for project specific areas			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know			
Cost savings/cost reduction	Major			
Cost avoidance	Major			

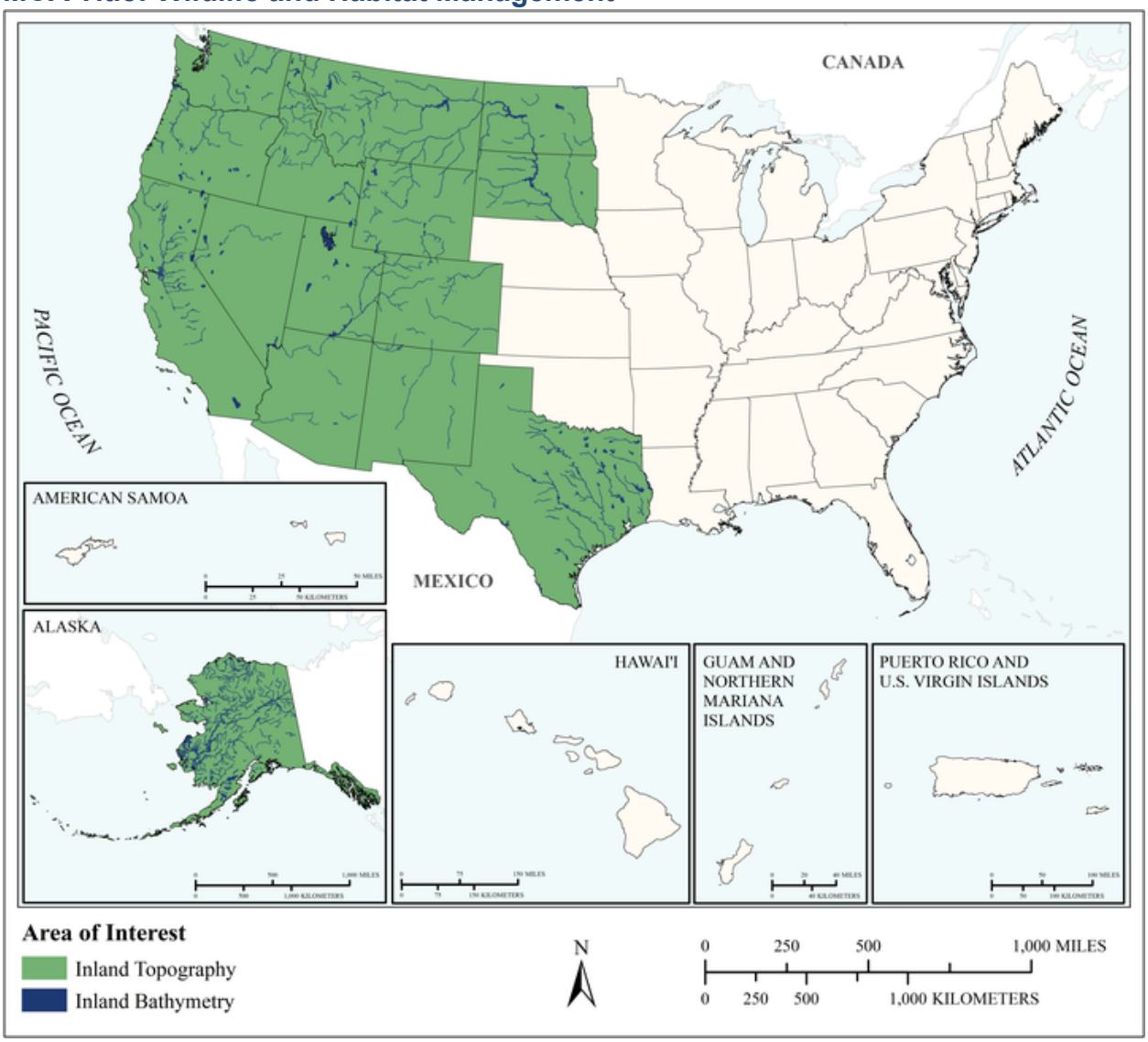
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	I don't know			
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Nice to have		
Geographic Area Requirements	Custom description	Custom description		
Sub Area Requirements	All states with BLM lands	All states with BLM lands		

MCA Description	Response
Mission Critical Activity	Wildlife and Habitat Management; includes sage grouse and other wildlife. Inland bathy would be nice for managing fish species.
MCA Title	Wildlife and Habitat Management
MCA ID	21992
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: Bureau of Land Management (BLM)
Sub-Agency or Division	Resources & Planning Directorate
Organization Mission	It is the mission of the Bureau of Land Management to sustain the health, diversity and productivity of the public lands for the use and enjoyment of present and future generations.
Program Name	Wildlife
Total Annual Program Budget	$33,000,000
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Individual shrubs, vegetation, trees

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs		
Update Frequency	Annually	Annually		
Event type(s)				
Quality Level and/or update frequency variability across AOI	QL1 is needed for vegetation structure in project specific areas (sage grouse habitat), QL2 or QL3 is OK for bare earth terrain			
Acceptable Horizontal Error	Up to 1 meter	I don't know		
Acceptable Vertical Error	Up to 30 cm	I don't know		
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		I don't know		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Highly desirable	Nice to have		
DEM	Required	Highly desirable		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Highly desirable	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Nice to have		
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Highly desirable	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	NED augmented with some BLM project specific acquisitions	None available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	BLM project specific acquisitions			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	Inland bathy data not available		

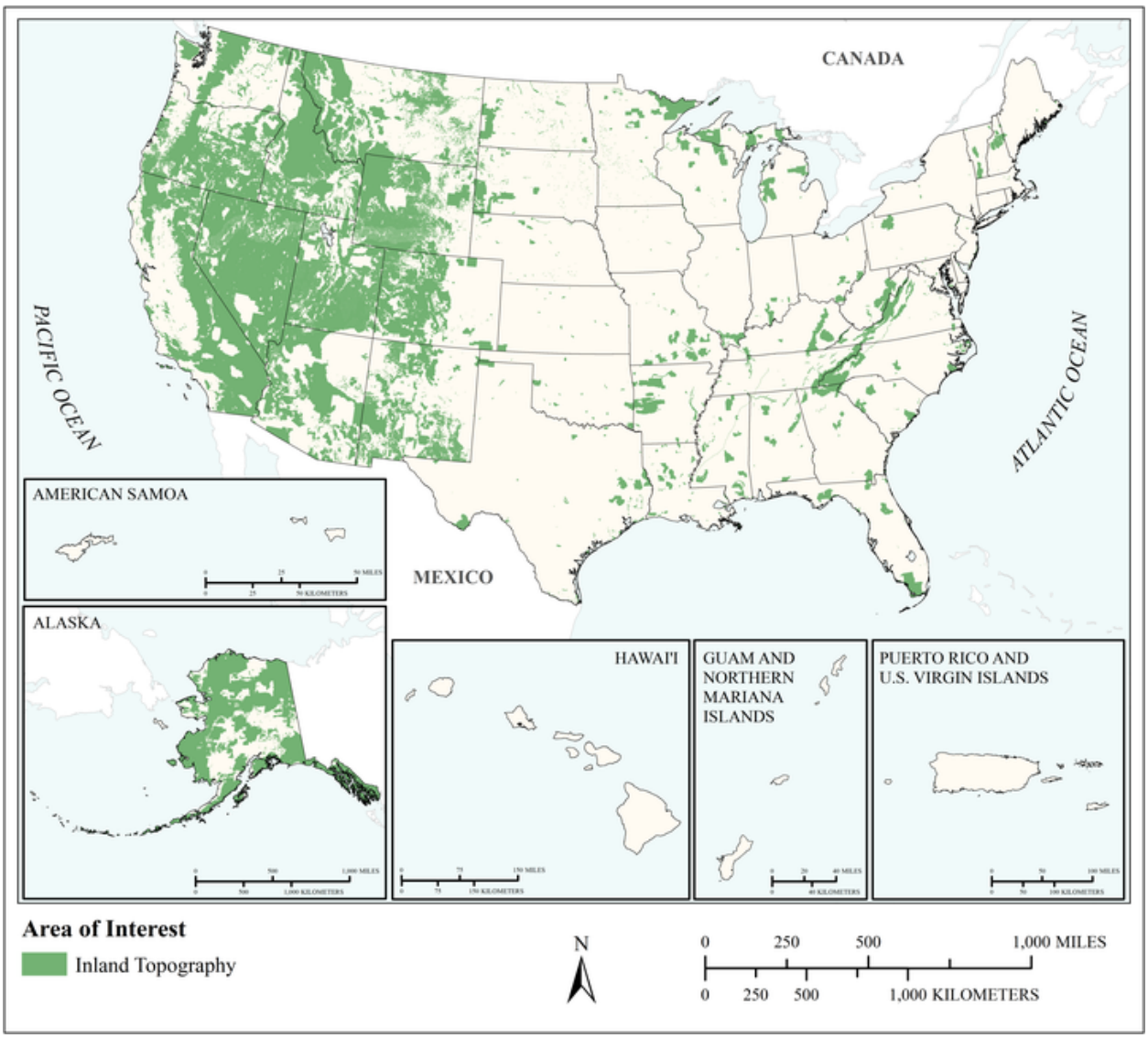
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	I don't know	Inland bathy data not available		
Cost avoidance	I don't know	Inland bathy data not available		
Increased revenues	I don't know	Inland bathy data not available		
Mission-driven performance improvements	I don't know	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	Inland bathy data not available		
Improved response or timeliness	I don't know	Inland bathy data not available		
Improved customer experience	I don't know	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Inland bathy data not available		
Environmental	I don't know	Inland bathy data not available		
Public safety, including life and property	I don't know	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide							
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide							
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	I don't know			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Mineral Production Verification



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Custom description			
Sub Area Requirements	All Federal lands except DoD in CONUS and AK			

MCA Description	Response
Mission Critical Activity	Mineral production verification program. Elevation data are needed for review of surface mining and mineral extraction activities. Includes BLM's minerals responsibilities underneath non-BLM lands. Primarily located in Colorado, but extends elsewhere as well. Includes all or portions of the following: BU 02 BU 04, BU 05, BU 06, BU 09, BU 11, BU 12, BU 13, BU 14, BU 17, and BU 27.
MCA Title	Mineral Production Verification
MCA ID	1331
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: Bureau of Land Management (BLM)
Sub-Agency or Division	
Organization Mission	Public lands and resources management.
Program Name	Locatable Minerals Program, Mineral Materials Program
Total Annual Program Budget	$400,000
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Mineral material stockpile.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	Quarterly			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	Quality level is somewhat consistent, but frequency may vary depending on requirements per operation. Some sites require quarterly updates or more frequently. Will collect via UAS or other means as needed.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Not required			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Agisoft, Global Mapper, Digital Globe			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	I don't know			
Mission-driven performance improvements	I don't know			

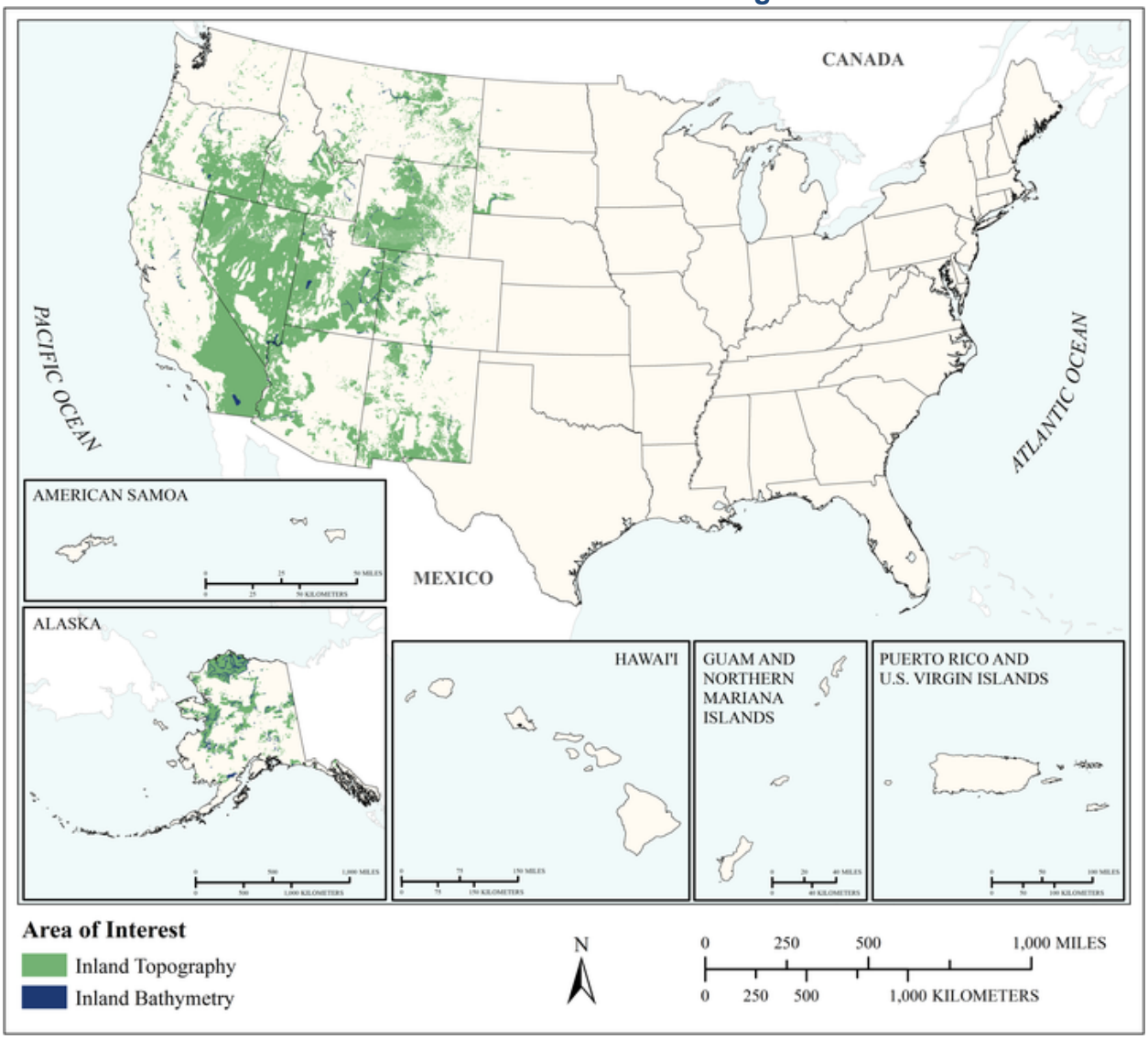
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	I don't know			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None											
Improved response or timeliness	Minor	Unable to provide										
Improved customer experience	None											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	None											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies		
Sub Area Requirements	BLM	BLM		

MCA Description	Response
Mission Critical Activity	Cultural Resources Preservation and Management. BLM manages the land under USBR reservoirs, including boat ramps or cultural resources under the water. USBR manages the water only. Elevation data are needed to inventory, identify, document, map, and preserve sites. BLM has Tribal responsibilities where BLM has trust holdings.
MCA Title	Cultural Resources Preservation and Management
MCA ID	22134
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: Bureau of Land Management (BLM)
Sub-Agency or Division	National Operations Center
Organization Mission	The Bureau of Land Management's mission is to sustain the health, diversity, and productivity of public lands for the use and enjoyment of present and future generations.
Program Name	Cultural Heritage and Paleontology
Total Annual Program Budget	$17,000,000
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Native masonry structure, burial site, underwater cultural resources, etc

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B		
Update Frequency	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.		
Event type(s)	Project requirement e.g. NEPA activity for cultural resource inventory.	Project requirement e.g. NEPA activity for cultural resource inventory.		
Quality Level and/or update frequency variability across AOI	Project and situational based.			
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm		
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Nice to have	
Entire AOI under same environmental conditions	Nice to have	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Nice to have		
DTM	Nice to have	Nice to have		
DEM	Required	Nice to have		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Nice to have	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Nice to have		
Bridges/culverts	Not required	Not required		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Very high resolution (0.001 to 0.02 meter) close range and UAS based photogrammetric data of site specific areas. Landscape areas to look for features and trends associated with prehistoric and historic habitation.	We currently have only very limited opportunity to use this type of data. It would be useful for locating historical river or lake features related to mining or transportation (boats/barges). Also submerged structures and burials.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

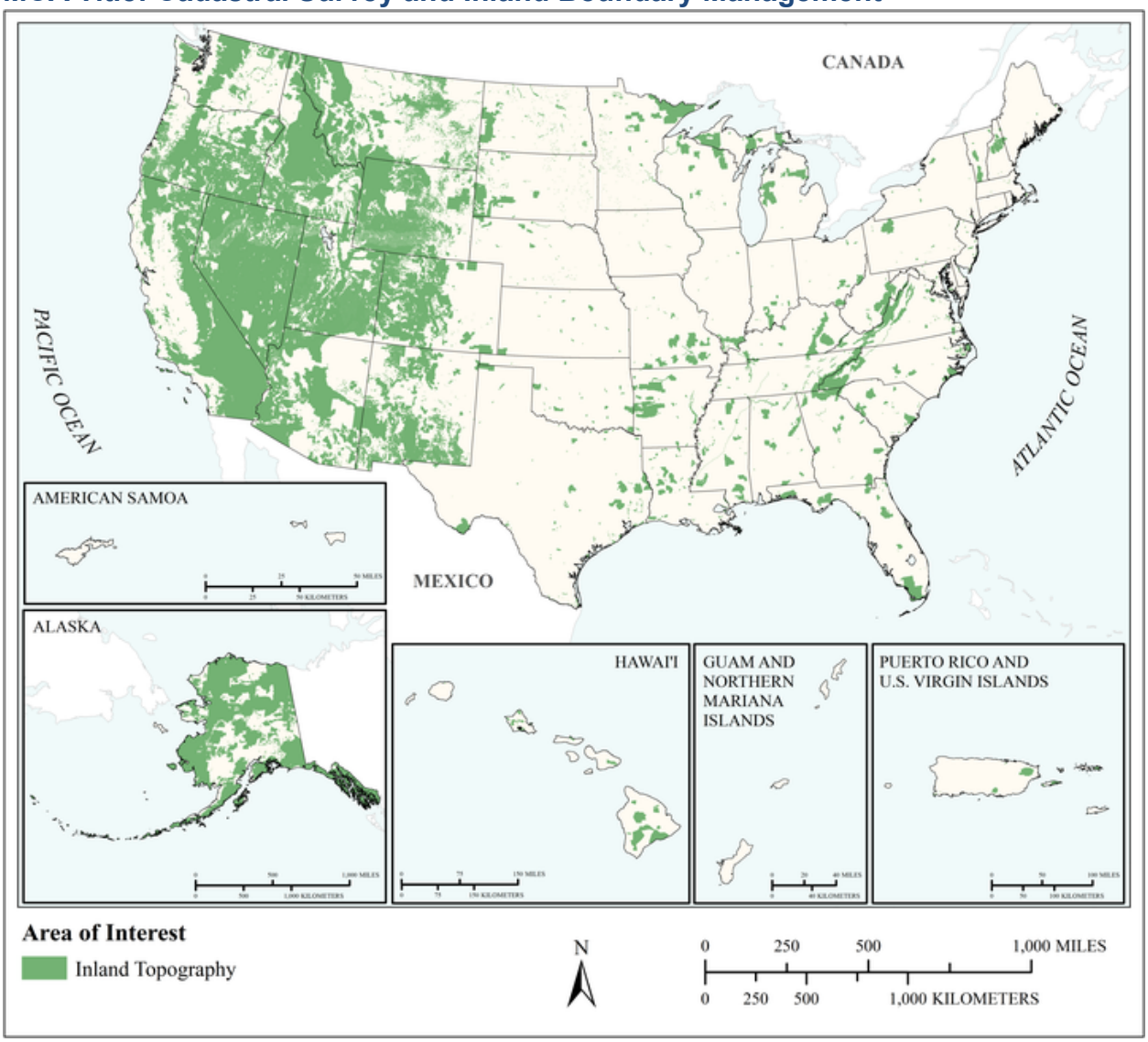
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes	Yes		
Other description	Agency acquired imagery	Contracted on a project basis		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	Minor		
Cost savings/cost reduction	Minor	Minor		
Cost avoidance	Minor	Minor		
Increased revenues	I don't know	None		
Mission-driven performance improvements	Minor	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Minor		
Improved response or timeliness	Minor	Minor		
Improved customer experience	Minor	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate		
Environmental	Moderate	Moderate		
Public safety, including life and property	Moderate	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide							
Time savings description	Field time would be saved by having better data.			Field time would be saved by having better data.								
Cost savings/cost reduction	Minor	Unable to provide		Minor	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Moderate			Moderate								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Cadastral Survey and Inland Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies			
Sub Area Requirements	BLM, BOR, DOD, FS, FWS, NPS, TVA			

MCA Description	Response
Mission Critical Activity	Cadastral Survey and inland boundary management. Public Land Survey System (PLSS) cadastral surveys are BLM's responsibility. Surveys are done for PLSS updates when land exchanges to/from Federal agencies occur. The conveyance program in Alaska is quite active. NGS sets the coordinate grid and BLM places markers tied to the NGS grid. Physical field surveys are required. Elevation data can help plan the field work but the field work is mandatory.
MCA Title	Cadastral Survey and Inland Boundary Management
MCA ID	22109
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: Bureau of Land Management (BLM)
Sub-Agency or Division	Cadastral Survey
Organization Mission	BLM- Cadastral Survey is responsible for conducting official boundary surveys and resurveys for the federal government.
Program Name	Cadastral Survey defines the extent of federal lands or interests that would be covered under the following Business Use cases: BU 04, BU 05, BU 06, BU 07, BU 10, BU 11, BU 12, BU 13, BU 14, BU 17
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	640 acres or one PLSS section

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	10 meters			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Not required			
Classified point cloud	Not required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Nice to have			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	NAIP imagery , USGS topographic maps			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	Minor			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			
Improved response or timeliness	None			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Unable to provide										
Time savings description	Elevation data can help plan field work.											
Cost savings/cost reduction	None											
Cost avoidance	None											
Increased revenues	None											
Mission-driven performance improvements	None											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None											
Improved response or timeliness	None											
Improved customer experience	None											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	None											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

Bureau of Ocean Energy Management (BOEM)

The mission of BOEM is to manage development of U.S. Outer Continental Shelf energy and mineral resources in an environmentally and economically responsible way.

Current status of elevation data for BOEM

All of BOEM's various Program Offices and Regions make use of nearshore and offshore bathymetry for a variety of specific purposes. For example, in predicting the likely distribution of depth-controlled benthic organisms that could be impacted by oil and gas development activities. BOEM makes use of publicly accessible bathymetry data such as from NOAA, USGS, Esri, and Google for basic map reference/basemaps. Additionally, BOEM obtains hydrographic survey data from a variety of federal and state agencies and organizations either through freely available online downloads or more formal partnerships (e.g., cooperative agreements, studies, marine minerals program lease agreements). Of greatest importance is the mandatory acquisition of high-resolution bathymetry, side-scan sonar, and sub-surface seismic imagery that industry has to provide to BOEM as part of oil and gas permitting processes. These data are proprietary and can only be publicly released after a lengthy waiting period (e.g., 25 years).

Importance of elevation data to BOEM

All of the programs that are directly managing seafloor resources require related physical data for analyses and product generation. For example, the marine minerals program infers resource areas (e.g., potential sand shoals) based on indirect seismic profiles, bathymetry, and side-scan sonar data. High-resolution bathymetry is also an important foundational dataset in creating sediment thickness maps. Additionally, lease applicants (e.g., USACE) must complete pre- and post- bathymetric dredge surveys.

High-level summary of elevation data requirements

Hydrography data requirements for the BOEM Marine Minerals Program for offshore sand resource management are Quality Level 4B (QL4B) nearshore bathymetry, and in the offshore areas, International Hydrographic Organization (IHO) Order 1b, both refreshed every 4-5 years.

Hydrography data requirements for the BOEM Renewable Energy Program for site characterization and environmental review are QL3B nearshore bathymetry, and in the offshore areas, IHO Special Order, both refreshed every 2-3 years.

Hydrography data requirements for the BOEM Oil and Gas Energy Program for exploration and production are QL3B nearshore bathymetry, and in the offshore areas, IHO Order 1a, both refreshed every 2-3 years.

High-level summary of benefits that would come from higher resolution elevation data

Improved basemaps and reference data are essential for marine minerals, renewable energy, oil and gas, and environmental management purposes. Note that some required higher resolution data are obtained directly from industry as part of permit requirements.

Marine Minerals would benefit from having high-resolution DEMs to support creation of Isopach Arc layers that represent positions of equal formation thickness of a sand body, or other geologic unit, with the thickness measured perpendicular to the seafloor. The identification of a geologic formation and the determination of formation thickness typically begins with geophysical surveys involving sub-bottom sonar, seismic reflection profiles, or coring at discrete locations.

Additional Comments

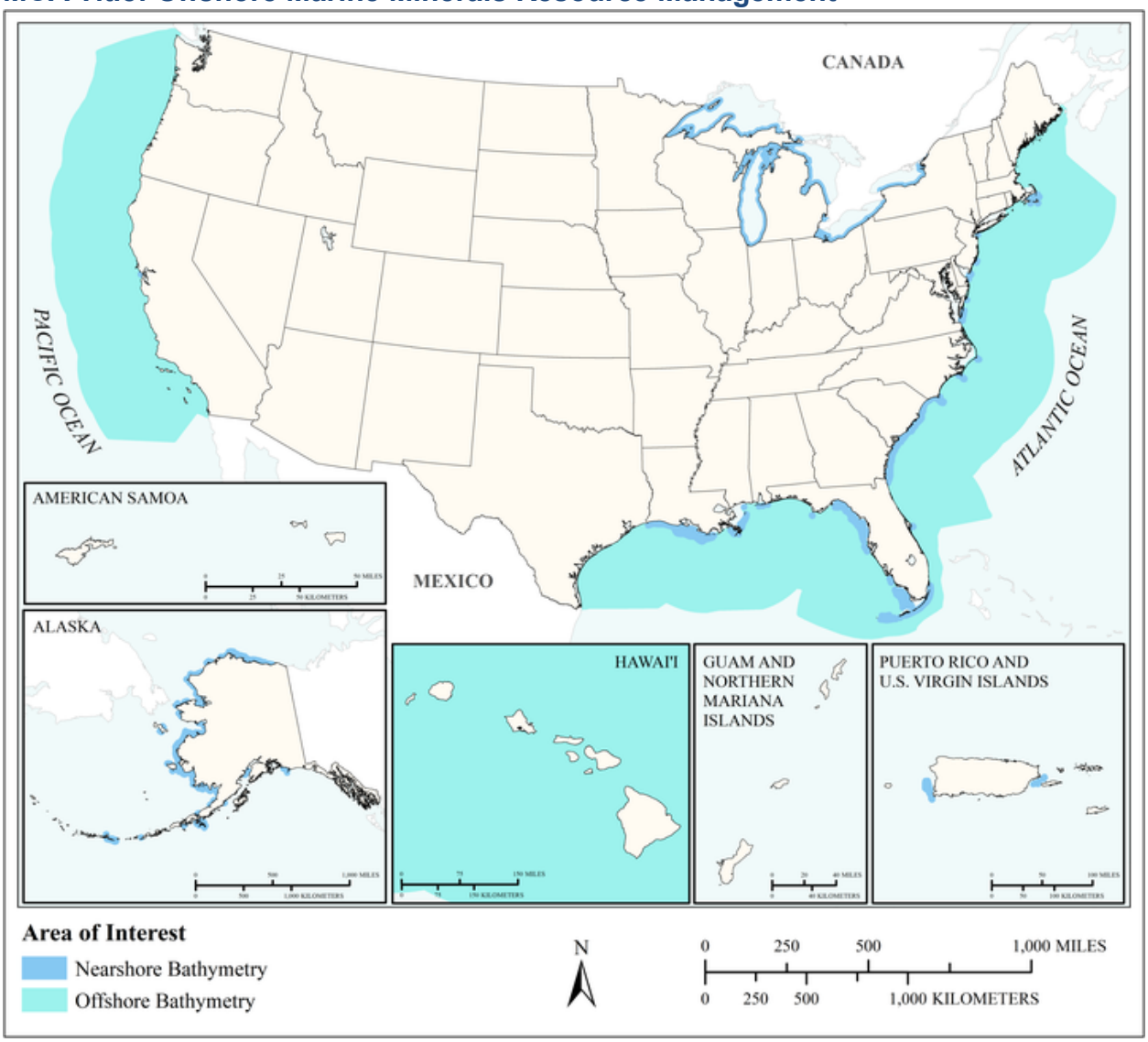
Improved hydrographic source data to advance topobathy products in the Coastal National Elevation Database (CoNED) (https://topotools.cr.usgs.gov/topobathy_viewer/) would benefit BOEM.

BOEM has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 11 – Geologic Resource Extraction	DoI: Bureau of Ocean Energy Management (BOEM)	33020	Offshore Marine Minerals Resource Management	Nearshore Bathy	QL4B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	Order 1b	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 12 – Renewable Energy Resources	DoI: Bureau of Ocean Energy Management (BOEM)	21912	Offshore Renewable Energy Projects	Nearshore Bathy	QL3B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Offshore Bathy	Special Order	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 13 – Oil and Gas Resources	DoI: Bureau of Ocean Energy Management (BOEM)	1459	Oil and Gas Resources	Nearshore Bathy	QL3B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Offshore Bathy	Order 1a	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major

MCA Title: Offshore Marine Minerals Resource Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			One or more national maritime boundaries	Custom description
Sub Area Requirements			Federal waters	Federal waters around the 48 conterminous States and Hawai'i

MCA Description	Response
Mission Critical Activity	Ensure access to offshore outer continental shelf mineral resources Bathymetry is needed for sand resource management in shallow waters less than 150 feet deep. USACE also has similar needs for bathymetry for sand resource management. Pre- and post-dredging bathymetry are needed for management of mineral resources.
MCA Title	Offshore Marine Minerals Resource Management
MCA ID	33020
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: Bureau of Ocean Energy Management (BOEM)
Sub-Agency or Division	Marine Minerals Division
Organization Mission	The mission of BOEM's Marine Minerals Program is to facilitate access to and manage the Nation's Outer Continental Shelf (OCS) non-energy marine minerals, particularly sand and gravel, through environmentally responsible stewardship of resources, prudent assessments of exploration and leasing activities, coordination with governmental partners, engagement of stakeholders, strategic planning, and mission-focused scientific research to improve decision-making and risk management.
Program Name	Marine Minerals Program
Total Annual Program Budget	$1,600,000
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Survey level features - hazards such as wrecks, munitions of and explosive concerns, ... Aggregated features - such as hardbottom

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL4B	Order 1b
Update Frequency			4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error			Up to 10 meters	Up to 10 meters
Acceptable Vertical Error			Up to 1 meter	Up to 5 meters
How far onshore needed			Not applicable	
How far down the beach profile needed			Not applicable	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Not required	Not required		Not required
Entire AOI under same environmental conditions			Not required	Not required		Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Required	Required		Required
DEM for entire AOI needs to be seamless			Required	Required		Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness			I don't know	I don't know		I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Not required	Not required
DTM			Not required	Not required
DEM			Required	Required
Raw point cloud data			Required	Required
Classified point cloud			Required	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform			Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)			Required	Required
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery			Highly desirable	Highly desirable
Ground control/ground truthing			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery			Not required	Not required
Underwater videography			Nice to have	Nice to have
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Required	Required
Geologic and seismic data			Required	Required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Required	Required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Not required	Not required
Shorelines – current, historic, change rates			Not required	
Land use/land cover			Not required	Not required
Wetlands			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Not required	Not required
Inland surface water features			Not required	
Bridges/culverts				
Landmark features			Not required	
Cultural resources			Not required	
Coastal and riverine structures			Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			NOAA or USACE EM-1110-2-1003	IHO Order 1b from NOAA or USACE EM-1110-2-1003
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				Yes
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS			Yes	Yes
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Moderate	Moderate
Cost savings/cost reduction			Moderate	Moderate
Cost avoidance			Moderate	Moderate
Increased revenues			None	None
Mission-driven performance improvements			Moderate	Moderate

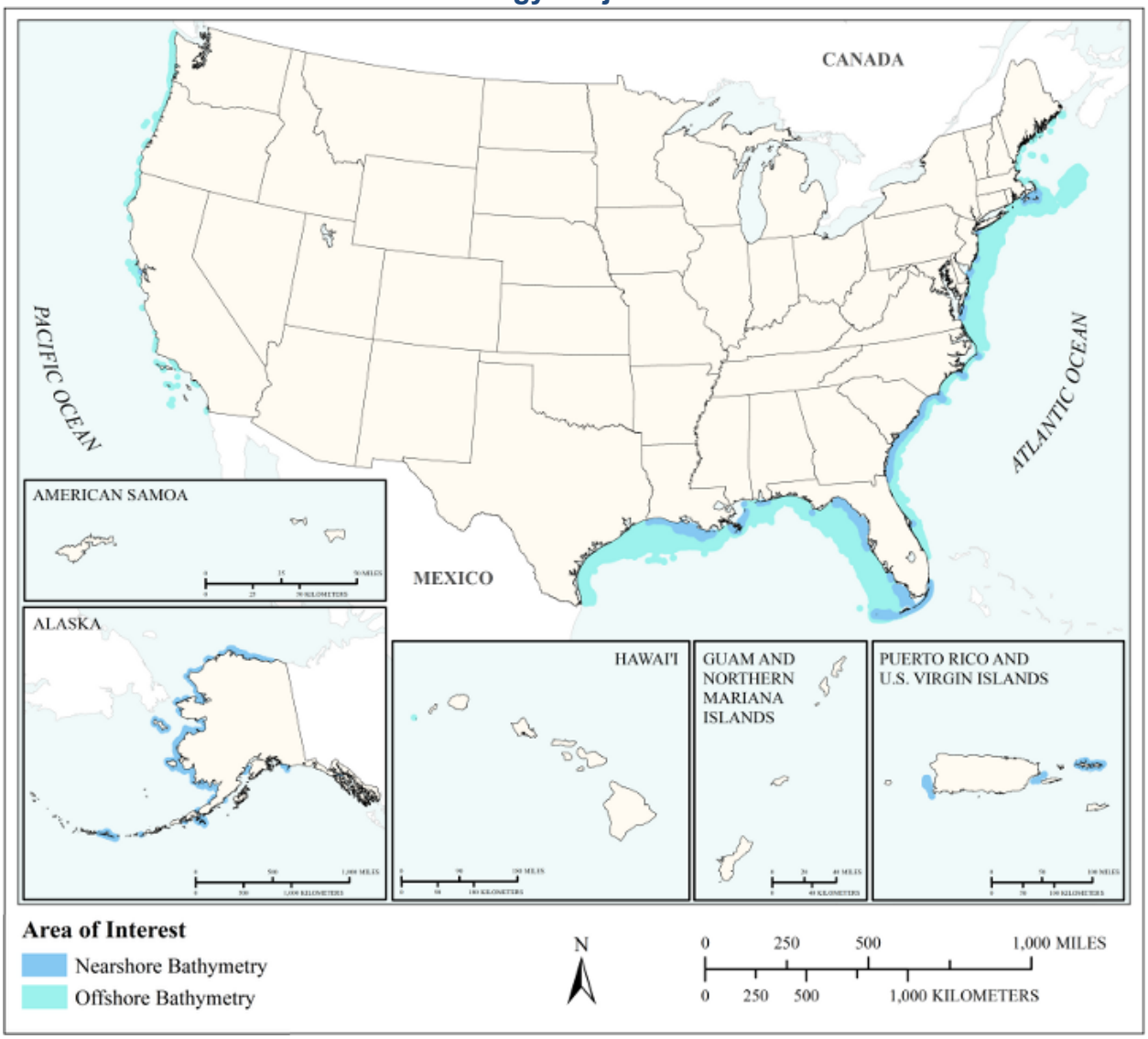
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Moderate	Moderate
Improved response or timeliness			Moderate	Moderate
Improved customer experience			Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			I don't know	I don't know
Environmental			I don't know	I don't know
Public safety, including life and property			I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction							Major	Unable to provide		Major	Unable to provide	
Cost avoidance							Major	Unable to provide		Major	Unable to provide	
Increased revenues							Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements							Moderate	Unable to provide		Moderate	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness							I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience							I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							I don't know			I don't know		
Environmental							I don't know			I don't know		
Public safety, including life and property							I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours			Yes	Yes
Hillshades			Yes	Yes
Slope maps			Yes	Yes
Aspect maps			Yes	Yes
Curvature maps				
Cross sections			Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Offshore Renewable Energy Projects



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Custom description	Custom description
Sub Area Requirements			Nearshore waters outside the State waters and where the cables cross.	Federal waters out to 60 meters depth around the 48 conterminous States and Hawai'i

MCA Description	Response
Mission Critical Activity	Planning, engineering review, technical review, and environmental review of offshore renewable energy projects (wind, marine hydrokinetic). Developers provide the site specific data for individual project areas, BOEM uses NOAA and others' data for planning purposes only.
MCA Title	Offshore Renewable Energy Projects
MCA ID	21912
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: Bureau of Ocean Energy Management (BOEM)
Sub-Agency or Division	Office of Renewable Energy Programs
Organization Mission	The Mission of the Bureau of Ocean Energy Management is to manage development of U.S. Outer Continental Shelf energy and mineral resources in an environmentally and economically responsible way.
Program Name	Office of Renewable Energy Programs
Total Annual Program Budget	$24,000,000
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	200,000 sq mi - 2 million sq mi (e.g. large state, large multi-state region such as the Great Basin, standard Federal region, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Underwater habitat, coral, and boulders

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL3B	Special Order
Update Frequency			2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			The best horizontal accuracy achievable for the vertical accuracy I need	Up to 2 meters

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error			Up to 1 meter	Up to 2 meters
How far onshore needed			To MHW	
How far down the beach profile needed			Below MLLW	
Tide correction requirement			Any tide correction is acceptable, as long as it is defined	Any tide correction is acceptable as long as it is defined
Cross sections and/or transects meet needs			Partial	Partial
Cross section/transect requirement			Need full coverage where turbines go, less in rest of lease block	Need full coverage where turbines go, less in rest of lease block

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Highly desirable	Highly desirable		Highly desirable
Entire AOI under same environmental conditions			Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Highly desirable	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless			Highly desirable	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Nice to have	Required
DTM			Required	Required
DEM			Required	Required
Raw point cloud data			Highly desirable	Highly desirable
Classified point cloud			Highly desirable	
Edited/cube XYZ			Highly desirable	Highly desirable
Full waveform			Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)			Highly desirable	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Highly desirable	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Nice to have
Intensity imagery/sidescan imagery			Required	Required
Ground control/ground truthing			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery			Highly desirable	Highly desirable
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Required	Required
Geologic and seismic data			Required	Required
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Required	Required
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates			Highly desirable	
Land use/land cover			Highly desirable	Highly desirable
Wetlands			Nice to have	Highly desirable
Estuaries			Nice to have	Highly desirable
Inland surface water features			Nice to have	
Bridges/culverts				
Landmark features			Nice to have	
Cultural resources			Required	
Coastal and riverine structures			Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			Quality and collection method varies greatly. Use anything from NOAA Coastal Relief Model to individual NOAA OCS Multibeam Surveys to bathymetry collected privately by industry for project use.	NOAA CRM, Individual NOAA/USGS Surveys, Privately Collected Data from Industry
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	Yes
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS			Yes	Yes
State Repositories				

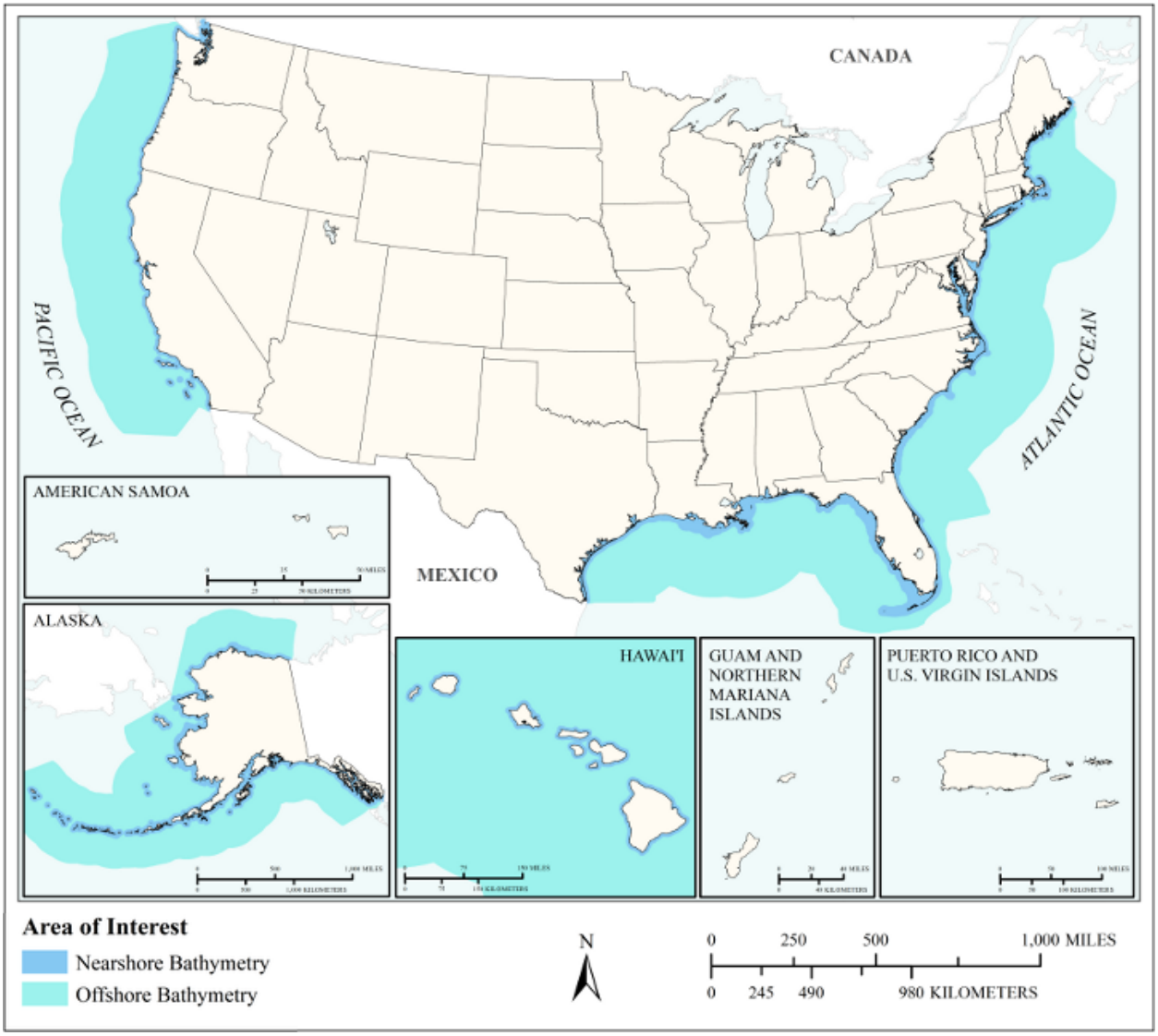
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Major	Major
Cost savings/cost reduction			Major	Major
Cost avoidance			Major	Major
Increased revenues			Major	Major
Mission-driven performance improvements			Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Major	Major
Improved response or timeliness			Major	Major
Improved customer experience			Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Major	Moderate
Environmental			Major	Major
Public safety, including life and property			Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction							Major	Unable to provide		Major	Unable to provide	
Cost avoidance							Major	Unable to provide		Major	Unable to provide	
Increased revenues							Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements							Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness							Major	Unable to provide		Major	Unable to provide	
Improved customer experience							Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Moderate			Moderate		
Environmental							Major			Major		
Public safety, including life and property							Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours			Yes	Yes
Hillshades			Yes	Yes
Slope maps			Yes	Yes
Aspect maps			Yes	Yes
Curvature maps			Yes	Yes
Cross sections			Yes	Yes
Height-Above-Ground maps			Yes	Yes
Viewshed maps			Yes	Yes
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Oil and Gas Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Custom description	Custom description
Sub Area Requirements			Oceans off the 48 conterminous States, Alaska, and Hawai'i	Oceans off the 48 conterminous States, Alaska, and Hawai'i, not including State waters and out 200 miles from land

MCA Description	Response
Mission Critical Activity	Oil and Gas Resources Oil and gas exploration and production. Pipeline and route selection. Facility siting to mitigate geologic hazards. Construction planning. Environmental impact assessment and mitigation. Regulatory compliance. Renewable Energy Resources Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Geologic Resource Mining and Extraction Onshore or offshore mineral extraction. Monitoring sand as a local resource. Seabed resources. Environmental impact assessment and site restoration. Offshore oil/gas operators are required to submit seismic surveys, oil/gas well data, high resolution survey data and other pertinent data. BOEM makes these data publicly available after a requisite waiting period (60 days to 25 years).
MCA Title	Oil and Gas Resources
MCA ID	1459
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: Bureau of Ocean Energy Management (BOEM)
Sub-Agency or Division	Bureau of Ocean Energy Management (BOEM)
Organization Mission	The Mission of the Bureau of Ocean Energy Management is to manage development of U.S. Outer Continental Shelf energy and mineral resources in an environmentally and economically responsible way.
Program Name	Resource Evaluation and Fair Market Evaluation
Total Annual Program Budget	$171,000,000
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	BU 12 - Renewable Energy Resources
Tertiary Business Use	BU 11 - Geologic Resource Mining and Extraction

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual oil and gas seeps, chemosynthetic and coral communities, seafloor features (e.g. pockmarks, faults, corals, etc.). Offshore oil and/or gas well tops. Some may be decommissioned and cut off above the seafloor.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL3B	Order 1a
Update Frequency			2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 1 meter	Up to 1 meter
Acceptable Vertical Error			Up to 50 cm	Less than 1 meter
How far onshore needed			To MHW	
How far down the beach profile needed			Below MLLW	
Tide correction requirement			MHW	MSL
Cross sections and/or transects meet needs			Partial	
Cross section/transect requirement			To delineate where the sand/mixed sediment resources exist, we need regularly spaced transects. Closer spacing is needed in shallow waters, 150% coverage of multi-beam swaths, full bottom coverage where active, use developers' data	

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Nice to have	Nice to have		Nice to have
Entire AOI under same environmental conditions			Nice to have	Nice to have		Nice to have
Other			Nice to have	Nice to have		Nice to have
Other description						
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Nice to have	Nice to have		Nice to have
DEM for entire AOI needs to be seamless			Nice to have	Nice to have		Nice to have
Other			Nice to have	Nice to have		Nice to have
Other description						
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Nice to have	Nice to have
DTM			Highly desirable	Nice to have
DEM			Highly desirable	Highly desirable
Raw point cloud data			Highly desirable	Highly desirable
Classified point cloud			Not required	
Edited/cube XYZ			Required	Required
Full waveform			Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)			Required	Not required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery			Required	Required
Ground control/ground truthing			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Nice to have
Nautical and/or navigation charts			Highly desirable	Nice to have
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery			Highly desirable	Nice to have
Underwater videography			Highly desirable	Required
Bottom texture			Highly desirable	Highly desirable
Bottom type			Required	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Required	Required
Geologic and seismic data			Required	Required
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Required	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Nice to have	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Required	Required
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates			Required	
Land use/land cover			Required	Nice to have
Wetlands			Required	Nice to have
Estuaries			Required	Nice to have
Inland surface water features			Highly desirable	
Bridges/culverts				
Landmark features			Highly desirable	
Cultural resources			Required	
Coastal and riverine structures			Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy

Current dataset used			Nearshore - at the state/fed boundary, only data provided by the state co-op partners for the Marine Minerals Program; not continuous and of variable quality; multibeam The nearshore bathymetric data that BOEM currently uses is derived in-house by seismic surveys that Oil/Gas Operators are required to submit. We can map the seafloor from this data and it is highly accurate. Oil/Gas Operators also submit well data. Currently in the Gulf of Mexico, they have over 50000 wells. Since the wells penetrate the seafloor, we have a database that has exact seafloor locations. Then we use software packages (Schlumberger Petrel, ESRI) to map the seafloor from the seismic surveys. The well control that we have is highly accurate to use to make sure we are where we say we are. As new surveys are submitted we can update the bathymetry data. Since I am in the Gulf of Mexico region I am answering for the Gulf of Mexico. BOEM also has other	BOEM Northern Gulf of Mexico Deepwater Bathymetry Grid from 3D Seismic (2017). BOEM acquires seismic data from offshore drilling Operators. Since we have a large database of seismic data, we can map the majority of the Gulf of Mexico seafloor. I am located in the Gulf region of BOEM. We also have other offices. I am answering for Gulf of Mexico BOEM.

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
			locations that I am not referring to here.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS			Yes	Yes
State Repositories				
State repositories used				
Other			Yes	Yes
Other description			BOEM	BOEM, Oil and gas operators
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Moderate	Major
Cost savings/cost reduction			Moderate	Moderate
Cost avoidance			Moderate	Minor
Increased revenues			None	Minor
Mission-driven performance improvements			Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Moderate	Major
Improved response or timeliness			None	Major
Improved customer experience			None	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Moderate	Major
Environmental			Major	Major
Public safety, including life and property			Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							I don't know	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction							I don't know	Unable to provide		None		
Cost savings/cost reduction description										The vast majority of our data is obtained by offshore oil/gas operators who are required by federal law to submit to BOEM.		
Cost avoidance							I don't know	Unable to provide		Moderate	Unable to provide	
Increased revenues							I don't know	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements							Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness							Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness description							With better data we can perform our job duties more efficiently. With better data BOEM could potentially see hazards (oil/gas leaks).					
Improved customer experience							I don't know	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Major			Major		
Education or outreach description							With better data we can perform our job duties more efficiently.			With better data we can conduct in-house studies and make these available		
Environmental							Major			Major		
Environmental description							With better data we can perform our job duties more efficiently.					
Public safety, including life and property							Major			Major		
Public safety, including life and property description							With better data BOEM could potentially see hazards (oil/gas leaks)					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours			Yes	Yes
Hillshades			Yes	Yes
Slope maps			Yes	Yes
Aspect maps			Yes	Yes
Curvature maps			Yes	Yes
Cross sections			Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Centers of Disease Control and Prevention (CDC)

CDC works 24/7 to protect America from health, safety and security threats, both foreign and in the U.S. Whether diseases start at home or abroad, are chronic or acute, curable or preventable, human error or deliberate attack, CDC fights disease and supports communities and citizens to do the same.

CDC increases the health security of our nation. As the nation's health protection agency, CDC saves lives and protects people from health threats. To accomplish its mission, CDC conducts critical science and provides health information that protects our nation against expensive and dangerous health threats and responds when these arise.

CDC is involved with response to emergency and disaster events, including those involving riverine and coastal flooding, providing GIS support. Response activities require elevation data along with imagery and other satellite data to help visualize and respond to the events. Elevation data are also used for modeling, monitoring, and predicting flooding; water supply and quality control; riverine analysis and management; and geologic mapping. The data are also of interest for assisting communities in assessing public health risks and their resilience to sea level rise. Bathymetry is of interest for addressing concerns related to red tides, harmful algal blooms, waterborne disease, and microplastics.

In order to assist state and local authorities during emergency and disaster events, CDC requires Quality Level 2 (QL2) inland topography updated every 4-5 years, QL1B inland bathymetry updated every 2-3 years, QL1B nearshore bathymetry updated annually, and Order 2 offshore bathymetry updated every 2-3 years. For all other purposes, CDC generally requires QL1 inland topography and QL1B nearshore and offshore bathymetry updated every 4-5 years. IHO Order 1a offshore bathymetry is needed at various update frequencies.

Major benefits that would come from improved elevation data include data errors avoided, enhanced ability to prepare for and respond to emergency events, enhanced public health prevention and practice, and increased public safety and health. Improved elevation data would result in significant time and cost savings, as well as mission-driven performance improvements.

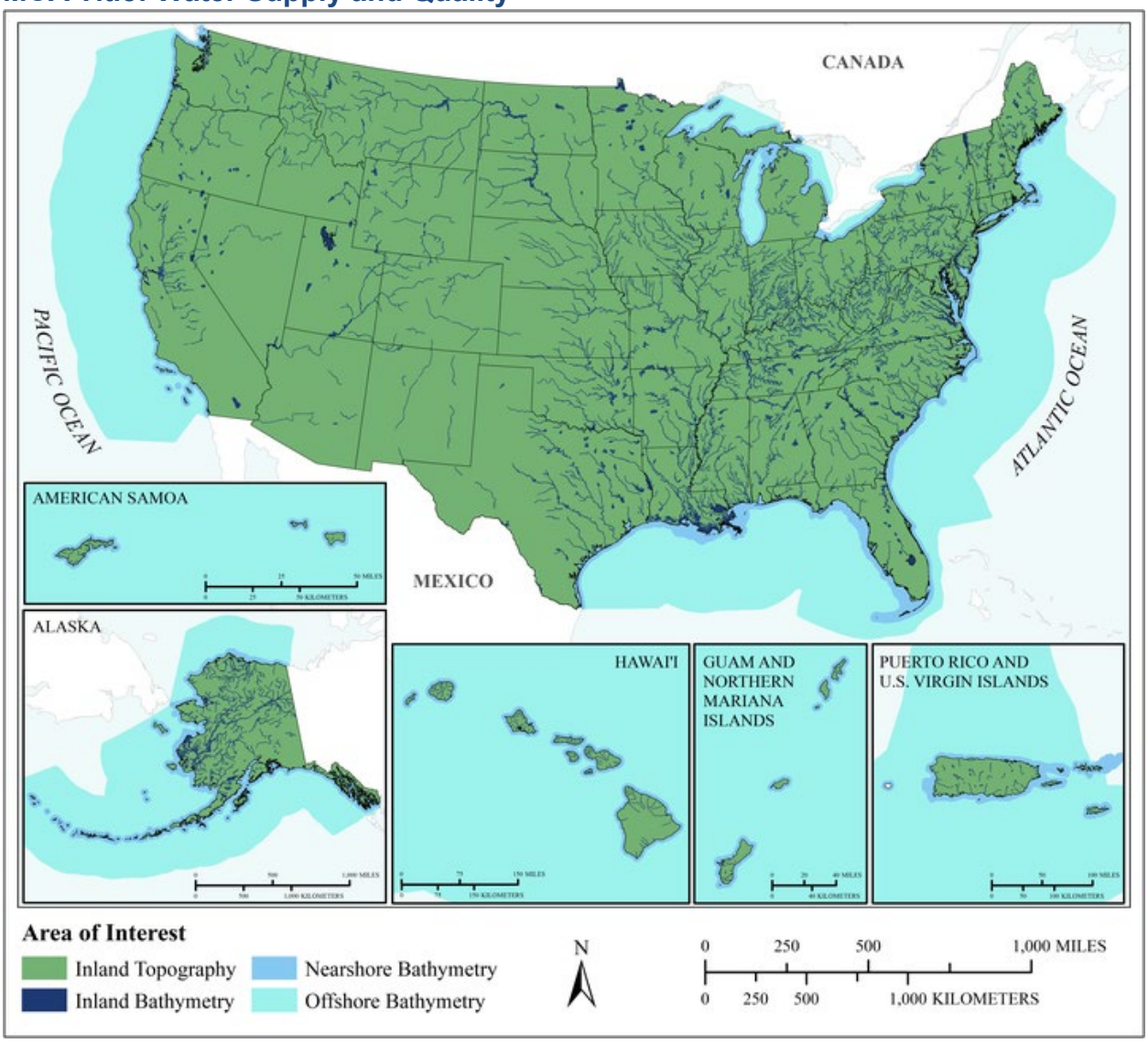
CDC has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	HHS: Centers for Disease Control (CDC)	60641	Water Supply and Quality	Inland Topo	QL2	4-5 years	$250,000	$250,000	Moderate	Major	Moderate
				Inland Bathy	QL1B	6-10 years	$250,000	$250,000	Moderate	Major	Moderate
				Nearshore Bathy	QL1B	4-5 years	$250,000	$250,000	Moderate	Moderate	Moderate
				Offshore Bathy	Order 1b	2-3 years	$250,000	$250,000	Moderate	Major	Major
BU 02 – Riverine Ecosystem Management	HHS: Centers for Disease Control (CDC)	60642	Riverine Ecosystem Management	Inland Topo	QL1	6-10 years	$250,000	$250,000	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$250,000	$250,000	Major	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$250,000	$250,000	Moderate	Moderate	Moderate
				Offshore Bathy	I don't know	I don't know	$250,000	$250,000	I don't know	I don't know	I don't know
BU 03 – Coastal Zone Management	HHS: Centers for Disease Control (CDC)	60643	Coastal Zone Management	Inland Topo	QL1	4-5 years	$250,000	$250,000	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	$250,000	$250,000	Moderate	Major	Major
				Nearshore Bathy	QL1B	4-5 years	$250,000	$250,000	Major	Major	Major
				Offshore Bathy	Order 1a	6-10 years	$250,000	$250,000	Minor	Moderate	Moderate
BU 10 – Geologic Assessment	HHS: Centers for Disease Control (CDC)	60644	Geologic Assessment and Hazard Mitigation	Inland Topo	QL1	4-5 years	$250,000	$250,000	Major	Major	Major
				Inland Bathy	QL1B	6-10 years	$250,000	$250,000	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$250,000	$250,000	Moderate	Moderate	Major
				Offshore Bathy	Special Order	6-10 years	$250,000	$250,000	Major	Moderate	Major
BU 15 – Flood Risk Management	HHS: Centers for Disease Control (CDC)	60645	Flood Risk Management	Inland Topo	QL2	4-5 years	$250,000	$250,000	Major	Moderate	Major
				Inland Bathy	QL1B	4-5 years	$250,000	$250,000	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$250,000	$250,000	Major	Moderate	Major
				Offshore Bathy	Order 1a	2-3 years	$250,000	$250,000	Moderate	Moderate	Major
BU 16 – Sea Level Rise and Subsidence	HHS: Centers for Disease Control (CDC)	60646	Sea Level Rise and Subsidence	Inland Topo	QL0	4-5 years	$250,000	$250,000	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	$250,000	$250,000	Major	Major	Major
				Nearshore Bathy	QL1B	2-3 years	$250,000	$250,000	Major	Major	Minor
				Offshore Bathy	Order 1a	6-10 years	$250,000	$250,000	Major	Major	Moderate

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 18 – Homeland Security	HHS: Centers for Disease Control (CDC)	60647	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	2-3 years	$250,000	$250,000	Moderate	Moderate	Major
				Inland Bathy	QL0B	2-3 years	$250,000	$250,000	Minor	Moderate	Major
				Nearshore Bathy	QL1B	2-3 years	$250,000	$250,000	Minor	Minor	Major
				Offshore Bathy	Order 2	2-3 years	$250,000	$250,000	Minor	Minor	Major
BU 24 – Health and Human Services	HHS: Centers for Disease Control (CDC)	1200	Assist State and Local Authorities to Save Lives and Protect Americans Including During Emergency and Disaster Events	Inland Topo	QL2	4-5 years	$250,000	$250,000	Minor	Moderate	Major
				Inland Bathy	QL1B	2-3 years	$250,000	$250,000	Minor	Moderate	Major
				Nearshore Bathy	QL1B	Annually	$250,000	$250,000	Minor	Moderate	Major
				Offshore Bathy	Order 2	2-3 years	$250,000	$250,000	Minor	Moderate	Major

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60641
Organization Type	Federal Agencies and Commissions
Organization Name	HHS: Centers for Disease Control (CDC)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Buildings and roads, underwater bottom surface, reefs

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	Order 1b
Update Frequency	4-5 years	6-10 years	4-5 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Nice to have	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Required	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Nice to have	Required
DTM	Required	Highly desirable	Nice to have	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Required
Underwater videography			Nice to have	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Not required
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Required
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Major	Minor	Moderate	Moderate
Cost avoidance	Major	Minor	Moderate	Moderate
Increased revenues	Minor	None	Minor	None
Mission-driven performance improvements	Major	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Moderate	Minor

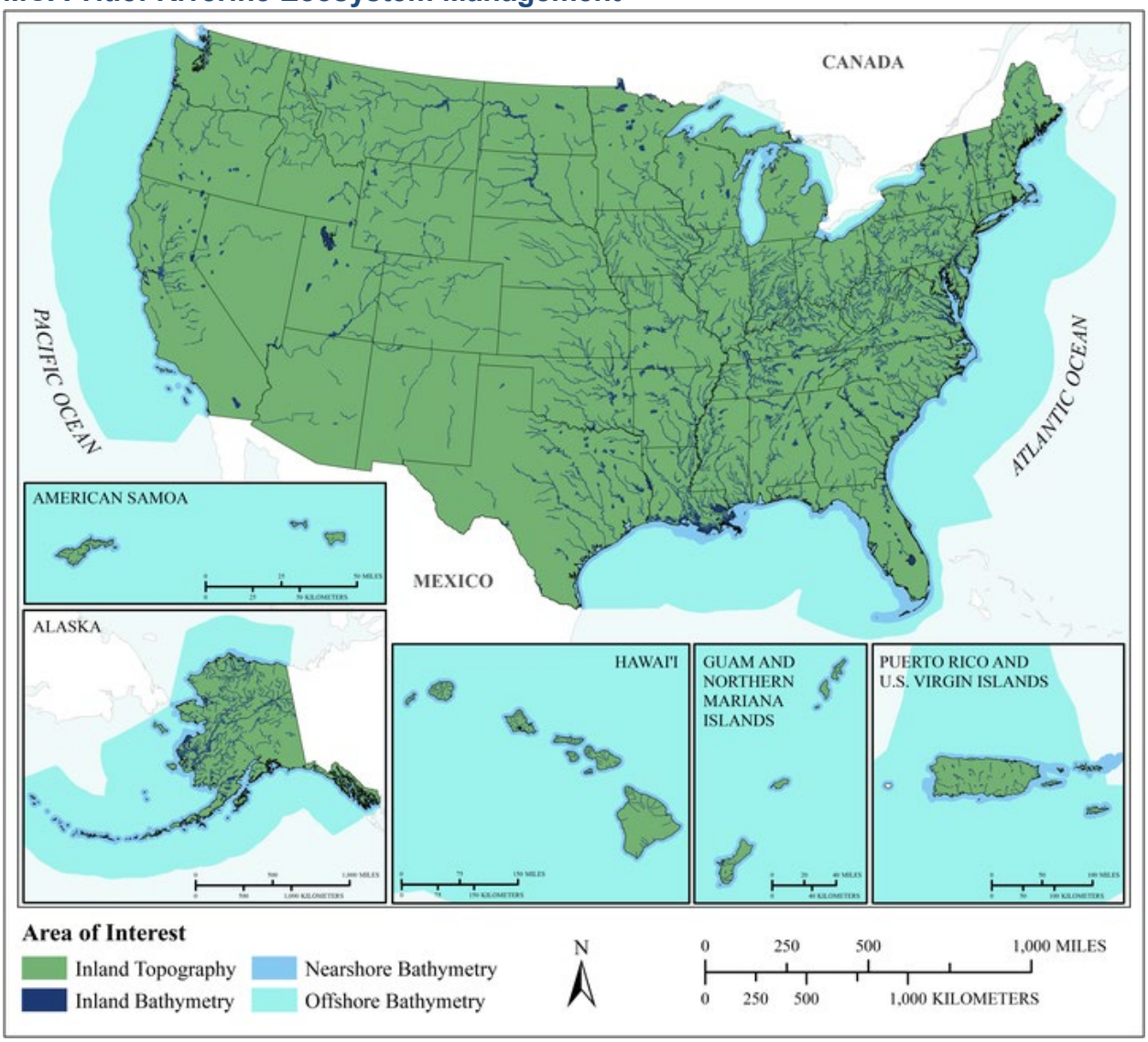
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Minor	Moderate	Moderate
Improved customer experience	Major	Minor	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Moderate	Minor
Environmental	Major	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		None		
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Major			Major			Moderate			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes		Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60642
Organization Type	Federal Agencies and Commissions
Organization Name	HHS: Centers for Disease Control (CDC)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Buildings and roads, underwater bottom surface, reefs

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	6-10 years	4-5 years	2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	I don't know	Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required	I don't know	Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	I don't know	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required	I don't know	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	I don't know
DTM	Required	Highly desirable	Required	I don't know
DEM	Required	Required	Required	I don't know
Raw point cloud data	Nice to have	Nice to have	Nice to have	I don't know
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	I don't know
Full waveform	Nice to have	Nice to have	Highly desirable	I don't know
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	I don't know
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	I don't know
Tide Predictions			Not required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Not required	I don't know
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	I don't know
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Not required	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery	Highly desirable	Required	Required	I don't know
Underwater videography			Not required	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Required	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Highly desirable	I don't know
Geologic and seismic data	Nice to have	Not required	Not required	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Nice to have	I don't know
Tide/wave heights			Not required	I don't know
Sea ice conditions			Not required	I don't know
Habitat distribution and classification			Nice to have	I don't know
Boundaries			Not required	I don't know
Routes			Not required	I don't know
Offshore cadastral			Not required	I don't know
Lease areas			Not required	I don't know
Fixed obstructions			Not required	I don't know
Floating observation/navigation systems			Not required	I don't know
Shorelines – current, historic, change rates	Highly desirable	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	I don't know
Wetlands	Required	Required	Required	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	I don't know
Cost savings/cost reduction	Moderate	Moderate	Moderate	I don't know
Cost avoidance	Moderate	Minor	None	I don't know
Increased revenues	None	None	None	I don't know
Mission-driven performance improvements	Major	Minor	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	I don't know

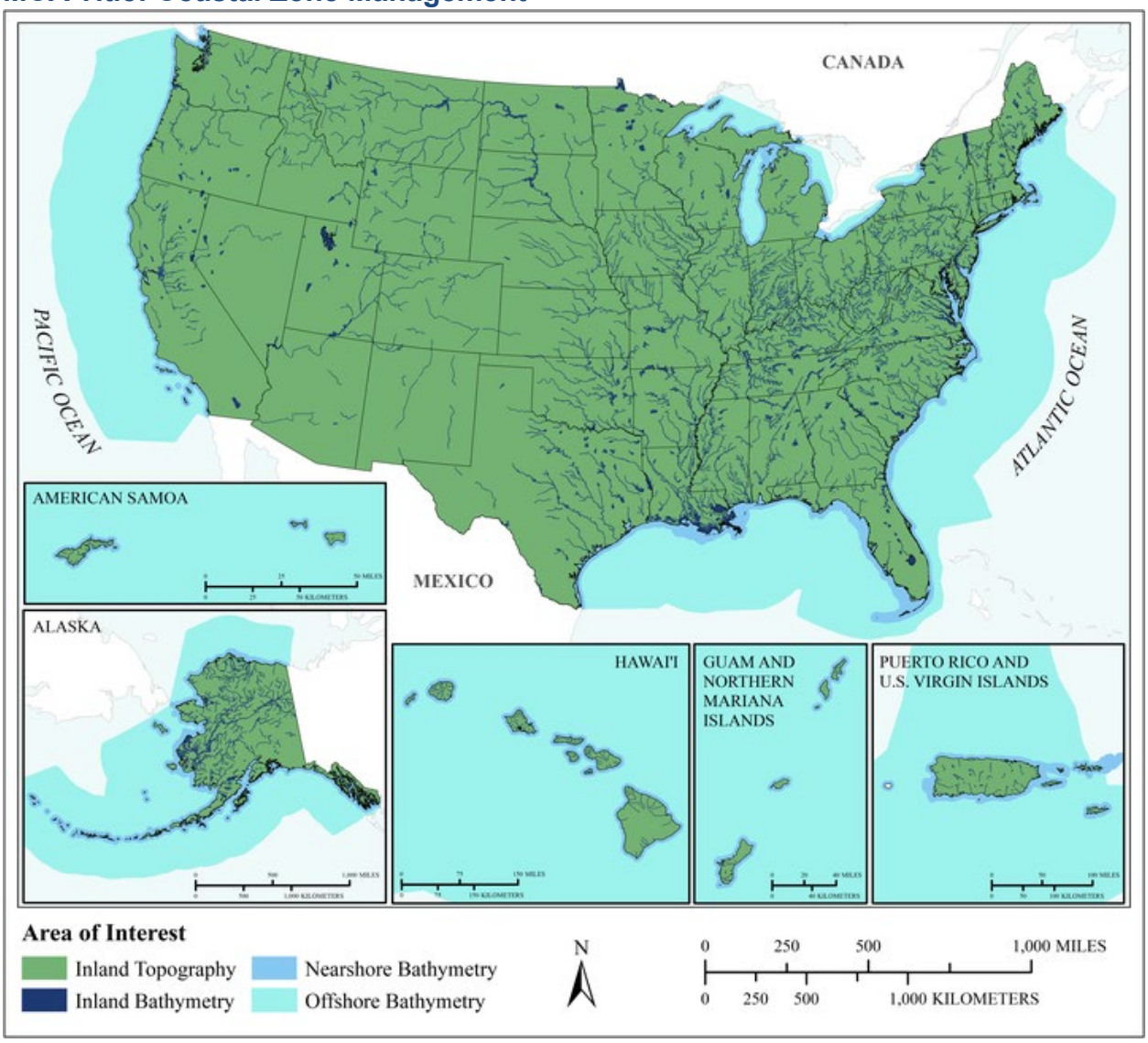
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Minor	Minor	I don't know
Improved customer experience	Major	Moderate	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	I don't know
Environmental	Major	Major	Moderate	I don't know
Public safety, including life and property	Major	Moderate	Moderate	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			I don't know		
Environmental	Major			Major			Moderate			I don't know		
Public safety, including life and property	Major			Major			Moderate			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Coastal Zone Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Analysis of coastal erosion and inundation. Hurricane storm surge and wind damage modeling and assessment. Coastal hazard modeling and mapping. Coastal hazard mitigation. Tsunami modeling. Land use and environmental planning. Coastal resiliency. Oil spill modeling. Littoral zone management including dunes and beaches.
MCA Title	Coastal Zone Management
MCA ID	60643
Organization Type	Federal Agencies and Commissions
Organization Name	HHS: Centers for Disease Control (CDC)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Buildings and roads, underwater bottom surface, reefs

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	Order 1a
Update Frequency	4-5 years	4-5 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Highly desirable	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Nice to have
Tide/wave heights			Highly desirable	Nice to have
Sea ice conditions			Not required	Nice to have
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Required	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				Yes
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Moderate
Cost savings/cost reduction	Major	Moderate	Major	Moderate
Cost avoidance	Major	Moderate	Major	Minor
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Moderate	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Major	Moderate

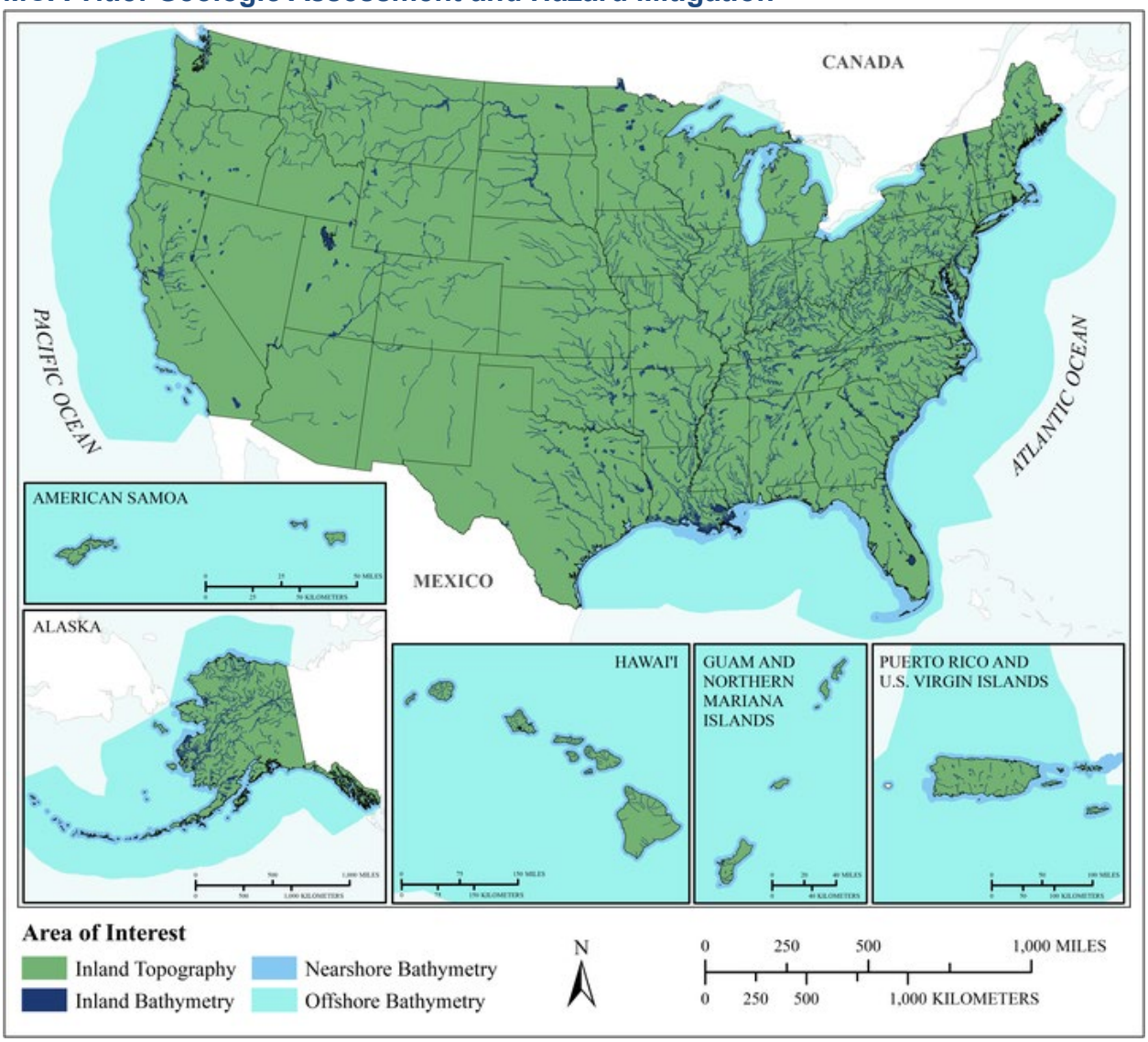
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Moderate	Moderate	Minor
Improved customer experience	Major	Moderate	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Minor
Environmental	Major	Moderate	Major	Moderate
Public safety, including life and property	Major	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	None			None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major			Minor		
Environmental	Major			Major			Major			Moderate		
Public safety, including life and property	Major			Major			Major			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			
Curvature maps	Yes	Yes	Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Assessment and Hazard Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Sinkhole and steephead mapping, monitoring, and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves. Aquifer recharge.
MCA Title	Geologic Assessment and Hazard Mitigation
MCA ID	60644
Organization Type	Federal Agencies and Commissions
Organization Name	HHS: Centers for Disease Control (CDC)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Buildings and roads, underwater bottom surface, reefs

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	Special Order
Update Frequency	4-5 years	6-10 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Required	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Required	Required	Required	Required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Nice to have	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Moderate
Cost avoidance	Major	Minor	Minor	Minor
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Major	Moderate	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major

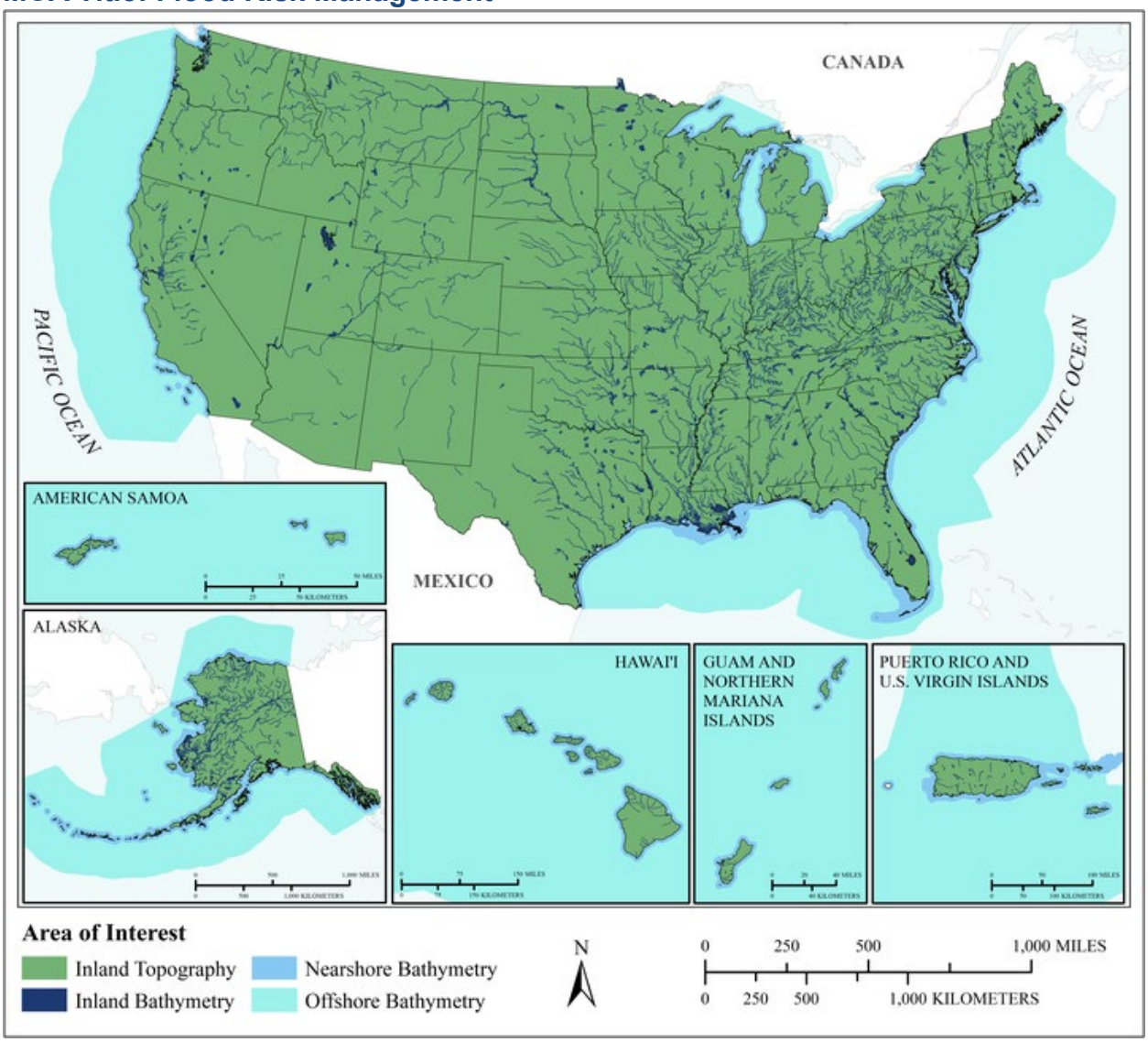
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Minor	Moderate	Moderate
Improved customer experience	Major	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Major
Environmental	Major	Minor	Minor	Moderate
Public safety, including life and property	Major	Major	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Moderate			Major		
Environmental	Major			Moderate			Moderate			Moderate		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps		Yes	Yes	Yes
Curvature maps				
Cross sections		Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes		Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60645
Organization Type	Federal Agencies and Commissions
Organization Name	HHS: Centers for Disease Control (CDC)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Buildings and roads, underwater bottom surface, reefs

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL2B	Order 1a
Update Frequency	4-5 years	4-5 years	4-5 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Nice to have
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Not required	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Moderate
Cost avoidance	Major	Moderate	Minor	Moderate
Increased revenues	Minor	Minor	None	None
Mission-driven performance improvements	Major	Moderate	Minor	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	Minor

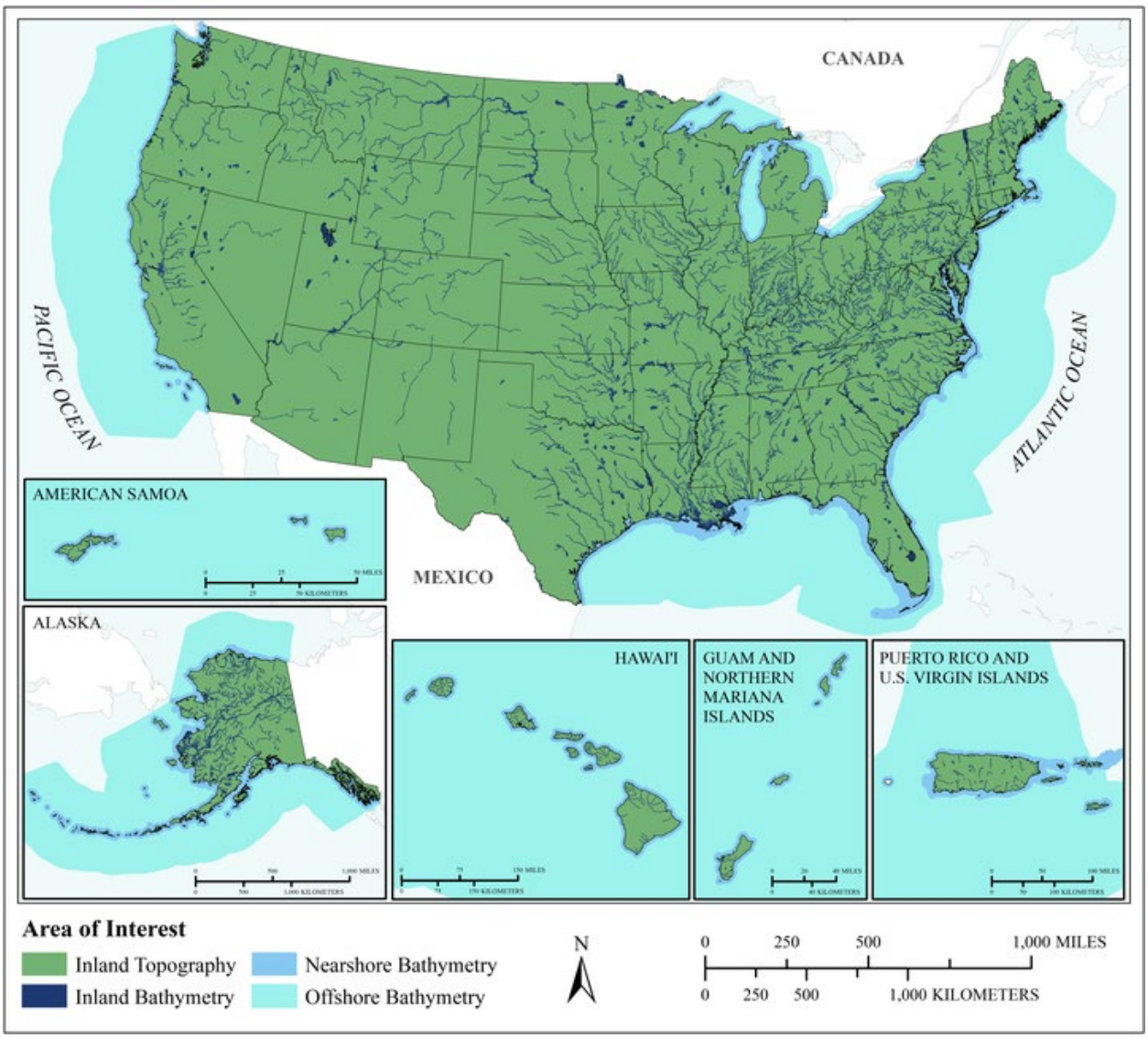
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Minor	Minor	Major
Improved customer experience	Major	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Minor	Minor
Environmental	Moderate	Moderate	Moderate	Minor
Public safety, including life and property	Major	Moderate	Moderate	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major			Moderate		
Environmental	Moderate			Moderate			Moderate			Moderate		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps			Yes	
Viewshed maps				
Hydrologic Flow Direction Grids	Yes		Yes	
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60646
Organization Type	Federal Agencies and Commissions
Organization Name	HHS: Centers for Disease Control (CDC)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Buildings and roads, underwater bottom surface, reefs

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL1B	QL1B	Order 1a
Update Frequency	4-5 years	4-5 years	2-3 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Required	Nice to have	Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required	Nice to have	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Required	Required	Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	Nice to have
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Required
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Not required	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Not required
Water column properties - Biological			Nice to have	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Moderate
Cost savings/cost reduction	Major	Moderate	Major	Moderate
Cost avoidance	Major	Major	Major	Moderate
Increased revenues	None	Minor	Minor	None
Mission-driven performance improvements	Major	Major	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major

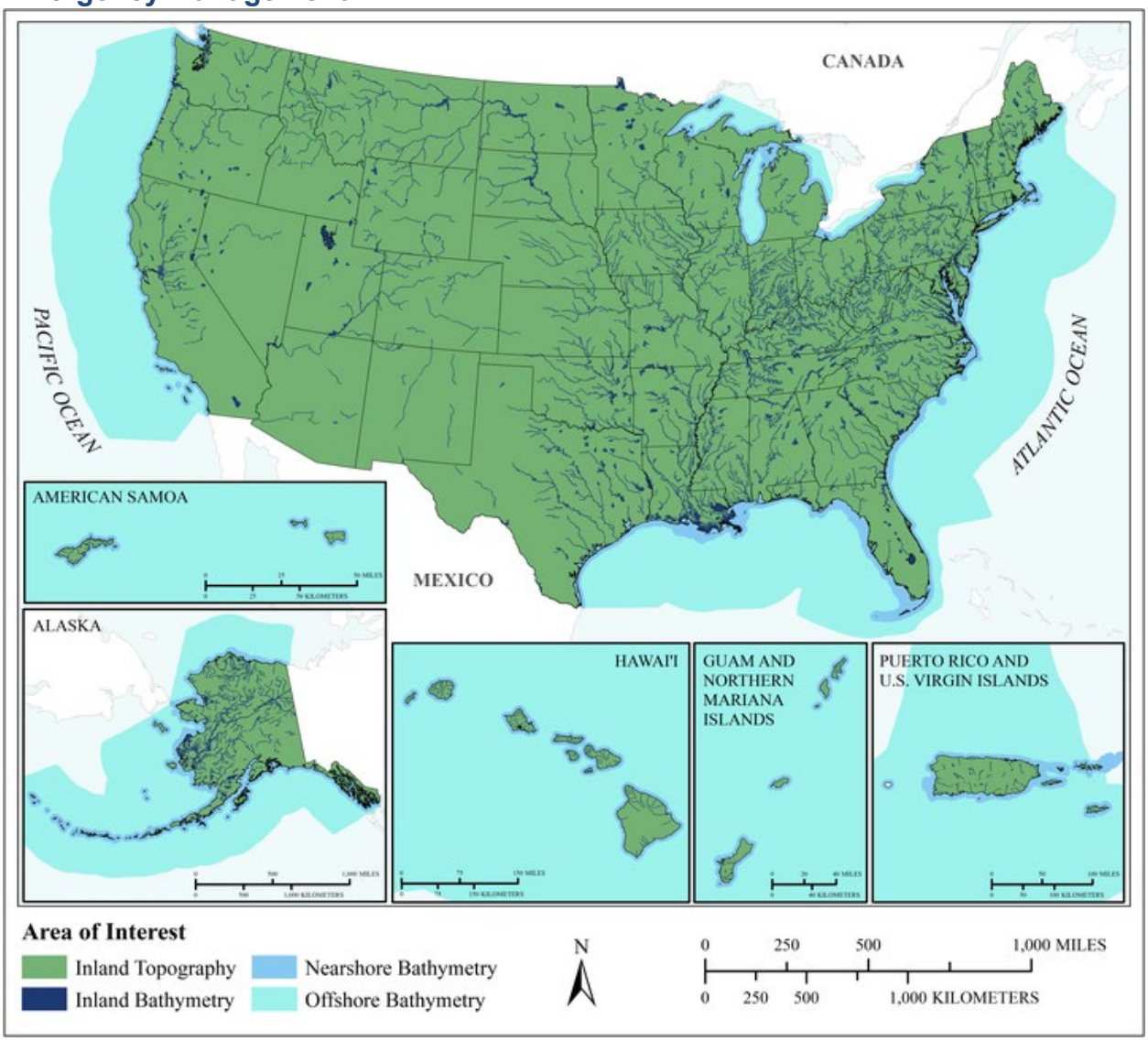
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Moderate	Moderate	Moderate
Improved customer experience	Moderate	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Moderate
Environmental	Major	Moderate	Major	Moderate
Public safety, including life and property	Major	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major			Major		
Environmental	Moderate			Major			Major			Major		
Public safety, including life and property	Moderate			Major			Minor			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness		Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60647
Organization Type	Federal Agencies and Commissions
Organization Name	HHS: Centers for Disease Control (CDC)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Buildings and roads, underwater bottom surface, reefs

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL1B	Order 2
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 20 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Up to 2 meters
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Required	Highly desirable	Highly desirable	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Nice to have	Nice to have	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Nice to have	Required
Bottom type			Nice to have	Nice to have
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Required
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Nice to have	Required
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Required
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Nice to have	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate	Moderate	Moderate
Cost savings/cost reduction	Major	Moderate	Moderate	Minor
Cost avoidance	Major	Moderate	Moderate	Minor
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	Minor

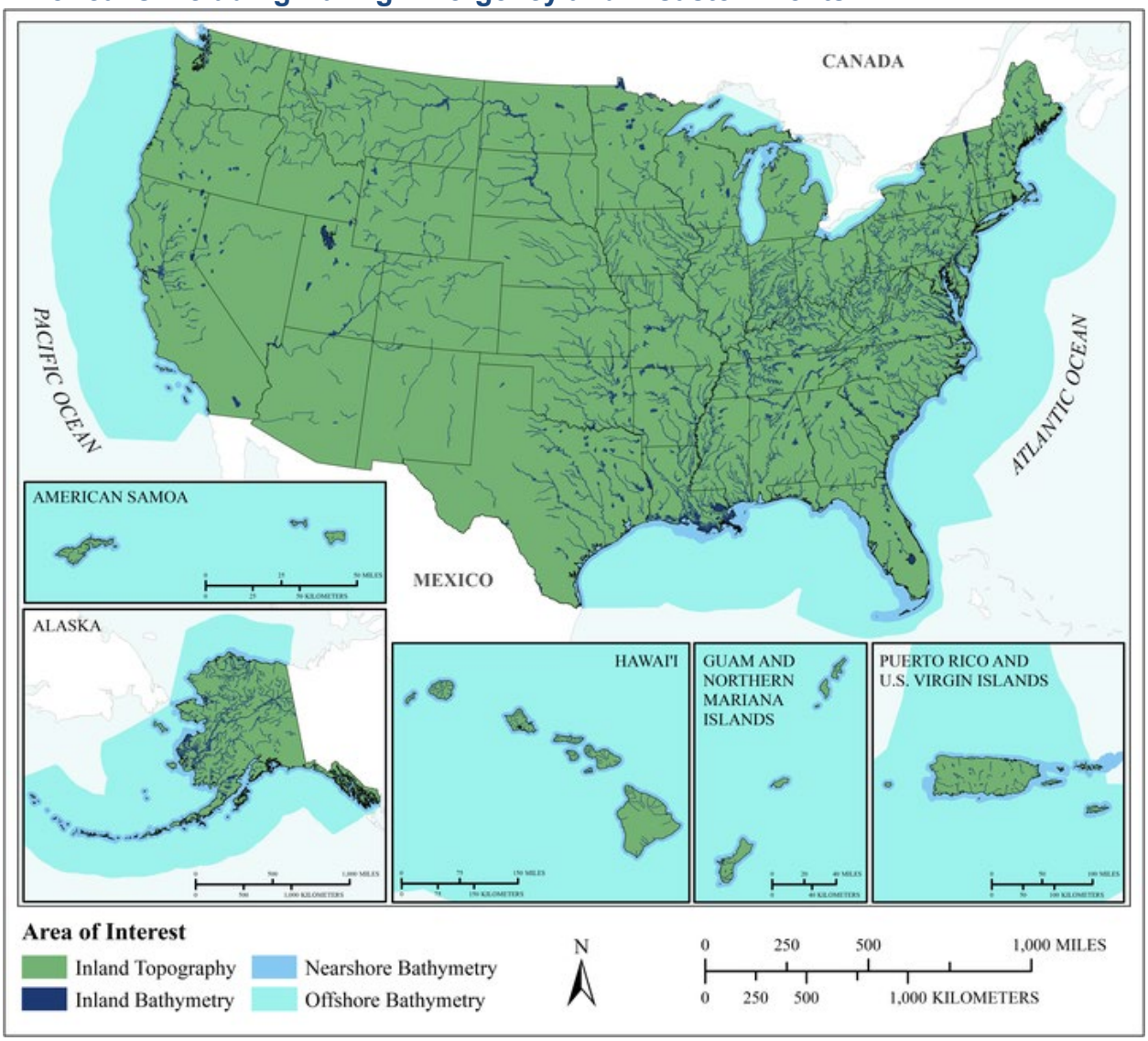
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Moderate	Moderate	Moderate
Improved customer experience	Major	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Minor	None
Environmental	Minor	Moderate	Minor	Minor
Public safety, including life and property	Major	Major	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		None			None			None		
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor			Minor			Minor		
Environmental	Moderate			Moderate			Minor			Minor		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps		Yes		
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes	Yes	Yes	Yes
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness		Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Assist State and Local Authorities to Save Lives and Protect Americans Including During Emergency and Disaster Events



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	States and/or Territories	States and/or Territories	All study waters	All study waters
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		

MCA Description	Response
Mission Critical Activity	Assist state and local authorities to save lives and protect Americans. CDC is involved with response to emergency and disaster events, including those involving riverine and coastal flooding, providing GIS support. Response activities require elevation data along with imagery and other satellite data to help visualize and respond to the events. Elevation data are also used for modeling, monitoring, and predicting flooding. The data are also of interest for assisting communities in assessing public health risks and their resilience to sea level rise. Bathymetry is of interest for addressing concerns related to red tides, harmful algal blooms, waterborne disease, and microplastics. Additional Business Uses include BU 04 - Forest Resources Management; BU 05 – Rangeland Management; BU 06 - Natural Resources Conservation; BU 08 - Agriculture and Precision Farming; BU 09 - Fisheries Management and Aquaculture; BU 11 - Geologic Resource Mining and Extraction; BU 13 - Oil and Gas Resources; BU 14 - Cultural Resources Preservation and Management; BU 17 - Wildfire Management, Planning, and Response; BU 19 – Land Navigation and Safety; BU 22 - Infrastructure and Construction Management; BU 23 - Urban and Regional Planning; BU 25 - Real Estate, Banking, Mortgage, and Insurance; BU 27 – Recreation; and BU 30 - Maritime and Land Boundary Management.
MCA Title	Assist State and Local Authorities to Save Lives and Protect Americans Including During Emergency and Disaster Events
MCA ID	1200
Organization Type	Federal Agencies and Commissions
Organization Name	HHS: Centers for Disease Control (CDC)
Sub-Agency or Division	Geospatial Research, Analysis, and Services Program
Organization Mission	CDC works 24/7 to protect America from health, safety and security threats, both foreign and in the U.S. Whether diseases start at home or abroad, are chronic or acute, curable or preventable, human error or deliberate attack, CDC fights disease and supports communities and citizens to do the same. CDC increases the health security of our nation. As the nation's health protection agency, CDC saves lives and protects people from health threats. To accomplish our mission, CDC conducts critical science and provides health information that protects our nation against expensive and dangerous health threats, and responds when these arise. Additionally, we utilize geospatial information to assist state and local authorities to save lives and protect Americans; especially with disaster and emergency response and preparedness activities.
Program Name	The Geospatial Research, Analysis, and Services Program and our Office of Public Health Preparedness and Response
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 24 - Health and Human Services
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required

What Needs to be Measured in 3D	Response
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Buildings and roads, underwater bottom surface, reefs

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	Order 2
Update Frequency	4-5 years	2-3 years	Annually	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 1 meter
Acceptable Vertical Error	Up to 10 cm	Up to 1 meter	Up to 1 meter	Less than 1 meter
How far onshore needed			To MHW	
How far down the beach profile needed	To MHW		To MHW	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs		Partial	Partial	Partial

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement	1m is fine	Currently we do not have access to any of these data and therefore it is difficult to define a sampling density. It could be dependent upon the type of event for which we have this data need.	1m	It is difficult for us to define at this point in time.

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Nice to have	Nice to have	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Not required	Not required	Not required
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Not required	Not required
Acoustic imagery of the seafloor			Not required	Not required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Not required	Not required
Geologic and seismic data	Highly desirable	Nice to have	Not required	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Nice to have	Highly desirable	Highly desirable	Highly desirable
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We currently use DEMs, best available	To date we have not used such data.	To date we have not used such data.	Rare use of these data.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	None	None	None
Cost savings/cost reduction	None	None	None	None
Cost avoidance	None	None	None	None

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None	None	None	None
Mission-driven performance improvements	Moderate	Minor	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	Moderate
Improved response or timeliness	Major	Moderate	Moderate	Moderate
Improved customer experience	Major	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Minor	Minor	Minor
Environmental	None	Moderate	Moderate	Moderate
Public safety, including life and property	Moderate	Major	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Time savings description				We are primarily users of these data and would not participate in field visits.			We are primarily data users and rarely conduct field visits.					
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction description				Does not pertain to our mission critical activities.			Does not pertain to our activities.					
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost avoidance description				Does not pertain to our mission critical activities.								
Increased revenues	None			I don't know	Unable to provide		I don't know	Unable to provide		None		
Increased revenues description				Does not pertain to our mission critical activities.			Does not pertain to our activities.					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Other operational benefits				Moderate	Unable to provide		Moderate	Unable to provide				
Other operational benefits description				Useful for preparedness, response, and recovery. Enhanced ability to respond to emergency events and public health responses.			Enhanced ability to respond to emergency events. Useful for preparedness, response, and recovery activities.					
Future annual operational benefits added during validation		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Value added to products or services description				Flood hazard maps and warnings.								
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000		Annual dollars saved/ realized	$250,000
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor			Minor		
Environmental	Moderate			Moderate			Moderate			Moderate		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes	Yes		
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps	Yes	Yes	Yes	Yes
Cross sections				
Height-Above-Ground maps	Yes	Yes		
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Census Bureau

The Census Bureau's mission is to serve as the nation's leading provider of quality data about its people and economy. We honor privacy, protect confidentiality, share our expertise globally, and conduct our work openly. We are guided on this mission by scientific objectivity, our strong and capable workforce, our devotion to research-based innovation, and our abiding commitment to our customers.

Geography is central to the work of the Census Bureau, providing the framework for survey design, sample selection, data collection, tabulation, and dissemination. Geography provides meaning and context to statistical data. Geospatial data obtained through ongoing partnership programs are critical to the Census Bureau's ability to accomplish its mission. Additionally, reference and thematic maps support the Census Bureau's demographic and economic surveys. To that end, the Census Bureau's Geography Division staff collect and maintain roads, boundaries, hydrography, and structure information using various spatial data sources and inputs for the United States and U.S. territories. This data stored in the MAF/TIGER system is the foundation of the Census Bureau's geospatial updates and partnership programs.

The Census Bureau has two primary objectives in using 3D imaging data such as lidar. First when paired with aerial and satellite imagery, lidar will enable us to detect change on the landscape to validate features such as roads, hydrography, rail, boundaries, and structures within the MAF/TIGER system. Lidar provides an alternate data source to evaluate whether linear features within the MAF/TIGER system meet the Census Bureau's 7.6-meter spatial quality standards. Second Census Bureau can use lidar to improve its methodologies for measuring the spatial accuracy of incoming imagery datasets.

Additionally, as a secondary objective, 3D (lidar) data products in combination with building outlines and road edge extraction can improve the coverage and spatial quality of the Census Bureau's address data. Lidar helps to identify multi-level structures visible in imagery, minimum square footage thresholds, and heights of housing units. For change detection and feature validation it is optimal to have data captured within a few years of existing data benchmarks. To ensure the spatial accuracy of incoming datasets, Quality Level 2 inland topographic data is required and should be no older than 2-3 years.

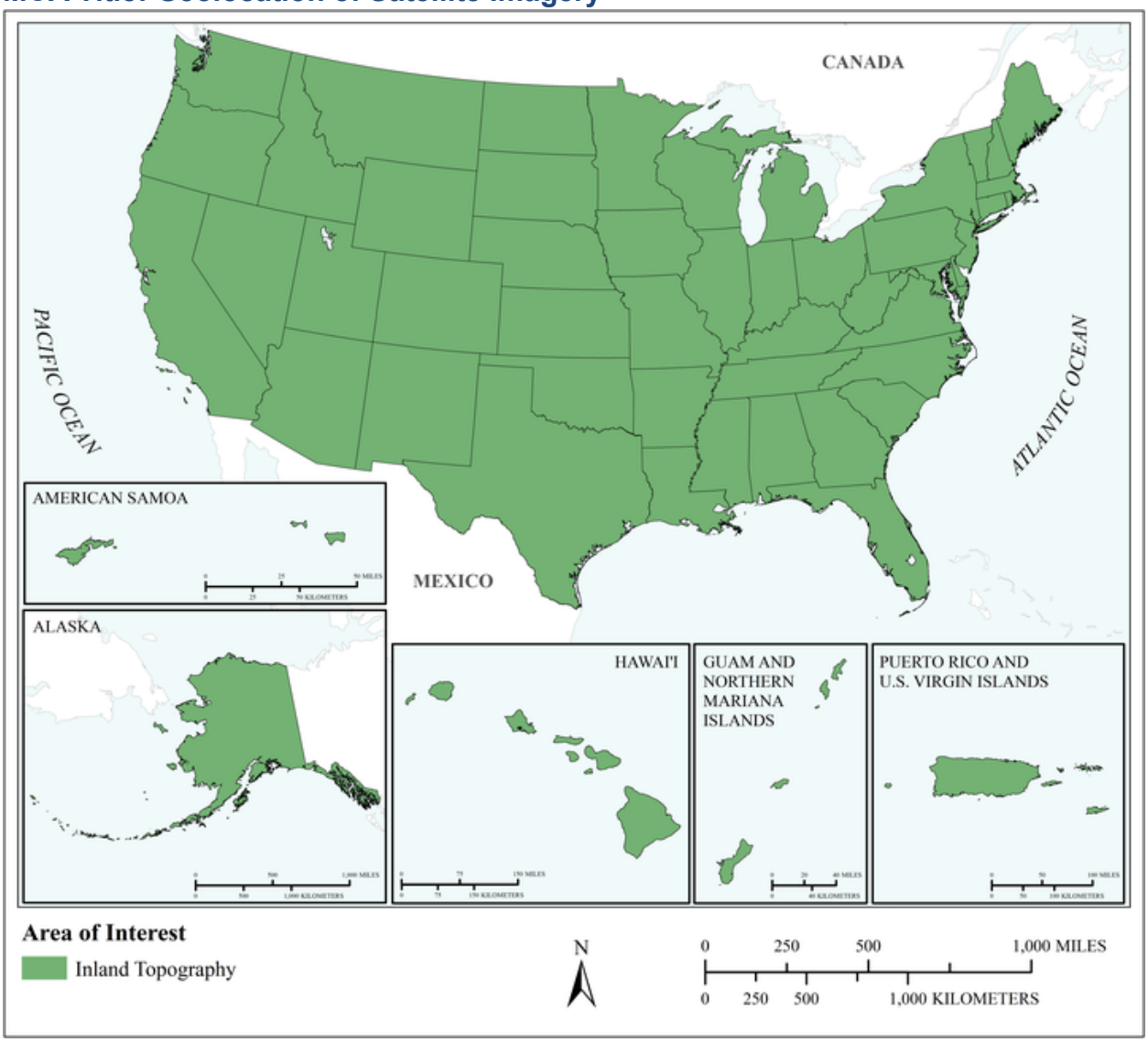
The Census Bureau's preference is to work with products (e.g. building footprints) linked to existing address data to confirm the location of structures and to validate the address itself from available source data. However, where gaps occur, lidar is considered a strong supplemental source for future updates and validation programs at the Census Bureau.

Census Bureau has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 23 – Urban and Regional Planning	DoC: U.S. Census Bureau (USCB)	1067	Geolocation of Satellite Imagery	Inland Topo	QL4	2-3 years	Unable to quantify	Unable to quantify	None	None	None
BU 23 – Urban and Regional Planning	DoC: U.S. Census Bureau (USCB)	1391	Identification of Change Within Census Geographic Framework	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Geolocation of Satellite Imagery



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	States and/or Territories			
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau			

MCA Description	Response
Mission Critical Activity	Georectification of satellite imagery at C-95 accuracy. The requirement is for seamless nationwide elevation data served on a web server sufficient to georectify SRTM imagery in ERDAS to a circular error at 95% of 5 meters to true.
MCA Title	Geolocation of Satellite Imagery
MCA ID	1067
Organization Type	Federal Agencies and Commissions
Organization Name	DoC: U.S. Census Bureau (USCB)
Sub-Agency or Division	Geography Division
Organization Mission	To serve as the nation's leading provider of quality data about its people and economy.
Program Name	Spatial, Address, and Imagery Data Program
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	A house.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL4			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 5 meters			
Acceptable Vertical Error	I don't know			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Nice to have			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Not required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Not required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Not required			
Wetlands	Not required			
Estuaries				
Inland surface water features				
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	SRTM data			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	SRTM data			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor			
Cost savings/cost reduction	Minor			

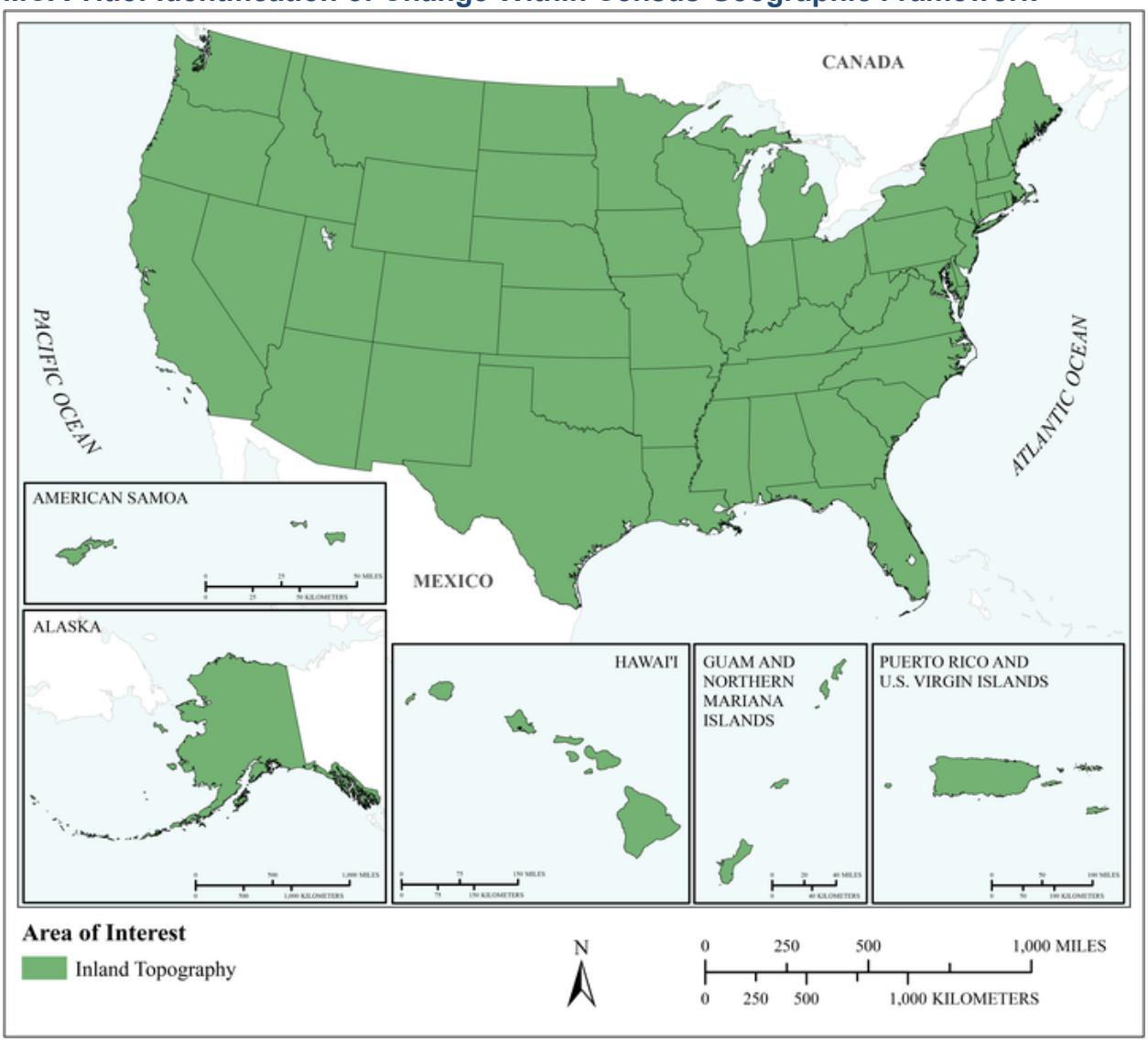
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Minor			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			
Improved response or timeliness	Minor			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Minor	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	None											
Public safety, including life and property	None											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Identification of Change Within Census Geographic Framework



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	States and/or Territories			
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau			

MCA Description	Response
Mission Critical Activity	Enumeration of population and the dissemination of statistical data. (Which include using and maintaining legal and statistical boundaries built from physical and political features, e.g. roads, rivers, railroads, incorporated place boundaries etc.). Geographic update activities. Help maintain the Census Bureau's geographic framework for data collection, tabulation, and dissemination between the decennial censuses and to support ongoing programs such as the ACS and the Population Estimates Program. Identification of change in the built environment is a primary function of this activity. Elevation and other datasets are needed to identify new building footprints and add addresses. Ideally, data are needed every 2-3 years.
MCA Title	Identification of Change Within Census Geographic Framework
MCA ID	1391
Organization Type	Federal Agencies and Commissions
Organization Name	DoC: U.S. Census Bureau (USCB)
Sub-Agency or Division	Geography Division
Organization Mission	The Census Bureau's mission is to serve as the nation's leading provider of quality data about its people and economy. The Census Bureau is also the leading statistical agency in the United States. The Geography Division (GEO) plans, coordinates, and administers all geographic and cartographic activities needed to facilitate the Census Bureau's statistical programs throughout the United States and its territories. It also manages the Census Bureau's programs to continuously update the addresses, features, boundaries, imagery, and geographic entities in its nationwide, automated geographic support system. An additional Business Use is BU 26 – Education K-12 and Beyond.
Program Name	Geographic Support Program
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 30 - Maritime and Land Boundary Management
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)

General Geographic Area and Size	
Description of smallest 3D features	We are interested in structures such as houses or buildings in general with area and elevation (volume) so that we can link to addresses for purposes of accurate enumeration and assessment of single/multi-unit structure densities.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years and certain events.			
Event type(s)	Natural disasters			
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 1 meter			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	3DEP, USIEI, state and local repositories. Currently using for testing purposes and to develop a methodology to calculate building outlines and road bed extraction; spatial quality desired to best the CE95 of 5 meters. Also research into automated change detection, shoreline delineation, and multi-unit identification.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI	Yes			
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Any available			
Other	Yes			
Other description	County data if available			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	I don't know			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	I don't know			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

Committee on the Marine Transportation System (CMTS)

The CMTS is a federal interagency coordinating committee which is chaired by the Secretary of Transportation. The purpose of the CMTS is assessing the adequacy of the marine transportation system, promoting the integration of the marine transportation system with other modes of transportation and other uses of the marine environment, and coordinating, improving the coordination of, and making recommendations with regard to federal policies that impact the Marine Transportation System (MTS). The CMTS was chartered in July 2004 and authorized in December 2012 to serve as a federal interagency coordinating committee with the following responsibilities:

- **Assess the adequacy of the MTS, including ports, waterways, channels, and intermodal connections.**
- **Promote the integration of the MTS with other modes of transportation and uses of the marine environment.**
- **Coordinate, improve coordination, and make recommendations with regard to federal policies that impact the MTS.**

The CMTS is chaired by the Secretary of Transportation and over 25 federal agencies and offices are engaged in the Coordinating Board. The activities of the CMTS are guided by the 14 recommendations laid out in the 2017-2022 National Strategy for Marine Transportation System (system performance, safety, security, energy innovation, and infrastructure investment) and by emerging issues (resilience/big data/Arctic transportation/ veteran's hiring).

The MTS is essential to the American economy; it supports millions of American jobs, facilitates trade, moves people and goods, and provides a safe, secure, cost-effective, and energy-efficient transportation alternative. The CMTS ensures that the MTS continues to meet the present and future needs of our nation. This interagency collaboration has resulted in a safer, more secure, environmentally-friendly, and efficient MTS.

Priorities of the CMTS include enhancing navigation safety, supporting maritime security, advancing energy innovation and development, and facilitating infrastructure investment.

Many of the CMTS member agencies currently use federally-generated lidar and bathymetry data. Elevation data are used for coastal erosion and inundation analysis; storm surge, tsunami, and wind damage modeling and assessment; coastal hazard modeling, mapping, and mitigation; land use and environmental planning; oil spill modeling; coastal zone resiliency and management; flood risk management; infrastructure investment; nautical charting; and commercial and marine navigation.

The CMTS, on behalf of its member agencies, expressed a need for nationwide topography and bathymetry data, including the territories. While individual requirements differ for each Mission Critical Activity, on average, Quality Level 2 (QL2) is sufficient for inland topographic data, QL1B for inland and bathymetric data, and IHO Order 1a for offshore bathymetric data, all on an update cycle of every 2-3 years.

There can be major future annual benefits from having more accurate topographic and bathymetric data. Improved data would provide time savings and cost reduction as well as major environmental and public safety benefits.

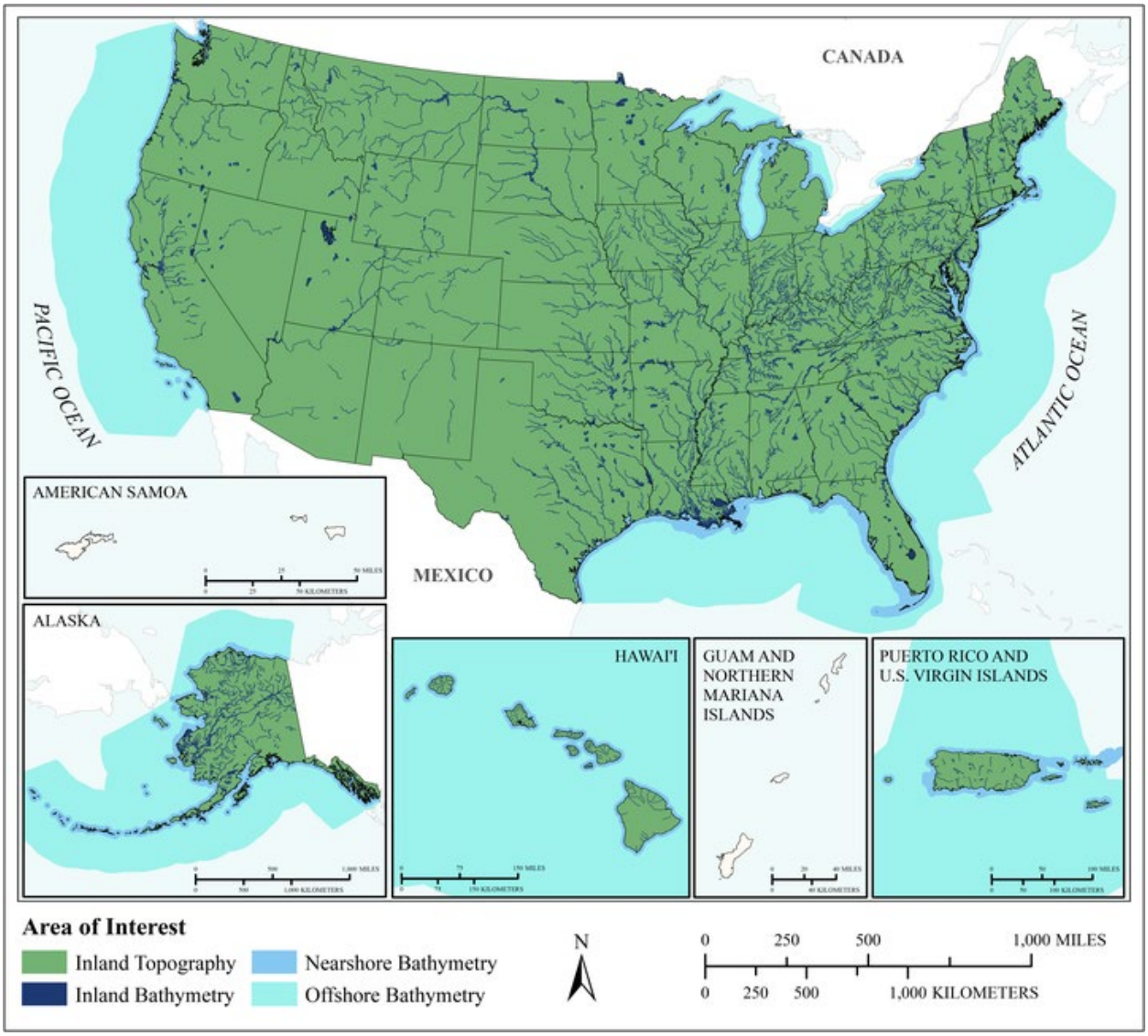
The CMTS has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 03 – Coastal Zone Management	Committee on the Marine Transportation System (CMTS)	22378	Coastal Zone Management	Inland Topo	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	Cross sections and/or transects meet needs	Event driven	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
				Offshore Bathy	Special Order	6-10 years	Unable to quantify	Unable to quantify	Major	Moderate	Major
BU 12 – Renewable Energy Resources	Committee on the Marine Transportation System (CMTS)	60696	Renewable Energy Resources	Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL4B	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
				Offshore Bathy	Special Order	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
BU 15 – Flood Risk Management	Committee on the Marine Transportation System (CMTS)	60697	Flood Risk Management	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Major	Moderate	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Major	Moderate	Major
				Offshore Bathy	Order 1a	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
BU 16 – Sea Level Rise and Subsidence	Committee on the Marine Transportation System (CMTS)	60698	Sea Level Rise and Subsidence	Inland Topo	QL0	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
				Offshore Bathy	Order 1a	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Moderate
BU 18 – Homeland Security	Committee on the Marine Transportation System (CMTS)	50005	Homeland Security Navigation	Inland Topo	QL2	Event driven	Unable to quantify	Unable to quantify	None	None	Moderate
				Inland Bathy	QL0B	Every 6 months	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL0B	Every 6 months	Unable to quantify	Unable to quantify	None	None	None
				Offshore Bathy	Order 1a	2-3 years	Unable to quantify	Unable to quantify	None	None	None

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 20 – Marine and Riverine Navigation	Committee on the Marine Transportation System (CMTS)	21556	Navigation, Charting, and Harbor Management	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Major
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Major
				Offshore Bathy	Order 2	2-3 years	$50,000	Unable to quantify	I don't know	I don't know	Minor
BU 20 – Marine and Riverine Navigation	Committee on the Marine Transportation System (CMTS)	50004	Navigational Safety and Marine Mapping	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	Major	Major
				Inland Bathy	QL0B	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL0B	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	Order 1a	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 20 – Marine and Riverine Navigation	Committee on the Marine Transportation System (CMTS)	50006	Data Collection and Analysis of Maritime Geospatial Data	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Inland Bathy	Cross sections and/or transects meet needs	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Nearshore Bathy	Cross sections and/or transects meet needs	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Offshore Bathy	Cross sections and/or transects meet needs	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 22 – Infrastructure Management	Committee on the Marine Transportation System (CMTS)	60699	Infrastructure and Construction Management	Inland Topo	QL0	4-5 years	Unable to quantify	Unable to quantify	Minor	Moderate	Major
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Moderate
				Nearshore Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
				Offshore Bathy	Special Order	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Minor
BU 30 – Maritime and Land Boundary Management	Committee on the Marine Transportation System (CMTS)	60700	Maritime and Land Boundary Management	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	Major	Minor	Minor
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	Order 1a	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate

MCA Title: Coastal Zone Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Nationwide, inland areas	Nationwide, inland areas	Custom description	Custom description
Sub Area Requirements			States, Puerto Rico, and U.S. Virgin Islands	States, Puerto Rico, and U.S. Virgin Islands out to the EEZ

MCA Description	Response
Mission Critical Activity	Analysis of coastal erosion and inundation. Hurricane storm surge and wind damage modeling and assessment. Coastal hazard modeling and mapping. Coastal hazard mitigation. Tsunami modeling. Land use and environmental planning. Coastal resiliency. Oil spill modeling. Littoral zone management including dunes and beaches
MCA Title	Coastal Zone Management
MCA ID	22378
Organization Type	Federal Agencies and Commissions
Organization Name	Committee on the Marine Transportation System (CMTS)
Sub-Agency or Division	
Organization Mission	The purpose of the CMTS is to create a partnership of Federal departments and agencies with responsibility for the Marine Transportation System (MTS). The CMTS was chartered in July 2005 and authorized in December 2012 to serve as a Federal interagency coordinating committee with the following responsibilities: •Assess the adequacy of the MTS, including ports, waterways, channels, and intermodal connections •Promote the integration of the MTS with other modes of transportation and uses of the marine environment •Coordinate, improve coordination, and make recommendations with regard to Federal policies that impact the MTS
Program Name	Coastal storm risk management
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Dunes, bulkhead, wharf, pier, jetty, groin

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	QL2B	Special Order
Update Frequency	2-3 years	Event driven only – Data need to coincide with a specific event.	4-5 years	6-10 years
Event type(s)		Event driven only		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 5 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs	Yes	Yes		
Cross section/transect requirement	Every 1000 feet; less than 1 foot in elevation accuracy	Every 1000 feet; less than 1 foot in elevation accuracy		

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Required	Required	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Required
DEM	Highly desirable	Highly desirable	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Highly desirable	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Highly desirable	Highly desirable	Required	Required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Required	Required	Highly desirable	Highly desirable
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Required	Required	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available	Best available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast		Yes		
NCEI	Yes	Yes		
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	All states	All states		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	I don't know	Moderate	Moderate
Cost savings/cost reduction	I don't know	I don't know	Minor	Moderate
Cost avoidance	I don't know	I don't know	Minor	Minor
Increased revenues	I don't know	I don't know	None	None

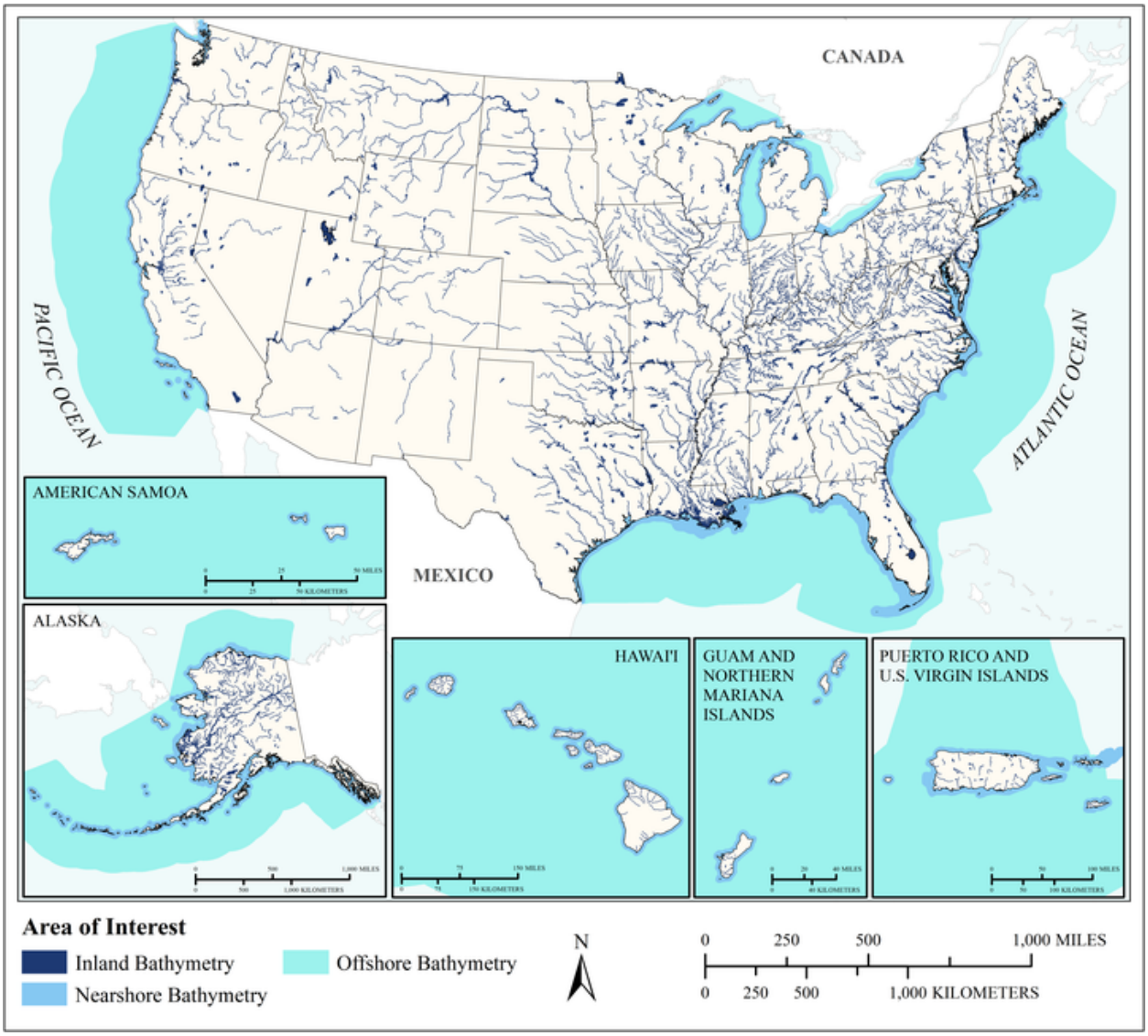
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	I don't know	I don't know	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	I don't know	Major	Major
Improved response or timeliness	I don't know	I don't know	Moderate	Moderate
Improved customer experience	I don't know	I don't know	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	I don't know	Moderate	Major
Environmental	I don't know	I don't know	Minor	Moderate
Public safety, including life and property	I don't know	I don't know	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		None			Minor	Unable to provide	
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			Moderate			Major		
Environmental	I don't know			I don't know			Moderate			Moderate		
Public safety, including life and property	I don't know			I don't know			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours			Yes	Yes
Hillshades			Yes	Yes
Slope maps			Yes	Yes
Aspect maps				
Curvature maps			Yes	
Cross sections			Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids			Yes	
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required	Required	Required
Geographic Area Requirements		Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements		All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60696
Organization Type	Federal Agencies and Commissions
Organization Name	Committee on the Marine Transportation System (CMTS)
Sub-Agency or Division	
Organization Mission	The purpose of the CMTS is assessing the adequacy of the marine transportation system, promoting the integration of the marine transportation system with other modes of transportation and other uses of the marine environment, and coordinating, improving the coordination of, and making recommendations with regard to Federal policies that impact the marine transportation system. The CMTS was chartered in July 2004 and authorized in December 2012 to serve as a Federal interagency coordinating committee with the following responsibilities: •Assess the adequacy of the MTS, including ports, waterways, channels, and intermodal connections •Promote the integration of the MTS with other modes of transportation and uses of the marine environment •Coordinate, improve coordination, and make recommendations with regard to Federal policies that impact the MTS
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		I don't know	QL4B	Special Order
Update Frequency		I don't know	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		I don't know	Up to 10 meters	Up to 2 meters
Acceptable Vertical Error		I don't know	Up to 50 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		I don't know	Highly desirable	Highly desirable		Highly desirable
Entire AOI under same environmental conditions		I don't know	Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		I don't know	Highly desirable	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless		I don't know	Required	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness		I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		I don't know	Highly desirable	Required
DTM		I don't know	Required	Required
DEM		I don't know	Required	Required
Raw point cloud data		I don't know	Highly desirable	Nice to have
Classified point cloud		I don't know	Highly desirable	
Edited/cube XYZ		I don't know	Nice to have	Nice to have
Full waveform		I don't know	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		I don't know	Nice to have	Nice to have
Breaklines required for standard hydro-flattening		I don't know		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Nice to have	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Not required
Intensity imagery/sidescan imagery		I don't know	Highly desirable	Highly desirable
Ground control/ground truthing		I don't know	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery		I don't know	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Required	Highly desirable
Geologic and seismic data		I don't know	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Required	Required
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates		I don't know	Highly desirable	
Land use/land cover		I don't know	Required	Highly desirable
Wetlands		I don't know	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features		I don't know	Required	
Bridges/culverts		I don't know		
Landmark features		I don't know	Not required	
Cultural resources		I don't know	Highly desirable	
Coastal and riverine structures		I don't know	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		I don't know	Major	Moderate
Cost savings/cost reduction		I don't know	Moderate	Moderate
Cost avoidance		I don't know	Moderate	Moderate
Increased revenues		I don't know	Major	Major
Mission-driven performance improvements		I don't know	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		I don't know	Major	Major

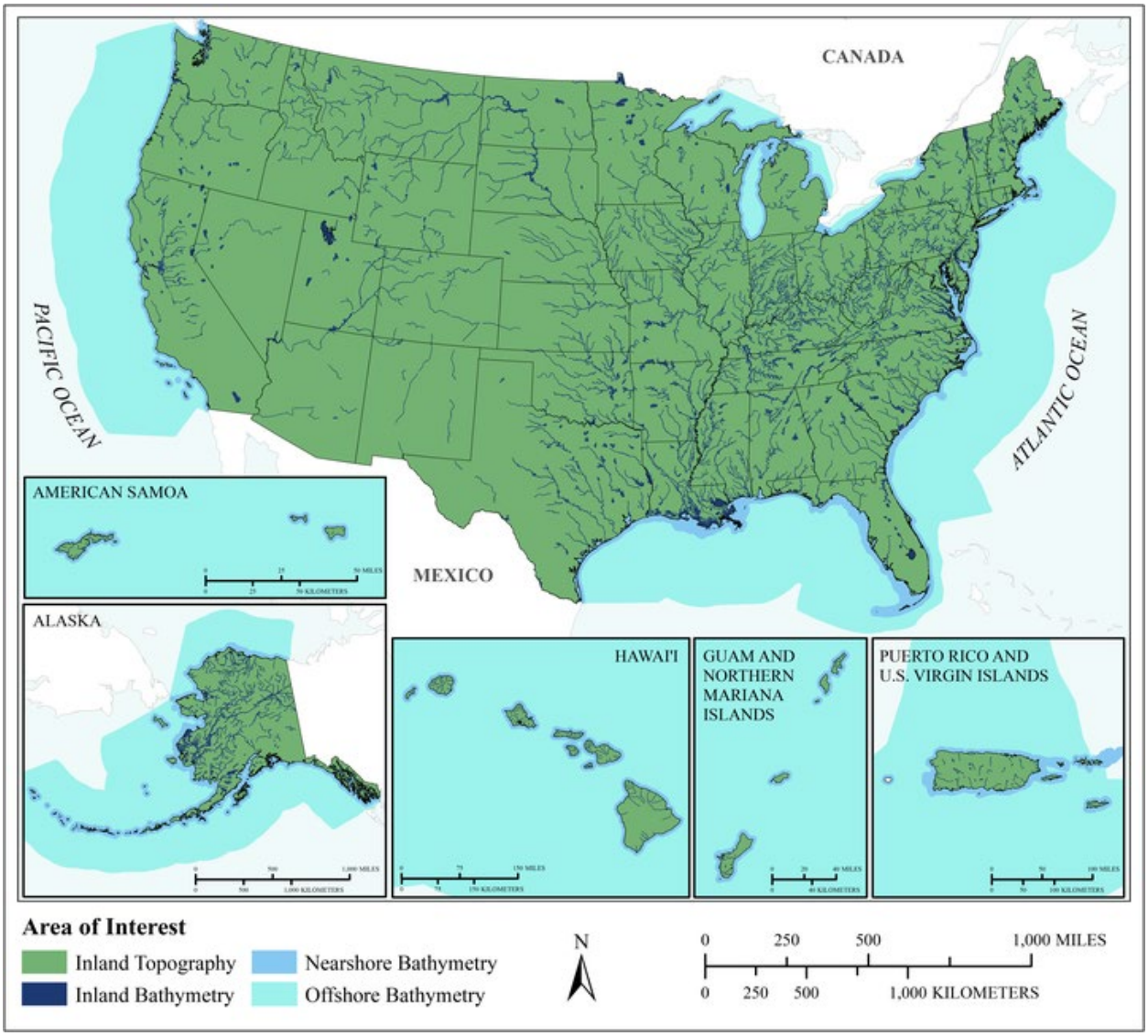
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness		I don't know	Major	Major
Improved customer experience		I don't know	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		I don't know	Major	Moderate
Environmental		I don't know	Major	Major
Public safety, including life and property		I don't know	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction				I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost avoidance				I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues				I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements				I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				I don't know	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness				I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience				I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				I don't know			Minor			Minor		
Environmental				I don't know			Moderate			Moderate		
Public safety, including life and property				I don't know			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours			Yes	Yes
Hillshades			Yes	Yes
Slope maps			Yes	Yes
Aspect maps			Yes	Yes
Curvature maps			Yes	Yes
Cross sections			Yes	Yes
Height-Above-Ground maps			Yes	Yes
Viewshed maps			Yes	Yes
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60697
Organization Type	Federal Agencies and Commissions
Organization Name	Committee on the Marine Transportation System (CMTS)
Sub-Agency or Division	
Organization Mission	The purpose of the CMTS is assessing the adequacy of the marine transportation system, promoting the integration of the marine transportation system with other modes of transportation and other uses of the marine environment, and coordinating, improving the coordination of, and making recommendations with regard to Federal policies that impact the marine transportation system. The CMTS was chartered in July 2004 and authorized in December 2012 to serve as a Federal interagency coordinating committee with the following responsibilities: •Assess the adequacy of the MTS, including ports, waterways, channels, and intermodal connections •Promote the integration of the MTS with other modes of transportation and uses of the marine environment •Coordinate, improve coordination, and make recommendations with regard to Federal policies that impact the MTS
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL2B	Order 1a
Update Frequency	4-5 years	4-5 years	4-5 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Nice to have
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Not required	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Moderate
Cost avoidance	Major	Moderate	Minor	Moderate
Increased revenues	Minor	Minor	None	None
Mission-driven performance improvements	Major	Moderate	Minor	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	Minor

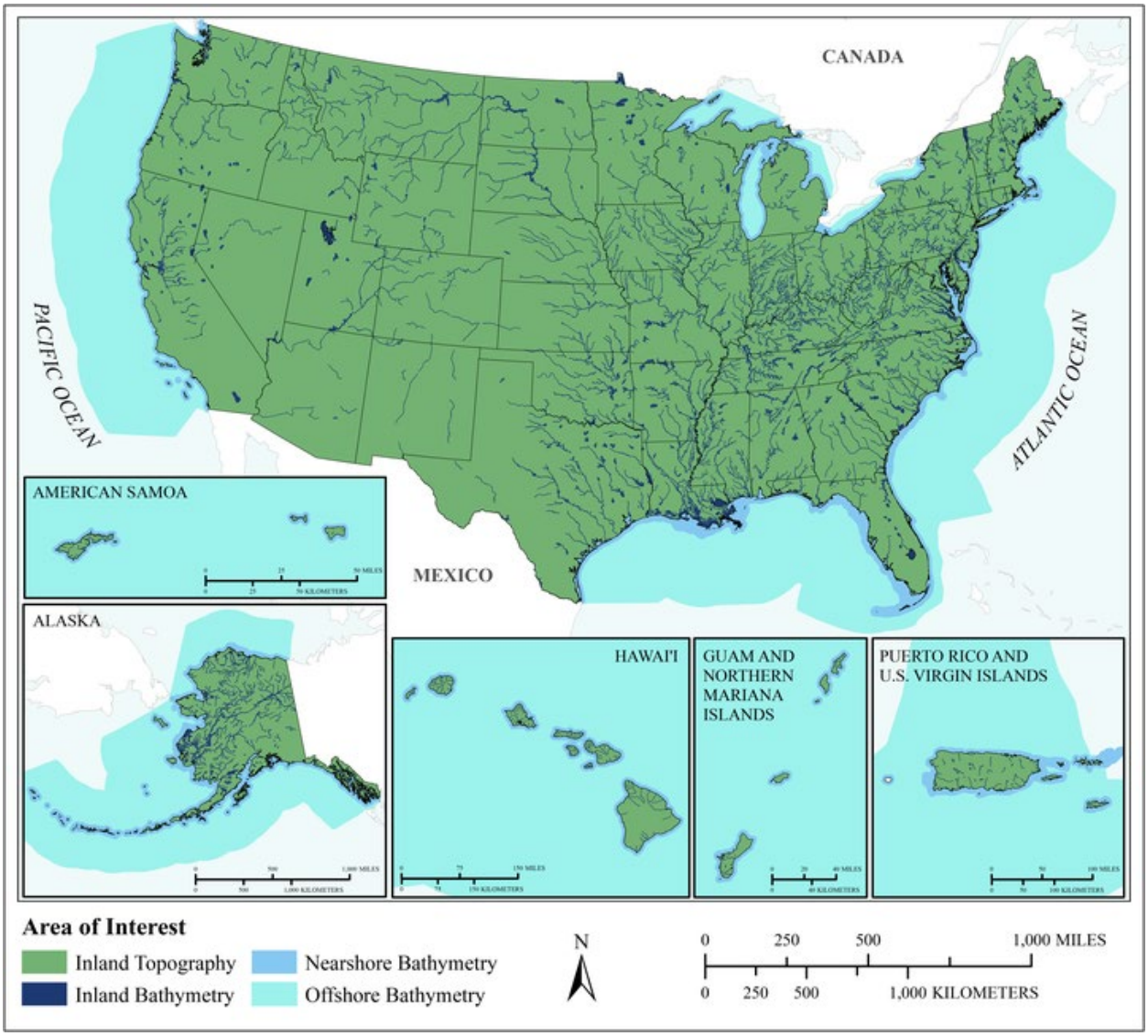
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	Major
Improved customer experience	Major	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Minor	Minor
Environmental	Moderate	Moderate	Moderate	Minor
Public safety, including life and property	Major	Moderate	Moderate	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major			Moderate		
Environmental	Moderate			Moderate			Moderate			Moderate		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps			Yes	
Viewshed maps				
Hydrologic Flow Direction Grids	Yes		Yes	
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60698
Organization Type	Federal Agencies and Commissions
Organization Name	Committee on the Marine Transportation System (CMTS)
Sub-Agency or Division	
Organization Mission	The purpose of the CMTS is assessing the adequacy of the marine transportation system, promoting the integration of the marine transportation system with other modes of transportation and other uses of the marine environment, and coordinating, improving the coordination of, and making recommendations with regard to Federal policies that impact the marine transportation system. The CMTS was chartered in July 2004 and authorized in December 2012 to serve as a Federal interagency coordinating committee with the following responsibilities: •Assess the adequacy of the MTS, including ports, waterways, channels, and intermodal connections •Promote the integration of the MTS with other modes of transportation and uses of the marine environment •Coordinate, improve coordination, and make recommendations with regard to Federal policies that impact the MTS
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL1B	QL1B	Order 1a
Update Frequency	4-5 years	4-5 years	2-3 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Required	Nice to have	Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required	Nice to have	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Required	Required	Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	Nice to have
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Required
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Not required	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Not required
Water column properties - Biological			Nice to have	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Moderate
Cost savings/cost reduction	Major	Moderate	Major	Moderate
Cost avoidance	Major	Major	Major	Moderate
Increased revenues	None	Minor	Minor	None
Mission-driven performance improvements	Major	Major	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major

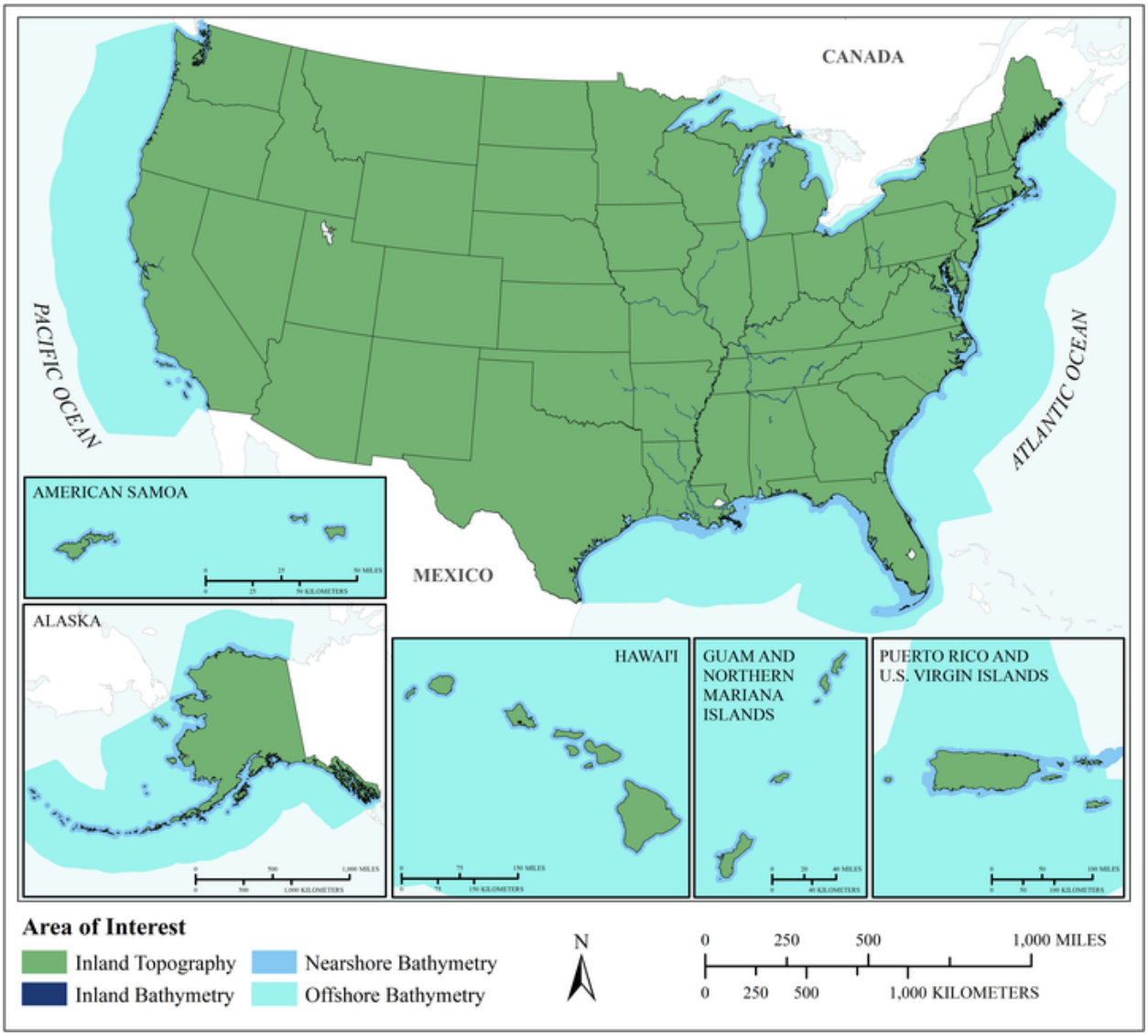
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate	Moderate	Moderate
Improved customer experience	Moderate	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Moderate
Environmental	Major	Moderate	Major	Moderate
Public safety, including life and property	Major	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major			Major		
Environmental	Moderate			Major			Major			Major		
Public safety, including life and property	Moderate			Major			Minor			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness		Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Homeland Security Navigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	States and/or Territories	Custom description	All study waters	All study waters
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Navigable waters		

MCA Description	Response
Mission Critical Activity	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management; Marine and Riverine Navigation and Safety; Aviation Navigation and Safety; Military; Environmental Protection; Coastal search and rescue. Elevation data are needed to improve mariner safety, improve the accuracy of maritime navigation, for advancements and enhancements to maritime charting, and to support our customers (public, commercial and private sector, military, and USCG districts). Elevation data are also needed for landmark recognition (e.g. lighthouses, navigation towers), for managing port infrastructure, and for situational awareness.
MCA Title	Homeland Security Navigation
MCA ID	50005
Organization Type	Federal Agencies and Commissions
Organization Name	Committee on the Marine Transportation System (CMTS)
Sub-Agency or Division	
Organization Mission	The purpose of the CMTS is to create a partnership of Federal departments and agencies with responsibility for the Marine Transportation System (MTS). The CMTS was chartered in July 2005 and authorized in December 2012 to serve as a Federal interagency coordinating committee with the following responsibilities: •Assess the adequacy of the MTS, including ports, waterways, channels, and intermodal connections •Promote the integration of the MTS with other modes of transportation and uses of the marine environment •Coordinate, improve coordination, and make recommendations with regard to Federal policies that impact the MTS
Program Name	Maritime Safety and Security
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Tertiary Business Use	BU 29 - Military

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Items that could affect maritime services, safety, and navigation such as underwater shipwrecks, obstructions to navigation, bottom surface characteristics

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL0B	Order 1a
Update Frequency	Event driven only – Data need to coincide with a specific event.	Every 6 months	Every 6 months	2-3 years
Event type(s)	Extreme weather event, ice formations, military operations, rescue efforts, humanitarian need, etc.			
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed			To Mean Lower Low Water (MLLW)	
How far down the beach profile needed	To MLLW		To MHHW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Not required	Nice to have	Not required	Not required
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Not required	Nice to have	Nice to have	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	Required
DTM	Nice to have	Required	Required	Required
DEM	Nice to have	Not required	Not required	Not required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Not required	Not required	Not required	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Not required	Not required	Not required
Ground control/ground truthing	Not required	Not required	Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Not required	Not required
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Highly desirable	Required
Bottom type			Required	Not required
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Not required	Nice to have	Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Required
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Required	Required
Habitat distribution and classification			Not required	Required
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Highly desirable	Required
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Required	
Land use/land cover	Not required	Not required	Nice to have	Not required
Wetlands	Highly desirable	Not required	Nice to have	Not required
Estuaries			Nice to have	Not required
Inland surface water features	Nice to have	Required	Nice to have	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Required	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	FAA Aeronautical Charts	Data from NOAA or USACE charts	Data from NOAA or USACE charts	NOAA and USACE survey data
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes		
Other description	FAA Aeronautical Charts	USACE Channel Surveys		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	Major	Major	Moderate

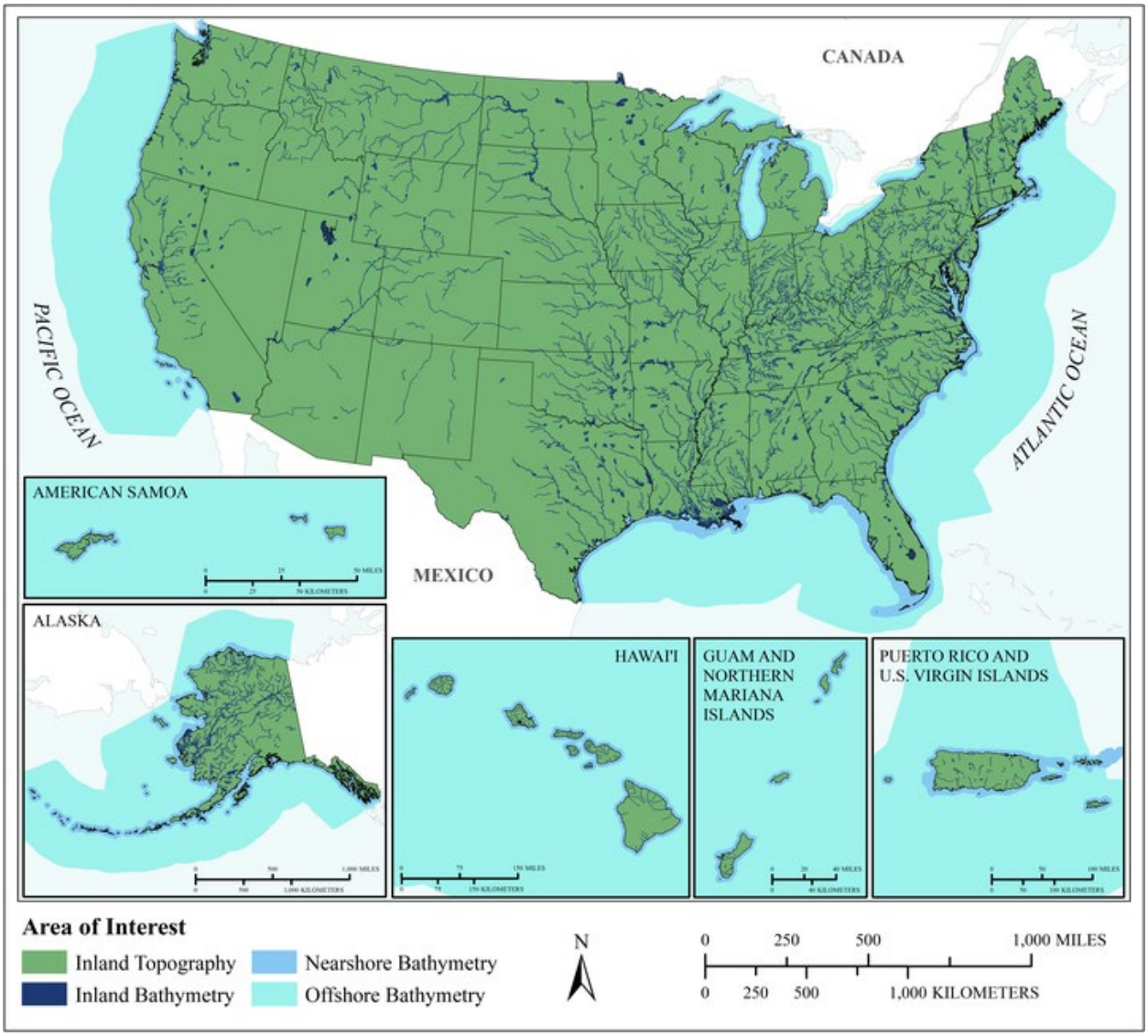
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	None	Moderate	Moderate	None
Cost avoidance	None	Moderate	Moderate	None
Increased revenues	None	None	None	None
Mission-driven performance improvements	None	I don't know	None	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	I don't know	None	None
Improved response or timeliness	None	Moderate	Moderate	Moderate
Improved customer experience	None	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	I don't know	None	None
Environmental	None	I don't know	None	None
Public safety, including life and property	Major	Major	Major	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	None			Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	None			None			None			None		
Cost avoidance	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Increased revenues	I don't know	Unable to provide		None			None			None		
Mission-driven performance improvements	I don't know	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements description				By rapidly determining the location of mariners in distress, there will be significant (and often critical) time savings in deploying rescue vessels or aircraft to distress locations.						By rapidly determining the location of mariners in distress, there will be significant (and often critical) time savings in deploying rescue vessels or aircraft to distress locations.		
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness description							Better protection of mariners and defense of the coasts. Additional lives and property can be saved at sea by taking the “search” out of search and rescue.			Better protection of mariners and defense of the coasts. Additional lives and property can be saved at sea by taking the “search” out of search and rescue.		
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		None			I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			I don't know			None			None		
Environmental	None			I don't know			None			None		
Public safety, including life and property	Moderate			I don't know			None			None		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes	Yes	Yes	Yes
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness		Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Navigation, Charting, and Harbor Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	States and/or Territories	States and/or Territories	All study waters	All study waters
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of submerged inland topography. Identification of hazards to navigation. Precision marine navigation. Hydrographic survey for dredging the harbors for navigation. Flood risk management, Maritime channel and harbor improvements, ecological restoration, and navigation. Harbor maintenance. Planning and constructing new navigation channels, ports, and harbors, and maintaining channel depths along coastal channels, and harbors.
MCA Title	Navigation, Charting, and Harbor Management
MCA ID	21556
Organization Type	Federal Agencies and Commissions
Organization Name	Committee on the Marine Transportation System (CMTS)
Sub-Agency or Division	
Organization Mission	The purpose of the CMTS is to create a partnership of Federal departments and agencies with responsibility for the Marine Transportation System (MTS). The CMTS was chartered in July 2005 and authorized in December 2012 to serve as a Federal interagency coordinating committee with the following responsibilities: •Assess the adequacy of the MTS, including ports, waterways, channels, and intermodal connections •Promote the integration of the MTS with other modes of transportation and uses of the marine environment •Coordinate, improve coordination, and make recommendations with regard to Federal policies that impact the MTS
Program Name	Navigation, charting, and harbor maintenance
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Size range for all mission areas is at the point level of obstructions or obstacles to navigation in channels, flood risk management with vegetation in channels, to restoration with plant species. Also bollards, underwater wrecks, mooring anchors, docks, top of coastal structure, bridge abutments.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	Order 2
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	Project specific requirements			
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Less than 10 cm	Less than 10 cm	Up to 2 meters
How far onshore needed			To the fall line	
How far down the beach profile needed	Below MLLW		To MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs	Partial	Partial	Partial	Partial
Cross section/transect requirement	For initial planning purposes cross sections/transects are appropriate levels of granularity and increased coverage is needed to move to construction of projects.	QL1(B) to QL0(B) level for dredging surveys QL3(B) to QL2(B) level for charting surveys Full sweep for hard material bottoms NTE 200 foot cross section spacing in soft bottom materials (typical 200 to 400 foot spacing)	50 to 200 ft spacing typical	Sampling density of 2m along transects spaced at 32 m (100 ft)

Hydrologic Processing Required	Response
Hydro-flattening	Required

Hydrologic Processing Required	Response
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required	Not required	Nice to have	Not required	Not required
Entire AOI under same environmental conditions	Highly desirable	Not required	Not required	Highly desirable	Highly desirable	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Highly desirable	Nice to have
Classified point cloud	Highly desirable	Nice to have	Highly desirable	
Edited/cube XYZ		Required	Required	Required
Full waveform	Nice to have	Nice to have	Highly desirable	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Required	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Required	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Nice to have
Aerial and/or satellite imagery	Required	Highly desirable	Required	Highly desirable
Underwater videography			Highly desirable	Not required
Bottom texture			Highly desirable	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Required	Highly desirable	Highly desirable	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Nice to have
Tide/wave heights			Required	Nice to have
Sea ice conditions			Highly desirable	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Highly desirable	Required	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Typically federal generated elevation data is used where available.	Typically federal generated elevation data is used where available.	Presently use nearshore bathymetric data collected by the USGS (Coastal and Marine Geology Program), and nearshore/beach topographic data collected by the USACE JALBTCX program. The USACE JALBTCX data is collected about every 2 to 3 years along the U.S. West Coast and the vertical and horizontal accuracy standards have been +/- 15 cm RMSE and +/1.5 m RMSE, respectively. Also, annually collected multi-beam and single-beam bathymetric data for all federal navigation products (harbors and channels)	Use USACE collected offshore bathymetry of dredged material disposal sites. USACE standards recommend a vertical accuracy of 0.3 ft (repeatability) with a typical standard deviation (+/- 95%) of 0.8 ft.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			

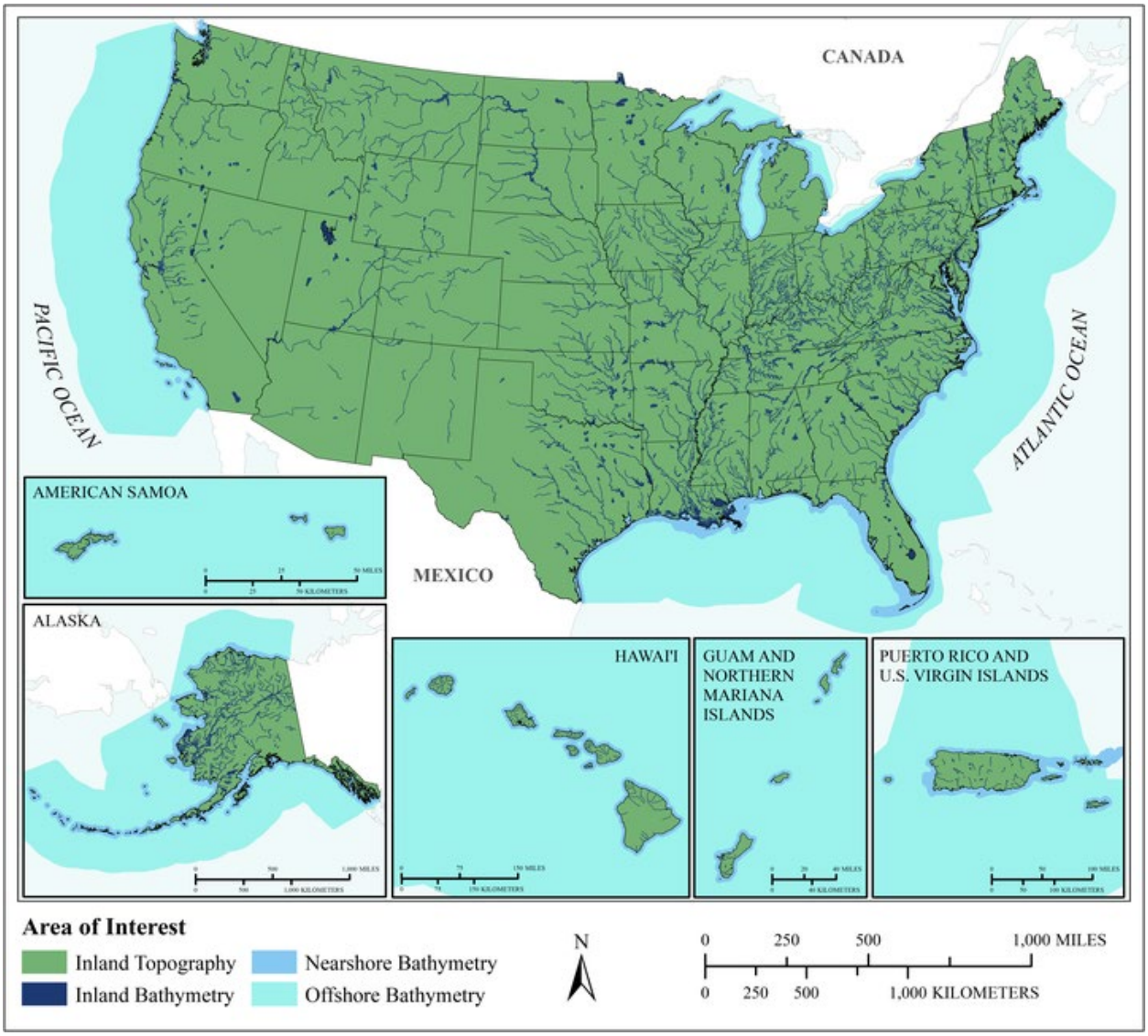
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Digital Coast	Yes	Yes	Yes	
NCEI	Yes	Yes	Yes	
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Moderate	Minor
Cost savings/cost reduction	Major	Minor	Moderate	Minor
Cost avoidance	Moderate	Minor	Moderate	Minor
Increased revenues	None	None	None	I don't know
Mission-driven performance improvements	Minor	Major	Major	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Moderate	Moderate	Minor
Improved response or timeliness	Major	Moderate	Moderate	Minor
Improved customer experience	Moderate	Moderate	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	I don't know
Environmental	Major	Minor	Moderate	I don't know
Public safety, including life and property	Major	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Time savings description				Time savings for GIS analyst. Time savings from less contract management. Fewer (or no) site visits required.			Less effort for GIS Analyst. Time savings if no contract needed for bathymetric data collection. Fewer site visits.			Time saved if no bathymetry data collection contract is needed. Could reduce need for in-house offshore survey. Could reduce data processing time for hydrographer.		
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Annual dollars saved/realized	$50,000
Cost savings/cost reduction description				Cost savings if no contract needed for bathymetric data collection.			Cost savings if no contract needed for bathymetric data collection.			Cost saving if no bathymetry data collection contract is needed.		
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements description							Up to date bathymetry (including coastal structures) supports the navigation mission.					
Other operational benefits	Major	Unable to provide										
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			Minor			I don't know		
Environmental	Moderate			Major			Major			I don't know		
Environmental description							Improved coordination with environmental agencies regarding dredging and nearshore sand placement.					
Public safety, including life and property	Major			Major			Major			Minor		
Public safety, including life and property description							Improved understanding of condition of coastal structures (e.g., jetties).					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes	Yes	Yes
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Navigational Safety and Marine Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	States and/or Territories	States and/or Territories	All study waters	All study waters
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		

MCA Description	Response
Mission Critical Activity	Navigational safety and marine mapping. Bathymetric measurements of near-shore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels. Planning, acquiring, integrating, and disseminating ocean and coastal geospatial data.
MCA Title	Navigational Safety and Marine Mapping
MCA ID	50004
Organization Type	Federal Agencies and Commissions
Organization Name	Committee on the Marine Transportation System (CMTS)
Sub-Agency or Division	
Organization Mission	The purpose of the CMTS is to create a partnership of Federal departments and agencies with responsibility for the Marine Transportation System (MTS). The CMTS was chartered in July 2005 and authorized in December 2012 to serve as a Federal interagency coordinating committee with the following responsibilities: •Assess the adequacy of the MTS, including ports, waterways, channels, and intermodal connections •Promote the integration of the MTS with other modes of transportation and uses of the marine environment •Coordinate, improve coordination, and make recommendations with regard to Federal policies that impact the MTS
Program Name	Nautical charts
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	BU 30 - Maritime and Land Boundary Management
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Pilings, piers, rocks, trees, antennas, etc; A 1x1 meter cube object is the generally accepted norm for the size feature we are interested in; Depth and resolution/scale dependent. From 3m depth contour out to 20m depth, 1x1x1 meter object on the sea floor; Anything that can sink a ship; wrecks and hazards to marine navigation

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Other	Highly desirable
Other description	Any areas NOAA charts
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL0B	Order 1a
Update Frequency	4-5 years	Annually	Annually	Annually
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	Less than 50 cm
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Less than 10 cm	Less than 1 meter
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	WGS84 + VDatum
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Required	Highly desirable	Highly desirable	Required
Entire AOI under same environmental conditions	Nice to have	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Highly desirable	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Highly desirable	Required	
Edited/cube XYZ		Highly desirable	Required	Required
Full waveform	Not required	Highly desirable	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Required	Required	Required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Required	Required
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Required	Required
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Required	Nice to have
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Required	Required
Geologic and seismic data	Nice to have	Nice to have	Not required	Not required
Water column properties - Physical			Required	Required
Water column properties - Chemical			Required	Required
Water column properties - Biological			Required	Required
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Required	Required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Required	Required
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Nice to have	Highly desirable	Nice to have	Highly desirable
Wetlands	Nice to have	Highly desirable	Required	Highly desirable
Estuaries			Required	Highly desirable
Inland surface water features	Nice to have	Highly desirable	Nice to have	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Required	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available Federal sources	We are collecting IHO order 1 and 2 data for these areas	Lidar, acoustic	Acoustic
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

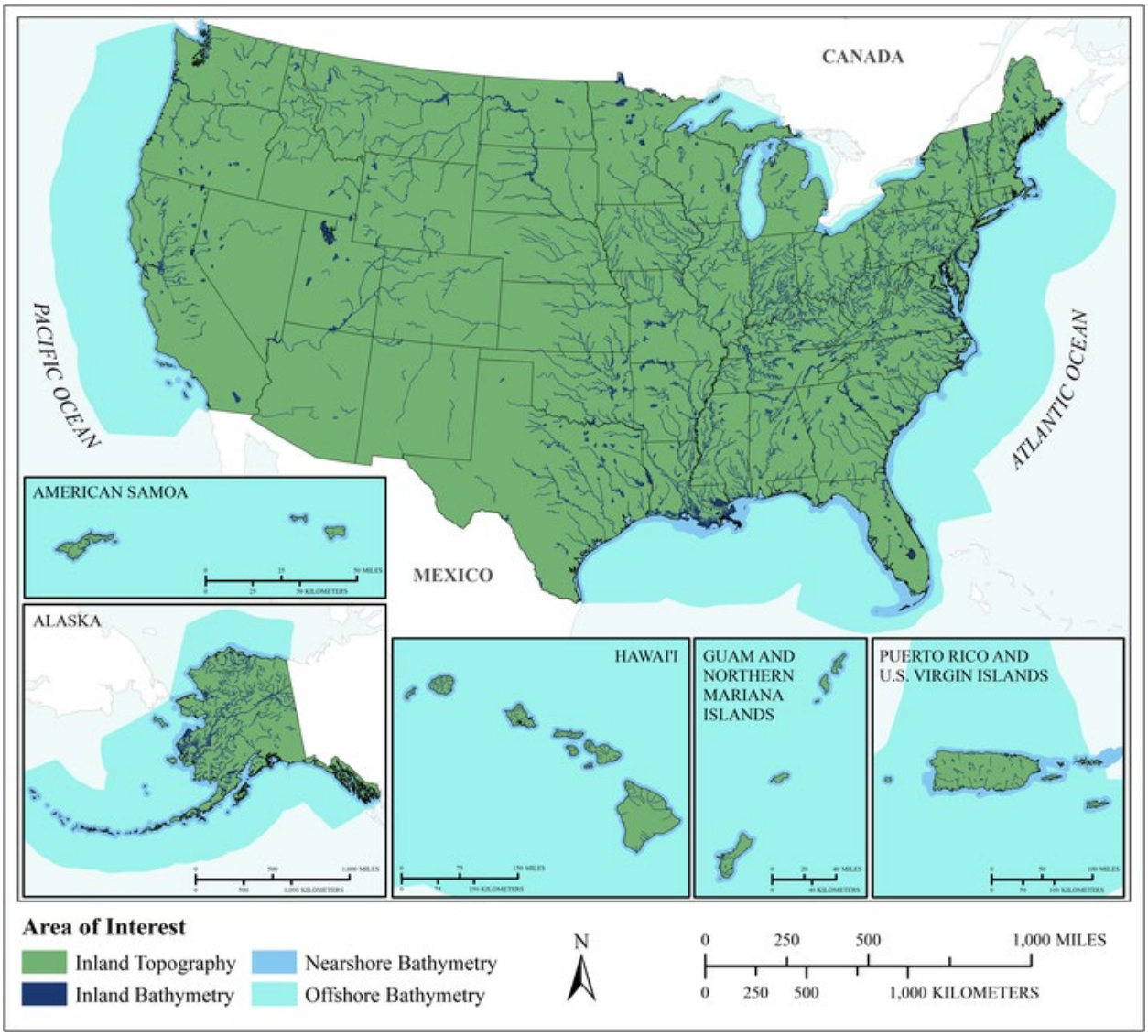
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other		Yes		
Other description		We collect data that is in NCEI. We also use data from other reliable sources such as professional surveyors. Data that meets my needs is not available.		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major	Major	Moderate
Cost savings/cost reduction	Moderate	Major	Major	Moderate
Cost avoidance	Minor	Major	Major	Moderate
Increased revenues	Minor		Moderate	Moderate
Mission-driven performance improvements	Major	Major	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Moderate
Improved response or timeliness	Moderate	Major	Major	Moderate
Improved customer experience	Moderate	Major	Major	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Major	Major	Minor
Environmental	Moderate	Minor	Major	Minor
Public safety, including life and property	Major	Major	Major	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Time savings description				If national, seamless topo/ bathy were available, this would radically restructure charting.								
Cost savings/cost reduction	I don't know	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost avoidance	I don't know	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other operational benefits				Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other customer service benefits										Major	Unable to provide	
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know			I don't know		
Environmental	Major			I don't know			I don't know			I don't know		
Public safety, including life and property	Major			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Data Collection and Analysis of Maritime Geospatial Data



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Nice to have	Required	Required	Required
Geographic Area Requirements	States and/or Territories	States and/or Territories	All study waters	All study waters
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		

MCA Description	Response
Mission Critical Activity	Maritime issues to include shipping and all ports, both coastal and on inland waterways. Topographic and bathymetric data are used in conjunction with other datasets that are specific to vessel traffic, such as the Automatic Identification Systems (AIS) data transmitted by vessels about where and when they are traveling on the water.
MCA Title	Data Collection and Analysis of Maritime Geospatial Data
MCA ID	50006
Organization Type	Federal Agencies and Commissions
Organization Name	Committee on the Marine Transportation System (CMTS)
Sub-Agency or Division	
Organization Mission	The purpose of the CMTS is to create a partnership of Federal departments and agencies with responsibility for the Marine Transportation System (MTS). The CMTS was chartered in July 2005 and authorized in December 2012 to serve as a Federal interagency coordinating committee with the following responsibilities: •Assess the adequacy of the MTS, including ports, waterways, channels, and intermodal connections •Promote the integration of the MTS with other modes of transportation and uses of the marine environment •Coordinate, improve coordination, and make recommendations with regard to Federal policies that impact the MTS
Program Name	Maritime Security
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 30 - Maritime and Land Boundary Management

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Supporting U.S. maritime, we need national and international data. Needed features include docks, jetties, corals, underwater vegetation types, wrecks, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	Not required
51 - 100 ft	Not required
101 - 500 ft	Not required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs
Update Frequency	6-10 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	Need to know when updates are made to data so we can find best available data		Need to know when updates are made to data so we can find best available data	Need to know when updates are made to data so we can find best available data
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Less than 50 cm	Less than 50 cm
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	Less than 1 meter
How far onshore needed			To MHW	
How far down the beach profile needed	To MLLW		To MHHW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs	Partial	Yes	Yes	Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Required	Required	Required	Nice to have	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable
DEM for entire AOI needs to be seamless	Nice to have	Required	Highly desirable	Required	Nice to have	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Highly desirable	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Nice to have	Highly desirable	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Required	Required	Required
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Required
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Required
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Required
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery	Nice to have	Required	Nice to have	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Highly desirable	Required
Geologic and seismic data	Highly desirable	Required	Highly desirable	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Required
Routes			Highly desirable	Required
Offshore cadastral			Highly desirable	Required
Lease areas			Highly desirable	Nice to have
Fixed obstructions			Highly desirable	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Highly desirable	Required
Wetlands	Required	Required	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Required
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Required	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Whatever is the best data we can find	Whatever is the best data we can find	Whatever is the best data we can find	Whatever is the best data we can find
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes	Yes	Yes	Yes
Open Topography	Yes			
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS			Yes	Yes
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Moderate	Moderate	Major
Increased revenues	Moderate	Moderate	Moderate	None
Mission-driven performance improvements	Moderate	Major	Moderate	Major

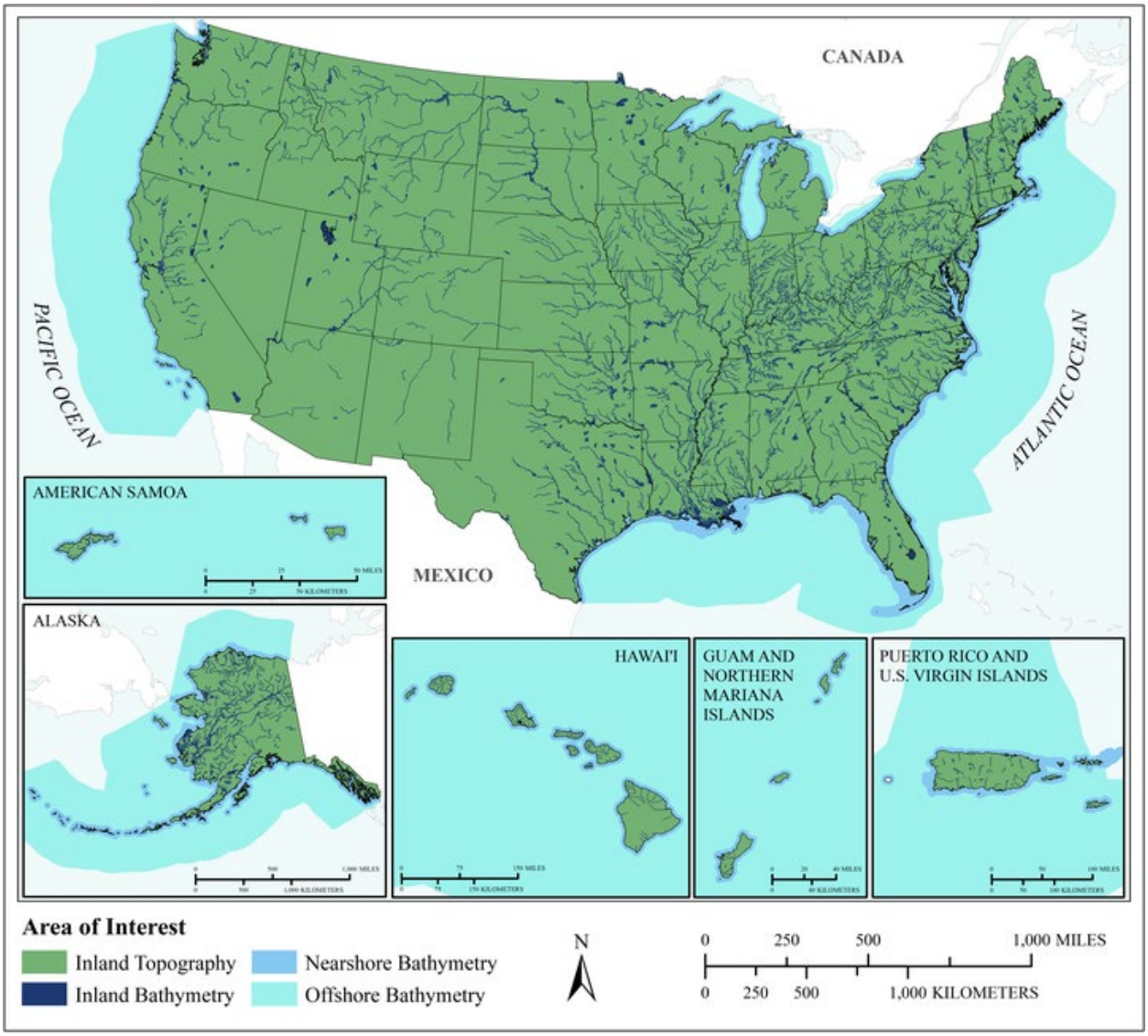
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Major	Major	Major
Improved response or timeliness	Major	Major	Moderate	Major
Improved customer experience	Moderate	Moderate	Moderate	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Moderate	Moderate
Environmental	Major	Moderate	Major	Major
Public safety, including life and property	Major	Major	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	None			None			Major	Unable to provide		Major	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other operational benefits				Major	Unable to provide					Major	Unable to provide	
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other customer service benefits				Major	Unable to provide					Major	Unable to provide	
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Major			Major			Major			Major		
Other												
Other benefits				Moderate			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps	Yes	Yes	Yes	Yes
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes	Yes	Yes	Yes
Viewshed maps	Yes	Yes	Yes	Yes
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60699
Organization Type	Federal Agencies and Commissions
Organization Name	Committee on the Marine Transportation System (CMTS)
Sub-Agency or Division	
Organization Mission	The purpose of the CMTS is assessing the adequacy of the marine transportation system, promoting the integration of the marine transportation system with other modes of transportation and other uses of the marine environment, and coordinating, improving the coordination of, and making recommendations with regard to Federal policies that impact the marine transportation system. The CMTS was chartered in July 2004 and authorized in December 2012 to serve as a Federal interagency coordinating committee with the following responsibilities: •Assess the adequacy of the MTS, including ports, waterways, channels, and intermodal connections •Promote the integration of the MTS with other modes of transportation and uses of the marine environment •Coordinate, improve coordination, and make recommendations with regard to Federal policies that impact the MTS
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL1B	Special Order
Update Frequency	4-5 years	4-5 years	4-5 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Not required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Required	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Highly desirable	Nice to have
Underwater videography			Not required	Nice to have
Bottom texture			Not required	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Not required	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Highly desirable	Nice to have
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	Moderate
Cost savings/cost reduction	Major	Moderate	Minor	Minor
Cost avoidance	Major	Moderate	Minor	Minor
Increased revenues	None	None	None	Minor
Mission-driven performance improvements	Major	Moderate	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	Moderate

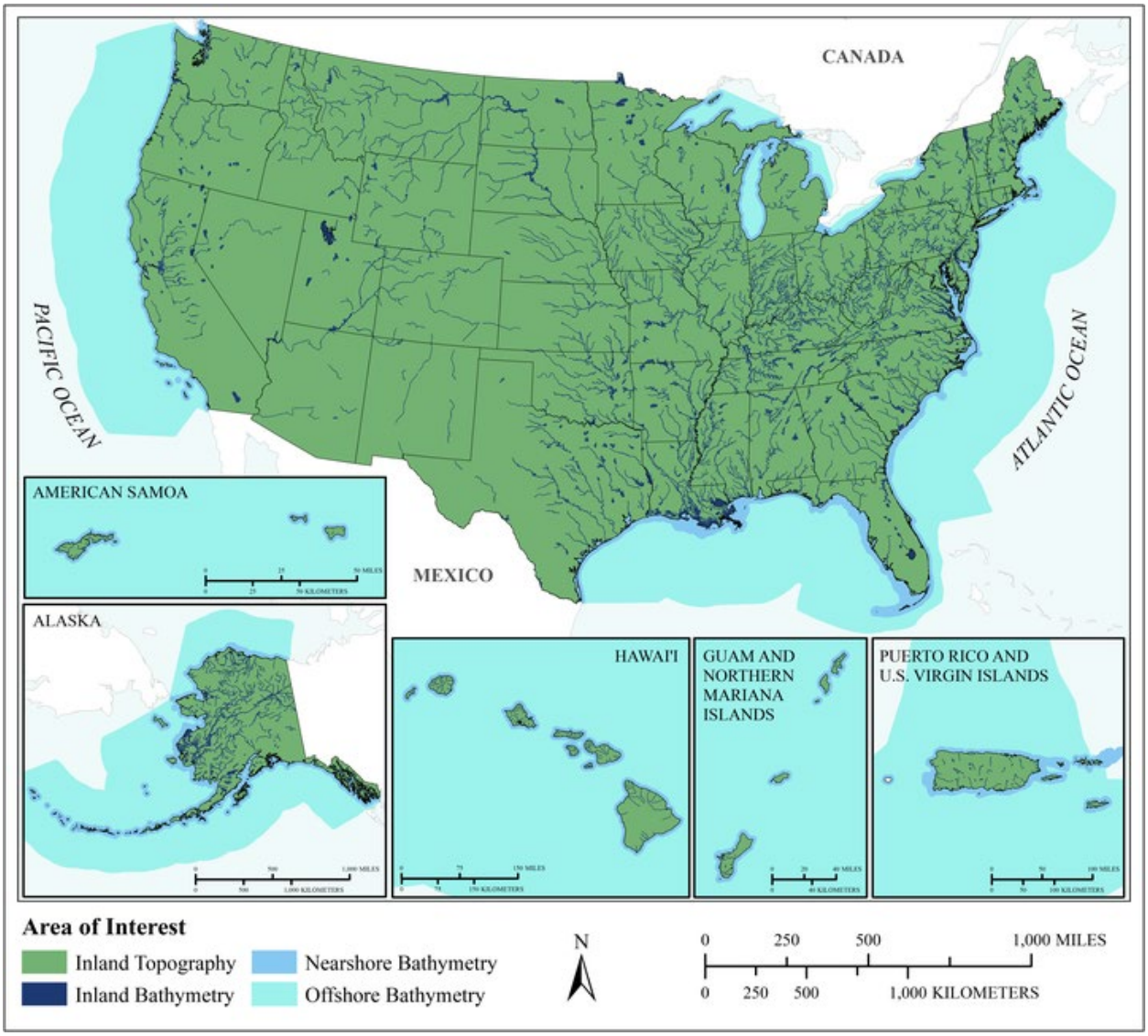
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Moderate	Minor	Moderate
Improved customer experience	Moderate	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	Moderate
Environmental	Moderate	Minor	Minor	Minor
Public safety, including life and property	Moderate	Moderate	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor			Minor		
Environmental	Moderate			Minor			Moderate			Moderate		
Public safety, including life and property	Major			Moderate			Moderate			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	Yes
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	Yes
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	Yes
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes	Yes	Yes
Building footprints	Yes			Yes
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60700
Organization Type	Federal Agencies and Commissions
Organization Name	Committee on the Marine Transportation System (CMTS)
Sub-Agency or Division	
Organization Mission	The purpose of the CMTS is assessing the adequacy of the marine transportation system, promoting the integration of the marine transportation system with other modes of transportation and other uses of the marine environment, and coordinating, improving the coordination of, and making recommendations with regard to Federal policies that impact the marine transportation system. The CMTS was chartered in July 2004 and authorized in December 2012 to serve as a Federal interagency coordinating committee with the following responsibilities: •Assess the adequacy of the MTS, including ports, waterways, channels, and intermodal connections •Promote the integration of the MTS with other modes of transportation and uses of the marine environment •Coordinate, improve coordination, and make recommendations with regard to Federal policies that impact the MTS
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	Order 1a
Update Frequency	4-5 years	4-5 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Highly desirable	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Required	Required
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	Not required
Ground control/ground truthing	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Nice to have	Highly desirable
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate	None	I don't know
Cost savings/cost reduction	Major	Minor	Minor	Moderate
Cost avoidance	Moderate	Minor	Minor	Moderate
Increased revenues	None	Moderate	None	I don't know
Mission-driven performance improvements	Major	Minor	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	I don't know

Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Minor	Minor	Moderate
Improved customer experience	Major	Minor	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	Moderate
Environmental	Major	Moderate	Minor	Moderate
Public safety, including life and property	Minor	Minor	Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	None			None			None			I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			Moderate		
Environmental	Minor			Major			Major			Major		
Public safety, including life and property	Minor			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

Department of Homeland Security (DHS)

The mission of the DHS is "With Honor and integrity, we will safeguard the American people, our homeland, and our values." DHS is committed to resilience, striving to prevent future attacks against the U.S. and its allies, responding decisively to natural and man-made disasters, and advancing American prosperity and economic security. DHS is raising security baselines across the world, addressing systemic risks, and building redundancies for critical lifelines that enable our prosperity and way of life. DHS is also forging partnerships to strengthen public, private, and international cooperation and crowd-sourcing solutions that outpace the intentions of our adversaries.

DHS's strategic plan is comprised of:

- Counter Terrorism and Homeland Security Threats: One of the DHS's top priorities is to resolutely protect Americans from terrorism and other homeland security threats.
- Secure U.S. Borders and Approaches: DHS secures the nation's air, land, and sea borders to prevent illegal activity while facilitating lawful travel and trade.
- Secure Cyberspace and Critical Infrastructure: Increased connectivity of people and devices to the Internet and to each other has created an ever-expanding attack surface that extends throughout the world and into almost every American home.
- Preserve and Uphold the Nation's Prosperity and Economic Security: America's prosperity and economic security are integral to DHS's homeland security operations, which affect international trade, national transportation systems, maritime activities and resources, and financial systems.
- Strengthen Preparedness and Resilience: Preparedness is a shared responsibility across federal, state, local, tribal, and territorial governments; the private sector; non-governmental organizations; and the American people.
- Champion the DHS Workforce and Strengthen the Department: Since the Department's formation, each Secretary has recognized the importance of strengthening the integrated relationships between and among Headquarters Offices and Operational Components to optimize the Department's efficiency and effectiveness.

Elevation data are used for National Special Security event planning and protection including line of sight analysis in urban areas, determining blast radius, and helicopter landing; border protection; disaster preparedness and response to flooding, wildfires, domestic search and rescue, and law enforcement; and critical infrastructure protection.

Elevation requirement vary depending on the Mission Critical Activity. For national security event protection and line of sight analysis, Quality Level 1 (QL1) HD is required annually. For border protection, QL1 inland topography and QL1B inland bathymetry is needed with an update frequency every 4-5 years. Disaster preparedness and response requires QL0 inland topography with an update frequency that varies based on location, QL1B inland bathymetry and QL2B nearshore bathymetry updated annually, and Order 1b updated every 2-3 years. QL2 inland topography updated annually is required for critical infrastructure protection.

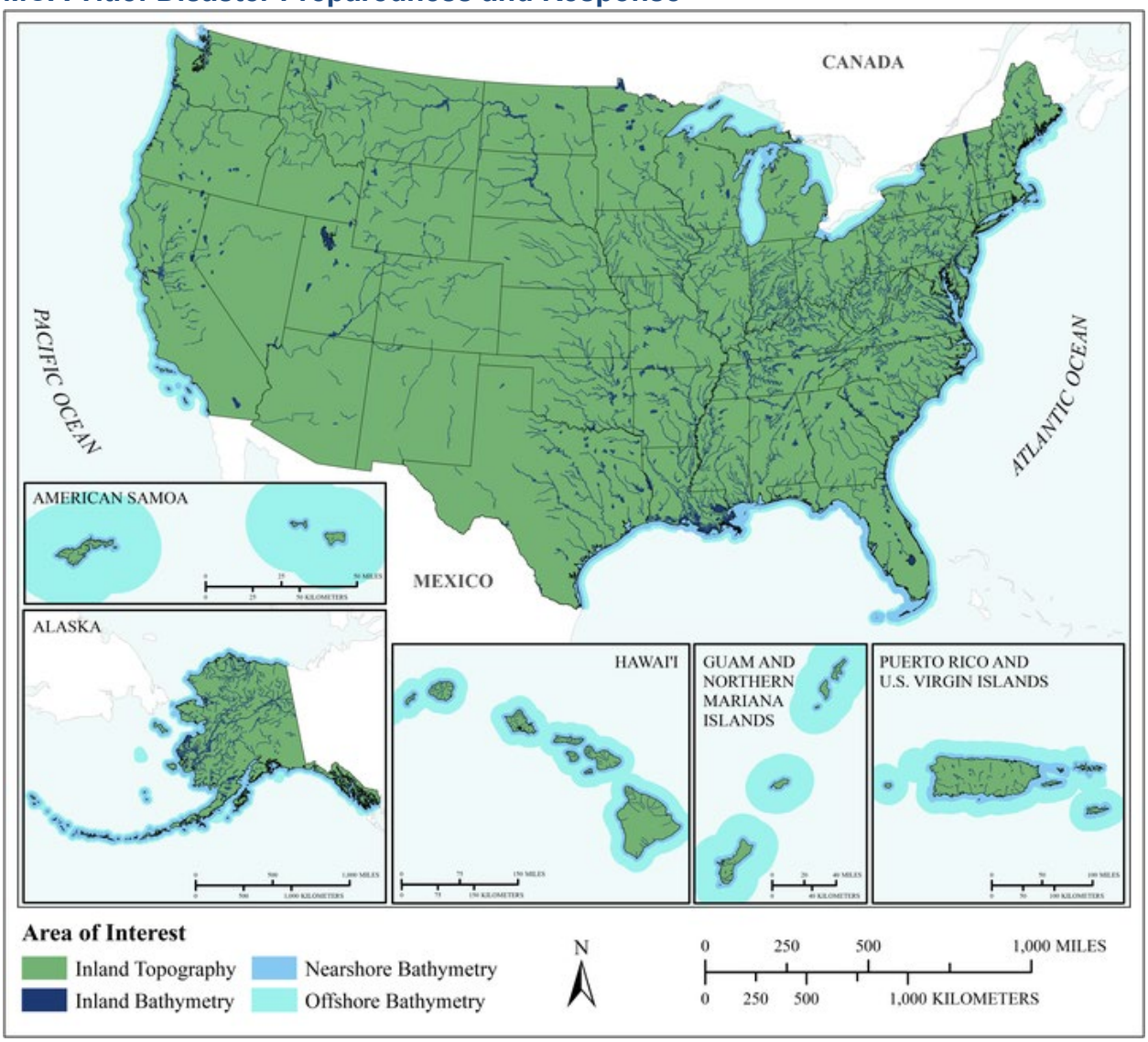
Benefits of having higher resolution elevation data include time savings for in-office project planning, increased program effectiveness, improved ability to carry out mission, improved decision making due to better data and modeling, and significant data acquisition cost savings.

DHS has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 18 – Homeland Security	DHS: Office of Intelligence and Analysis (OIA) and Science and Technology (S&T)	21673	Disaster Preparedness and Response	Inland Topo	QL0	(a) 2-3 years (b) Annually	$75,008,683	Unable to quantify	Moderate	I don't know	Major
				Inland Bathy	QL1B	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	Moderate
				Offshore Bathy	Order 1b	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	Minor
BU 18 – Homeland Security	DHS: U.S. Secret Service (USSS)	21675	National Special Security Event Protection	Inland Topo	QL1 HD	Annually	Unable to quantify	Unable to quantify	Major	I don't know	Major
BU 18 – Homeland Security	DHS: U.S. Customs and Border Protection (USCBP)	22435	Border Protection	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	None	None	None
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 28 – Telecom-munications	DHS: National Protection and Programs Directorate (NPPD)	22441	Critical Infrastructure Protection	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Disaster Preparedness and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Area split by varying quality level or update frequency	States and/or Territories	States and/or Territories	One or more national maritime boundaries
Sub Area Requirements	All study land	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	State waters, Territorial sea (12 nautical miles)

MCA Description	Response
Mission Critical Activity	DHS components on Disaster preparedness and response to flooding, wildfires, domestic search and rescue, border security and Law Enforcement. Additional Business Uses include the following: BU 02, 03, 10, 15 - 25, and 28-30.
MCA Title	Disaster Preparedness and Response
MCA ID	21673
Organization Type	Federal Agencies and Commissions
Organization Name	DHS: Office of Intelligence and Analysis (OIA) and Science and Technology (S&T)
Sub-Agency or Division	DHS GEOINT Collection Management
Organization Mission	I am the DHS GEOINT Collection Manager (CM) and DHS Department Requirement Officer (DRO). As a GEOINT CM, I write collection requirements for any DHS component or office that does not have a GEOINT CM (FEMA, USSS, ICE, NPPD, DNDO...). As a DRO, I adjudicate DHS national GEOINT requirements with commercial satellite and NTM platforms for all DHS components and offices.
Program Name	Homeland Security
Total Annual Program Budget	$40,600,000,000
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Building footprints, under water obstructions, roads, ground cover types

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL1B	QL2B	Order 1b
Update Frequency	(a) 2-3 years (b) Annually and certain events.	Annually	Annually	2-3 years
Event type(s)	A crisis or National Special Security Event.			
Quality Level and/or update frequency variability across AOI	My quality level starts at a baseline of every 2 years at QL0 for all US and territories (where ever might have a disaster) and annually for border areas (both land and sea) with event driven requirements during crisis and National Special Security Events Canada and Mexico borders and U.S. coast need annual update			
Acceptable Horizontal Error	Up to 30 cm	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 1 meter
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Up to 40 cm	Less than 1 meter
How far onshore needed			500 meters inland	
How far down the beach profile needed	To MLLW		Below MLLW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs	Partial	Partial		

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement	Vertical accuracy and longitudinal sampling density need to be near 25cm for a base line to assess vulnerable levees, to create line of sight for security (anti-sniper) and subsidence analysis	USCG missions for waterway management, security, crisis response and crew safety Full bottom coverage is better, cross sections every meter if not available		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Required	Required	Required
Classified point cloud	Highly desirable	Required	Required	
Edited/cube XYZ		Highly desirable	Required	Required
Full waveform	Nice to have	Required	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Required	Required	Required
Breaklines required for standard hydro-flattening	Highly desirable	Required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Required	Required
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Required	Required
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Highly desirable	Required
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	Required
Water column properties - Physical			Required	Required
Water column properties - Chemical			Required	Required
Water column properties - Biological			Required	Required
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Required	Required
Habitat distribution and classification			Required	Required
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Required	Required
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Required	Highly desirable	Highly desirable
Wetlands	Nice to have	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Highly desirable	
Cultural resources	Required	Required	Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LAS, DEM, and DTM's	USCG and FEMA use it for disaster and mission requirements, I don't know what they use right now	Unknown, data used by US Coast Guard, CBP, ICE for various missions	Unknown
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts			Yes	Yes
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	FEMA regions have accessed State holdings to support their disaster preparation modeling			
Other	Yes			Yes
Other description	NGA GRID			Unknown
Data that meet my needs are not available				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	Minor
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Major	Minor	Minor	Minor
Increased revenues	None	I don't know	None	None
Mission-driven performance improvements	Major	I don't know	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	I don't know	I don't know
Improved response or timeliness	Major	I don't know	I don't know	I don't know
Improved customer experience	Major	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	I don't know	I don't know	I don't know
Environmental	Minor	I don't know	I don't know	I don't know
Public safety, including life and property	Major	I don't know	Minor	Minor

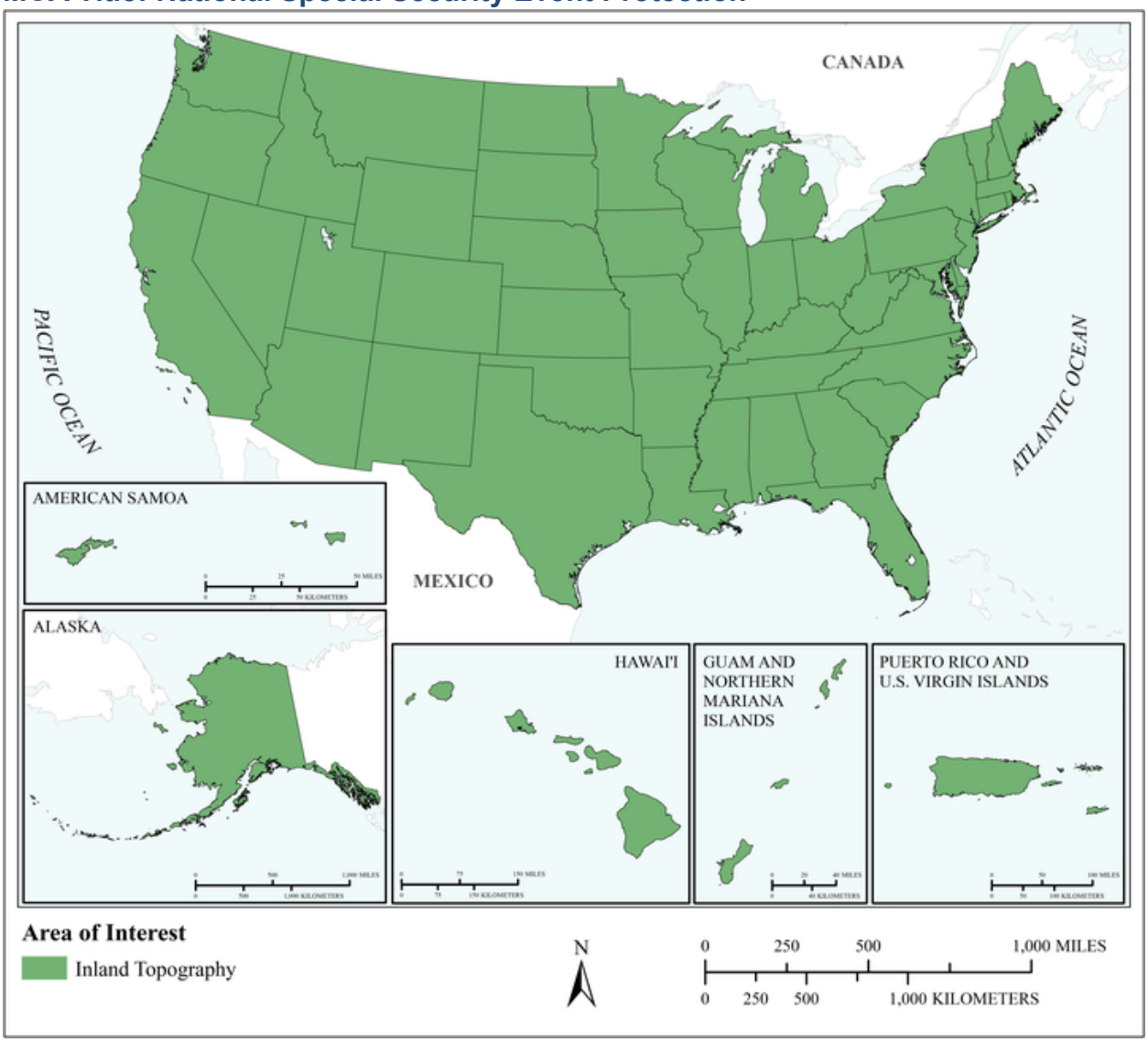
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$8,683	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Time savings description	Multiple DHS Components and offices have internal GIS and Modeling capabilities, saving thousands of man hours. Levee status during/after a flood event, ability to focus law enforcement in areas that show subsidence from possible tunneling, beach erosion, monitor seawalls, groins, jetties and other shoreline stabilization structures for damage after disaster. Approximately 24 man-hours per disaster (depending on the disaster) x 12 disasters/year (avg 6 named hurricanes plus others).											
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Annual percent improvement	12%	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements description	15% improvement to mission effectiveness is based on clearer information. Better and faster data to decision makers equals faster and better thought through decisions. The integration of more detailed and accurate data will improve.											
Other operational benefits	Major	Annual dollars saved/realized	$75,000,000									
Other operational benefits description	Figuring disasters, border studies, critical infrastructure studies, security needs. Data acquisition costs saved or reduced.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Value added to products or services description	Same as listed, and search and rescue, security mission planning, anti-sniper... With new, higher resolution, new products would be created to best use the data.											
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Improved response or timeliness description	Faster access to impacted areas, faster response and recovery operations, improved evacuation plans, all means millions of dollars saved and life and property secured.									I need to be able to answer to all DHS Components that ask for assistance, and this would be a great improvement over my current capability.		
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know			I don't know			I don't know		
Environmental	I don't know			I don't know			I don't know			I don't know		
Public safety, including life and property	Major			I don't know			Moderate			Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property description	The more accurate we can create accurate models for law enforcement, or disaster response, or search and recovery, the less it costs in lives or property. It would help planning for National Special Security Events (Super Bowl, Indy 500, Boston Marathon..) for public safety, ingress/egress planning			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps	Yes	Yes	Yes	Yes
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes	Yes	Yes
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	Yes
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	Yes
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	Yes
Building footprints	Yes	Yes	Yes	Yes
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: National Special Security Event Protection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	States and/or Territories			
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau			

MCA Description	Response
Mission Critical Activity	National Special Security Event planning and protection. Line of Sight analysis in urban areas. Blast radius. Helicopter landing.
MCA Title	National Special Security Event Protection
MCA ID	21675
Organization Type	Federal Agencies and Commissions
Organization Name	DHS: U.S. Secret Service (USSS)
Sub-Agency or Division	Investigations (INV)/Forensic Services Division (FSD)/Magnetometer Operations Branch (MOB)
Organization Mission	The Secret Service is recognized for the physical protection it provides to the nation's highest elected leaders, visiting foreign dignitaries, facilities and major events. Today the agency's investigative mission has evolved from enforcing counterfeiting laws to safeguarding the payment and financial systems of the United States from a wide range of financial and computer-based crimes.
Program Name	Dignitary Protection Division Presidential Protective Division In May of 1998, President Clinton issued Presidential Decision Directive 62 (PDD-62). In effect, this directive formalized and delineated the roles and responsibilities of federal agencies in the development of security plans for major events. The clarifying of responsibilities serves to focus more clearly the role of each agency and eliminate the duplication of efforts and resources. In 2000, the Presidential Protection Act of 2000 became public law. Included in the bill, signed on December 19, was an amendment to Title 18, USC § 3056 which codified PDD-62. Now, with the support of federal law, the Secret Service is authorized to participate "in the planning, coordination and implementation of security operations at special events of national significance." When an event is designated by the Secretary of Homeland Security as a National Special Security Event (NSSE), the Secret Service assumes its mandated role as the lead agency for the design and implementation of the operational security plan. The Secret Service has developed a core strategy to carry out its security operations, which relies heavily on its established partnerships with law enforcement and public safety officials at the local, state and federal levels. The goal of the cooperating agencies is to provide a safe and secure environment for Secret Service protectees, other dignitaries, the event participants and the general public.
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 23 - Urban and Regional Planning
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

What Needs to be Measured in 3D	Response
Other	Required
Other description	Underwater structures that protrude above water

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Curb, road line

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Required			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR - 50cm Aerial imagery, Bucky			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Military/Gov't Army Geospatial Center			
Data that meet my needs are not available				

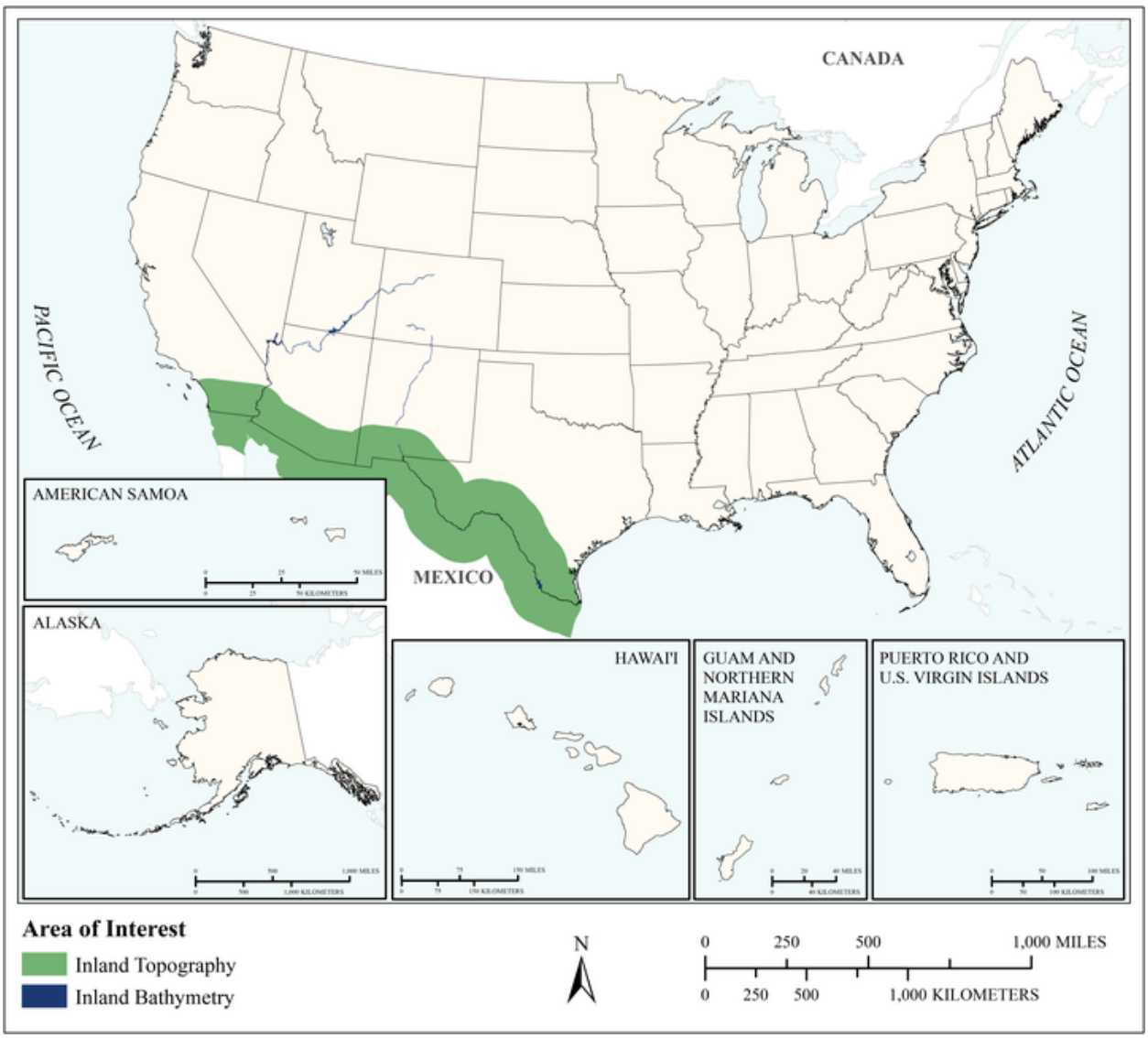
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	Moderate			
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Other operational benefits	Major	Unable to provide										
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	I don't know											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Border Protection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Nice to have		
Geographic Area Requirements	Custom description	Custom description		
Sub Area Requirements	100 miles on either side along the Mexican border	Rio Grande and Colorado Rivers		

MCA Description	Response
Mission Critical Activity	Situational awareness - awareness of the terrain and how it may affect flow, travel time on foot. Technology's relationship to the terrain in any given area - viewsheds, line of sight to provide situational awareness.
MCA Title	Border Protection
MCA ID	22435
Organization Type	Federal Agencies and Commissions
Organization Name	DHS: U.S. Customs and Border Protection (USCBP)
Sub-Agency or Division	US Border Patrol
Organization Mission	The priority mission of the Border Patrol is preventing terrorists and terrorist weapons, including weapons of mass destruction, from entering the United States. Undaunted by scorching desert heat or freezing northern winters, they work tirelessly as vigilant protectors of our Nation's borders.
Program Name	Enterprise Geospatial Information Services
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	200,000 sq mi - 2 million sq mi (e.g. large state, large multi-state region such as the Great Basin, standard Federal region, etc.)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Viewshed of camera within certain range - for example 3 - 5 miles.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Not required
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required

Inland Bathy Feature Size Requirements	Response
Other	Nice to have
Other description	Rio Grande and Colorado River channels
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Nice to have		
DTM	Highly desirable	Nice to have		
DEM	Highly desirable	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Not required	Not required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required		
Ground control/ground truthing	Not required	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Nice to have	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Not required	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Nice to have		
Bridges/culverts	Not required	Not required		
Landmark features	Nice to have	Nice to have		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	5m Intermap dataset and 1m dataset along TX from IWBC	None		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	ESRI's elevation service			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	Inland bathy data not available		
Cost savings/cost reduction	I don't know	Inland bathy data not available		

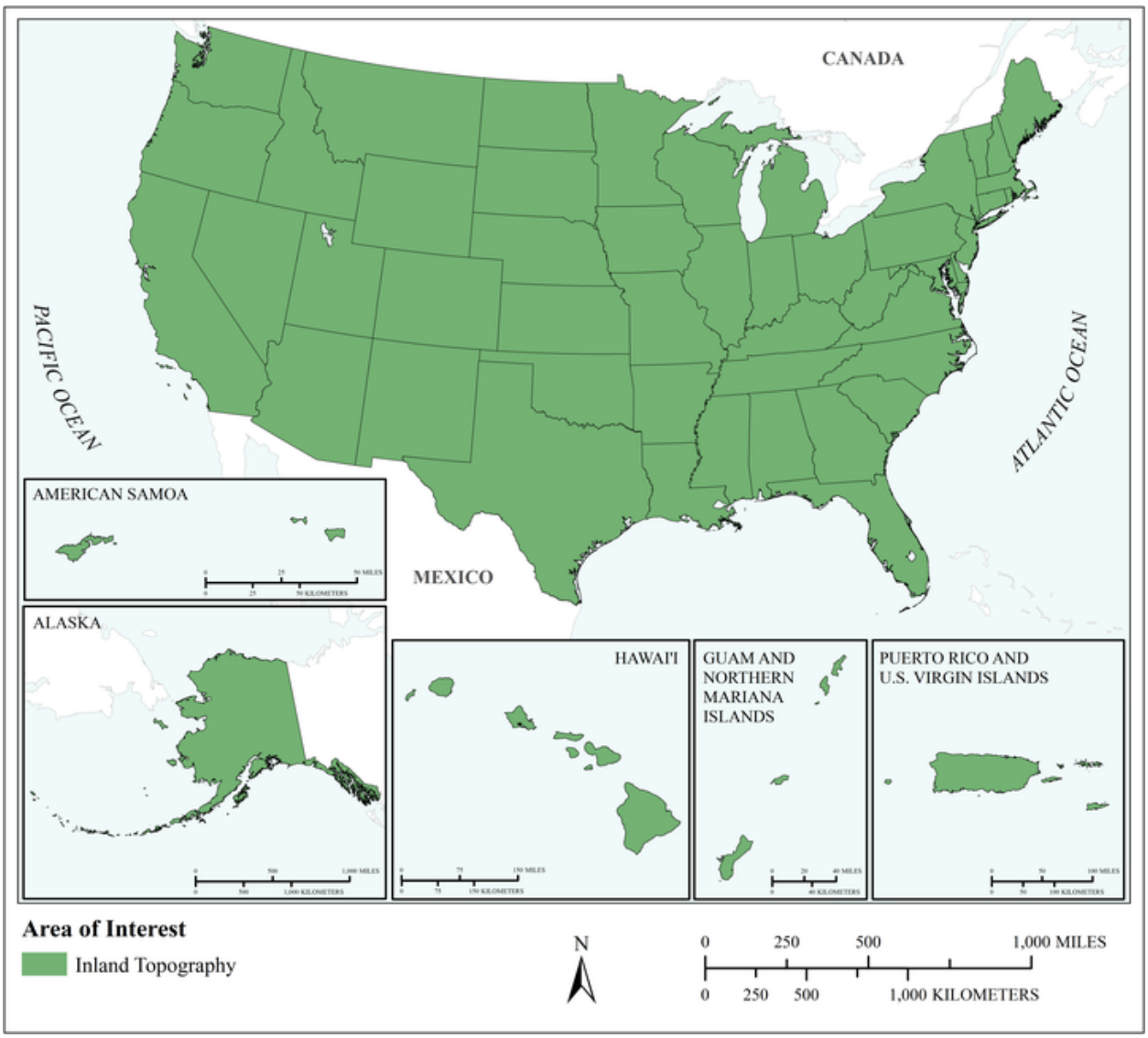
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	I don't know	Inland bathy data not available		
Increased revenues	I don't know	Inland bathy data not available		
Mission-driven performance improvements	I don't know	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	Inland bathy data not available		
Improved response or timeliness	I don't know	Inland bathy data not available		
Improved customer experience	I don't know	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Inland bathy data not available		
Environmental	I don't know	Inland bathy data not available		
Public safety, including life and property	I don't know	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide							
Time savings description	Streamline reasons for site visit (for infrastructure). Not sure how many data errors we have in our current data. Better models. We currently do this intermittently. Fewer site visits. Streamline of site visits and asset placement.											
Cost savings/cost reduction	Minor	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction description	N/a. Not sure we spend an incredible amount on this currently.											
Cost avoidance	Minor	Unable to provide		I don't know	Unable to provide							
Cost avoidance description	Minimal. Currently minimal. We do this minimally.											
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements description	For site visits and asset placement.											
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Time and money savings from not having to conduct site visits, more accurate site awareness.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			None								
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness description	Faster emergency response or response to illicit activity is possible. Potential faster recovery - this doesn't happen often & not sure how it applies to us.											
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide							
Improved customer experience description	Users will like accurate data. New tools and apps can be built. Not sure.											
Other customer service benefits	Moderate	Unable to provide										
Other customer service benefits description	Situational and terrain awareness at their fingertips.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			I don't know								
Environmental	None			I don't know								
Public safety, including life and property	None			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Critical Infrastructure Protection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	States and/or Territories			
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau			

MCA Description	Response
Mission Critical Activity	Critical infrastructure protection to include dam failure modeling, likelihood of electric power outages, and inland flooding.
MCA Title	Critical Infrastructure Protection
MCA ID	22441
Organization Type	Federal Agencies and Commissions
Organization Name	DHS: National Protection and Programs Directorate (NPPD)
Sub-Agency or Division	National Risk Management Center
Organization Mission	1. Identify, assess, and prioritize risks to national critical functions 2. Collaborate on the development of risk management strategies and approaches to manage risks to national critical functions 3. Coordinate integrated cross-sector risk management activities
Program Name	National Protection and Programs Directorate (NPPD)
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Buildings

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know			
Acceptable Vertical Error	I don't know			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Nice to have			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Not required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	I don't know			
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	I don't know			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

Defense Installations Spatial Data Infrastructure (DISDI)

The Defense Installation Spatial Data Infrastructure (DISDI) Program provides policy, guidance, and oversight of DoD's installation geospatial information and services programs (IGI&S). IGI&S is used to better manage the installations and bases for the U.S. Army, Navy, Air Force and Marine Corps across the globe. The DISDI Program develops Department-wide standards for data, metadata, and data quality as well as implementation guidance for each. Another capability of DISDI is to provide geospatial analysis and maps pertaining to DoD installations, using a select set of geospatial data collected annually from the military departments. DISDI routinely supports requests for such services from all parts of the Office of the Secretary of Defense (OSD) and shares their curated installation data within DoD as well as with other federal, state, and local agencies to the extent allowed by law or DoD policy. DISDI data and products routinely support priority missions such as real property accountability, force protection, environmental management, climate change resiliency planning, encroachment prevention, homeland defense, and emergency response.

Elevation data are used to support planning, homeland defense, and for oversight of the DoD Components (Army, Navy, Air Force, Marine Corps, Washington Headquarters Service, Defense Logistics Agency, etc.). DISDI's primary Mission Critical Activity interests are currently Coastal Hazard Mitigation and Flood Risk Management. Elevation data are needed to improve flood management and inundation, evaluate sea level rise impacts, and for climate change predictions. There is considerably less need for inland bathymetry, but NHD data get considerable use. DISDI also promulgates standards development and provides processing of data provided by the DoD branches.

DISDI requires Quality Level 1 (QL1) inland topography, QL1B inland bathymetry, and QL2B nearshore bathymetry for DoD planning, homeland defense, and oversight. Infrastructure and construction management requires QL0 inland topography and QL0B inland bathymetry. Urban and regional planning needs QL2 inland topography. Elevation data are needed across all DoD installations updated every 4-5 years.

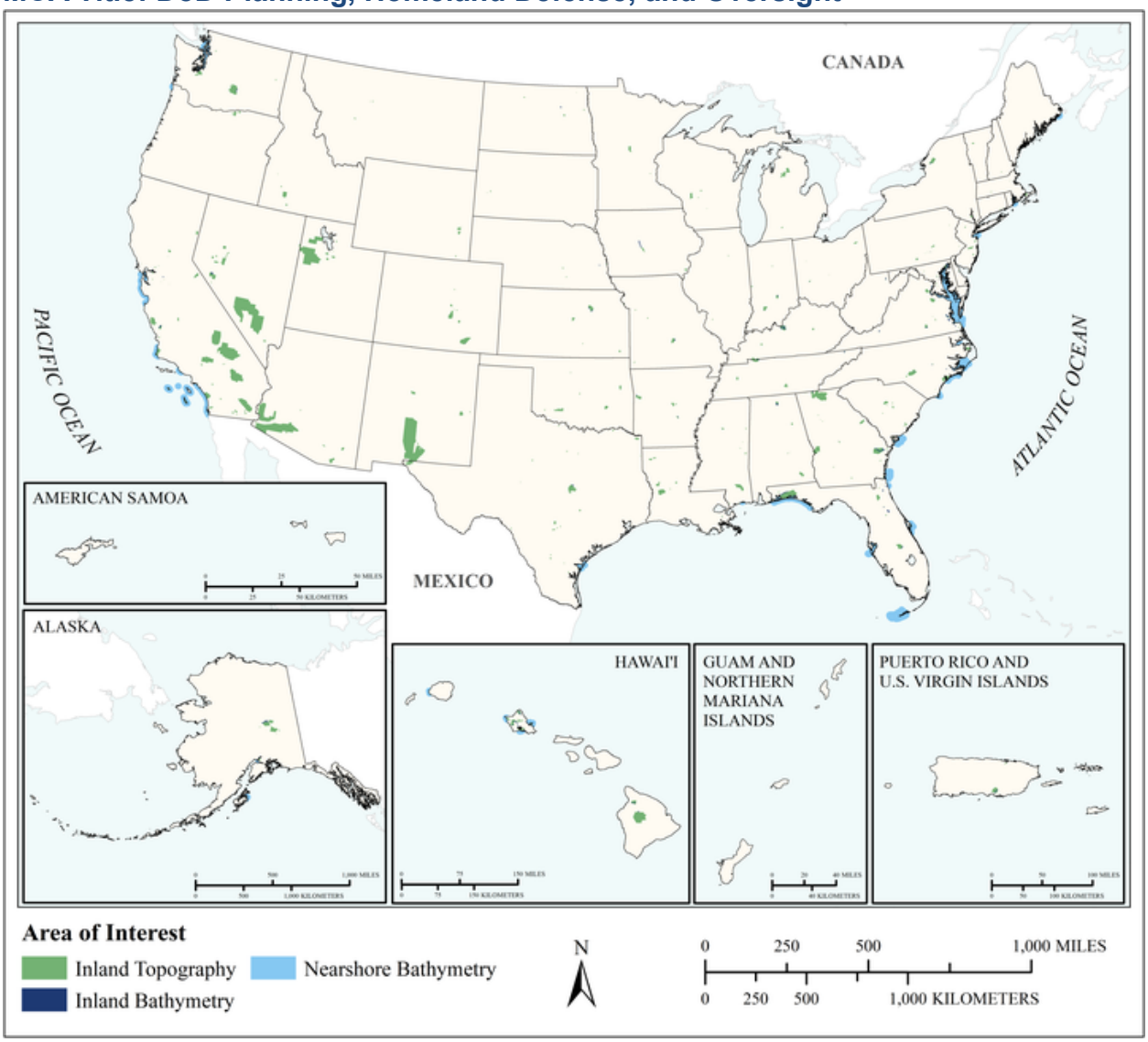
DISDI would experience moderate to major future benefits from improved elevation data. Benefits include mission-driven performance improvements such as increased program effectiveness, improved ability to carry out mission, and improved decision making. DISDI would also see improved accuracy of products or services and installation planning. All branches of DoD would benefit from DISDI's improved ability to conduct assessments.

DISDI has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 15 – Flood Risk Management	DoD: Defense Installations Spatial Data Infrastructure (DISDI)	21692	DoD Planning, Homeland Defense, and Oversight	Inland Topo	QL1	4-5 years	$4,256,323	$352,540	I don't know	I don't know	I don't know
				Inland Bathy	QL1B	4-5 years	$272,551	$151,756	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Major	Moderate	Major
BU 22 – Infrastructure Management	DoD: Defense Installations Spatial Data Infrastructure (DISDI)	60649	Infrastructure and Construction Management	Inland Topo	QL0	4-5 years	$1,370,130	$878,355	Minor	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$373,670	$23,351	Minor	Minor	Moderate
BU 23 – Urban and Regional Planning	DoD: Defense Installations Spatial Data Infrastructure (DISDI)	60650	Urban and Regional Planning	Inland Topo	QL2	4-5 years	$9,292,037	$660,166	Moderate	Major	Major
BU 29 – Military	DoD: Defense Installations Spatial Data Infrastructure (DISDI)	60651	Military	Inland Topo	QL2	2-3 years	$103,010	Unable to quantify	Major	Major	Major

MCA Title: DoD Planning, Homeland Defense, and Oversight



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Nice to have	Required	
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Federal Review AOIs	
Sub Area Requirements	DoD	DoD	Nearshore waters off DoD installations	

MCA Description	Response
Mission Critical Activity	DISDI is at the very top level of DoD and does not directly perform operational missions. However, it supports planning, homeland defense, and oversight of the DoD Components (Army, Navy, Air Force, Marine Corps, Washington Headquarters Service, Defense Logistics Agency, etc.). Regarding 3D elevation data, our primary mission critical activity interests right now are Coastal Hazard Mitigation, and Flood Risk Management. Elevation data are needed to improve flood management and inundation, evaluate sea level rise impacts, and for climate change predictions. There is considerably less need for inland bathymetry, but NHD data get considerable use. DISDI also promulgates standards development and provides processing of data provided by the DoD branches.
MCA Title	DoD Planning, Homeland Defense, and Oversight
MCA ID	21692
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Defense Installations Spatial Data Infrastructure (DISDI)
Sub-Agency or Division	Office of Assistant Secretary of Defense for Energy, Installations, and Environment
Organization Mission	Policy, Guidance and Oversight of installation management, military construction, environmental resource management, operational and installation energy, and real property
Program Name	DISDI Program
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Earth surface, buildings, structures

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL2B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		1000 ft spacing		

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Highly desirable		Not required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Required		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Not required	Highly desirable	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Not required	Highly desirable	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	
Full waveform	Not required	Not required	Nice to have	
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Not required	Not required	Nice to have	
Ground control/ground truthing	Not required	Not required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required	Not required	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Highly desirable	Required	
Bridges/culverts	Nice to have	Not required		
Landmark features	Not required	Not required	Nice to have	
Cultural resources	Not required	Not required	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	This varies widely between the Military Departments. Most current LiDAR data is of only medium to low resolution, although several broad acquisition efforts are underway to collect hi resolution LiDAR over the next several years. USAF is actively collecting lidar.	None		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

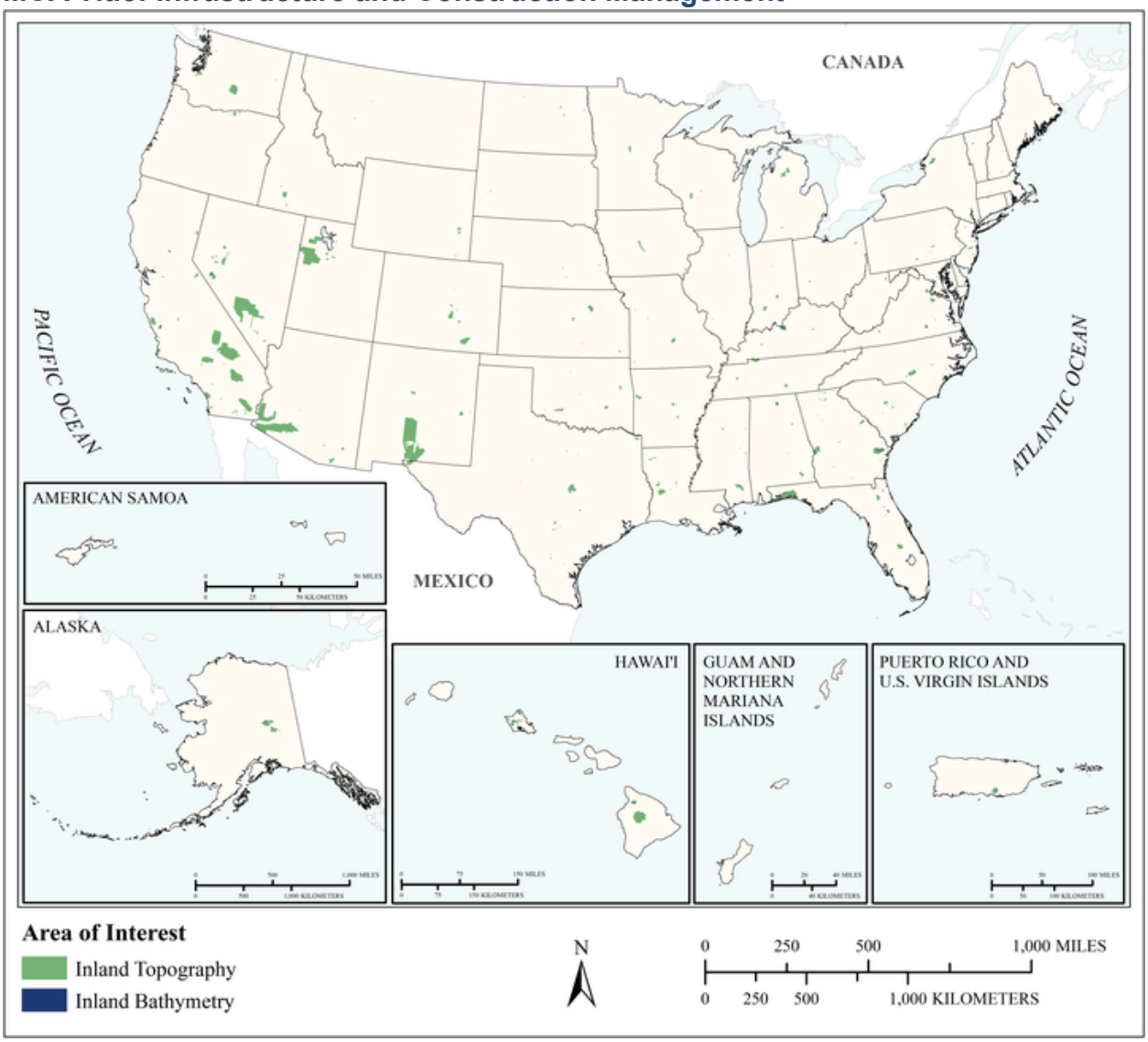
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	This varies by Military Department. There are DoD installations in all 50 states; I believe the installation staffs seek out any available state repositories for each installation			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available	Minor	
Cost savings/cost reduction	I don't know	Inland bathy data not available	Minor	
Cost avoidance	Major	Inland bathy data not available	Minor	
Increased revenues	None	Inland bathy data not available	None	
Mission-driven performance improvements	Moderate	Inland bathy data not available	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Inland bathy data not available	Minor	
Improved response or timeliness	I don't know	Inland bathy data not available	Minor	
Improved customer experience	I don't know	Inland bathy data not available	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Inland bathy data not available	Minor	
Environmental	Moderate	Inland bathy data not available	Moderate	
Public safety, including life and property	Major	Inland bathy data not available	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide				
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements description	Department wide assessments and planning would be improved by access to applicable elevation data.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$4,256,323		Annual dollars saved/ realized	$272,551						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Value added to products or services description	All branches of DoD would benefit from DISDI's improved ability to conduct assessments. Installation planning would also be improved.											
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$352,540		Annual dollars saved/ realized	$151,756						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			Major					
Environmental	I don't know			I don't know			Moderate					
Public safety, including life and property	I don't know			I don't know			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes		Yes	
Height-Above-Ground maps			Yes	
Viewshed maps	Yes			
Hydrologic Flow Direction Grids			Yes	
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs		
Sub Area Requirements	DoD installations	DoD installations		

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60649
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Defense Installations Spatial Data Infrastructure (DISDI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Nice to have		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Moderate		
Cost avoidance	Major	Moderate		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate		

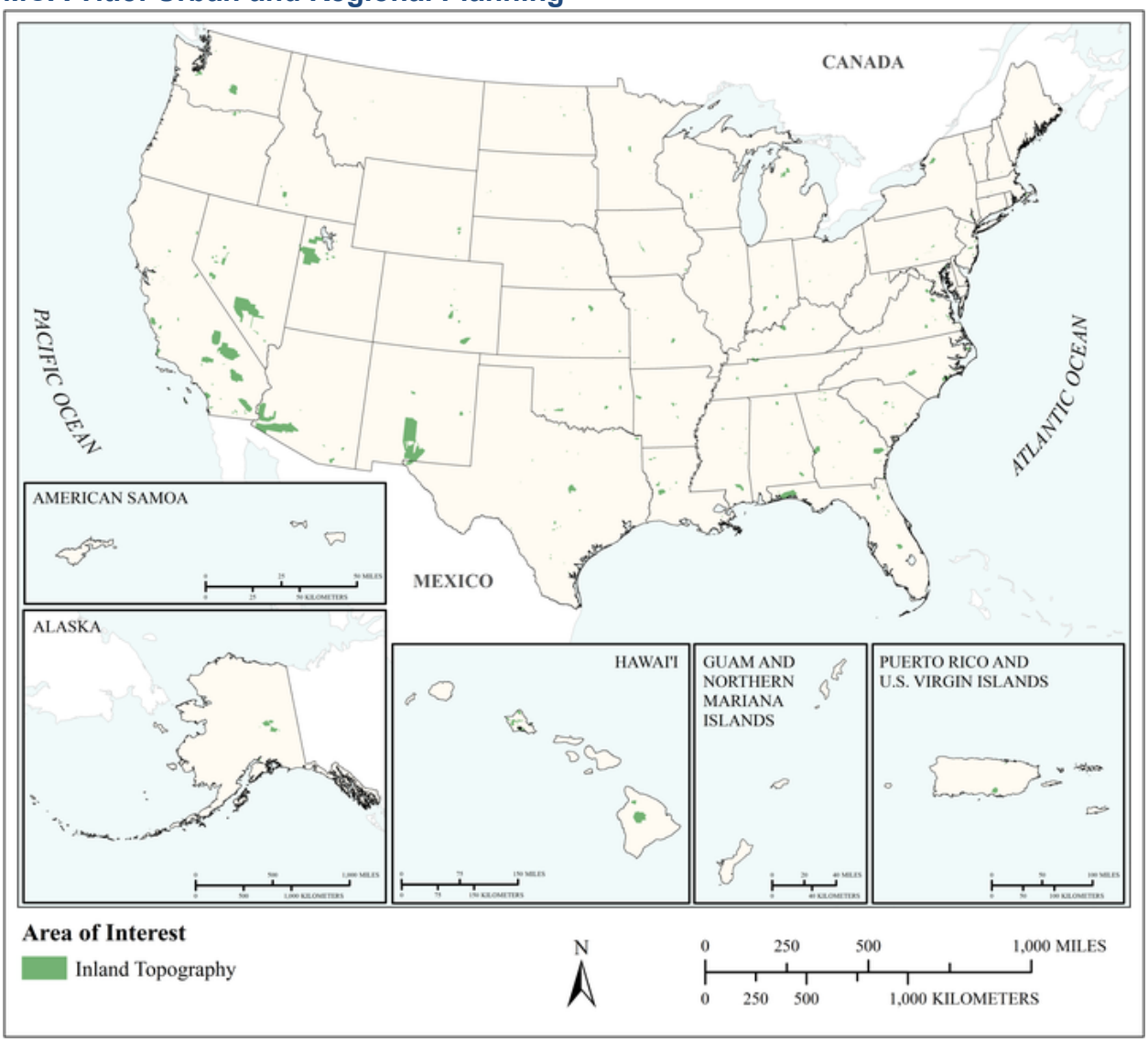
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Moderate		
Improved customer experience	Moderate	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Moderate	Minor		
Public safety, including life and property	Moderate	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,370,130		Annual dollars saved/ realized	$373,670						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Major	Unable to provide		Minor	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$878,355		Annual dollars saved/ realized	$23,351						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor								
Environmental	Moderate			Minor								
Public safety, including life and property	Major			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federal Review AOIs			
Sub Area Requirements	DoD installations			

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60650
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Defense Installations Spatial Data Infrastructure (DISDI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Required			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

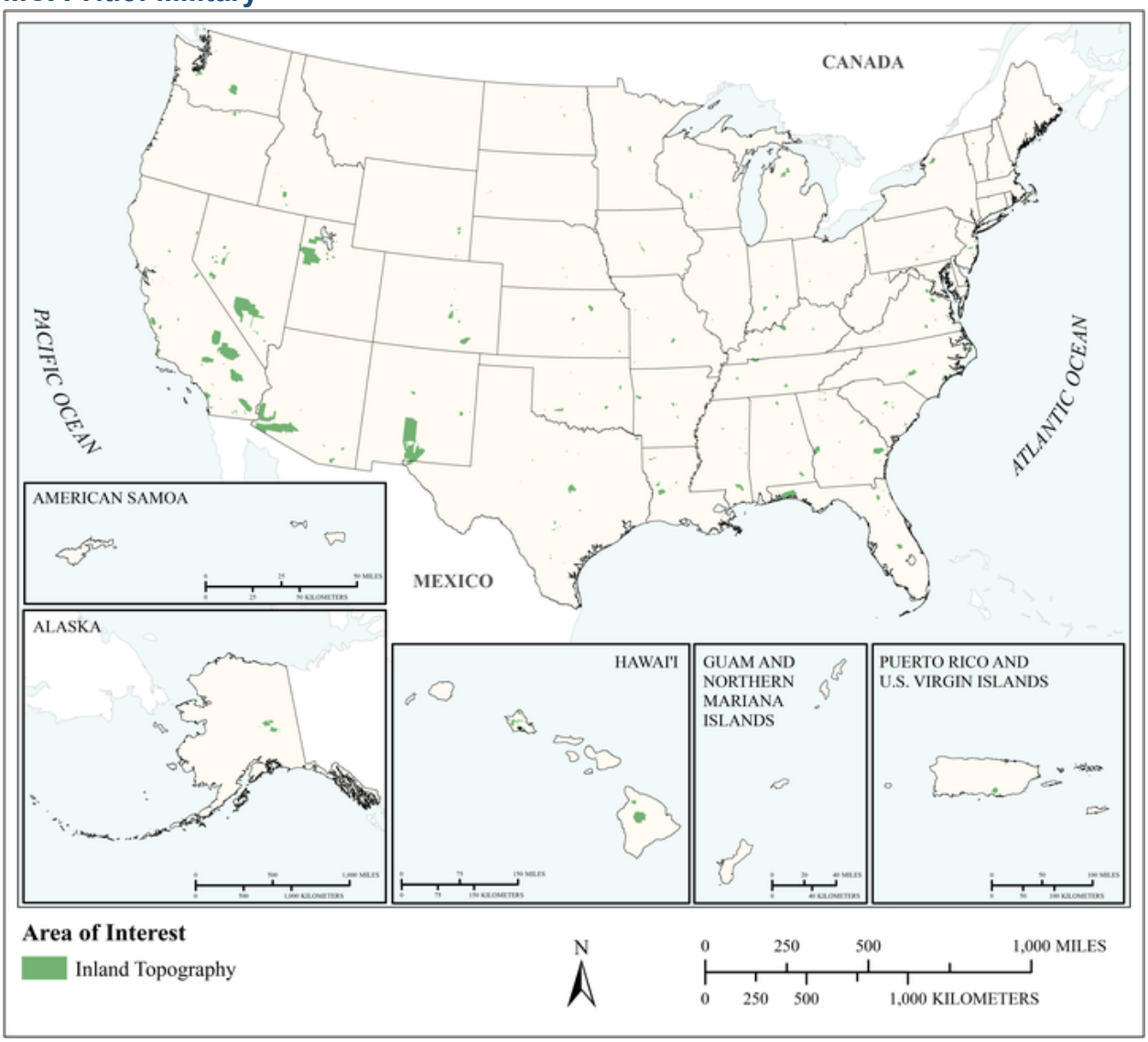
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$9,292,037									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$660,166									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Military



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federal Review AOIs			
Sub Area Requirements	DoD installations			

MCA Description	Response
Mission Critical Activity	Tactical military operations. Strategic defense. Amphibious landings and logistics over-the-shore. Operation of ships and submarines. Weapons system testing. Management of flight facilities and offshore launch or target areas.
MCA Title	Military
MCA ID	60651
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Defense Installations Spatial Data Infrastructure (DISDI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 29 - Military
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI	Yes			
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$103,010									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

Defense Threat Reduction Agency (DTRA)

DTRA enables the DoD and the U.S. Government to prepare for and combat weapons of mass destruction and improvised threats and to ensure nuclear deterrence.

DTRA is a Combat Support Agency and a Defense Agency with a three-pronged mission to:

> **1. counter the threats posed by the full spectrum of weapons of mass destruction (WMD), including chemical, biological, radiological, nuclear, and high-yield explosives;**
>
> **2. counter the threats posed by the growing, evolving categories of improvised threats, including improvised explosive devices, car bombs and weaponized consumer drones, as well as the tactics, technologies and networks that put them on the battlefield; and**
>
> **3. ensure the U.S. military maintains a safe, secure, effective, and credible nuclear weapons deterrent.**

DTRA provides 24/7 Chemical, Biological, Radiological, Nuclear, and high Explosives (CBRNE) Subject Matter Expertise and Decision Support Capability for planning, operations, and post-event analysis to: Combatant Commands (CCMDs) and partnered nations, Office of the Secretary of Defense (OSD), Joint Staff (JS), Intelligence Community (IC), Command elements, and other U.S. Government agencies and first responders.

DTRA currently uses Digital Terrain Elevation Data 2 (DTED2) provided lidar, augmented with publicly available data from USGS, NOAA, and other sources.

DTRA requires nationwide Quality Level 2 (QL2) topographic data updated every 2-3 years, QL3B inland and nearshore bathymetry updated every 4-5 years, and offshore bathymetry at an unknown Quality Level updated every 4-5 years for its Protection of Critical Infrastructure, Public Health and Safety, and Force Protection Mission Critical Activity. For DTRA's National Defense Mission Critical Activity, best-available cross sections and transects should be updated every 4-5 years for inland topography and bathymetry.

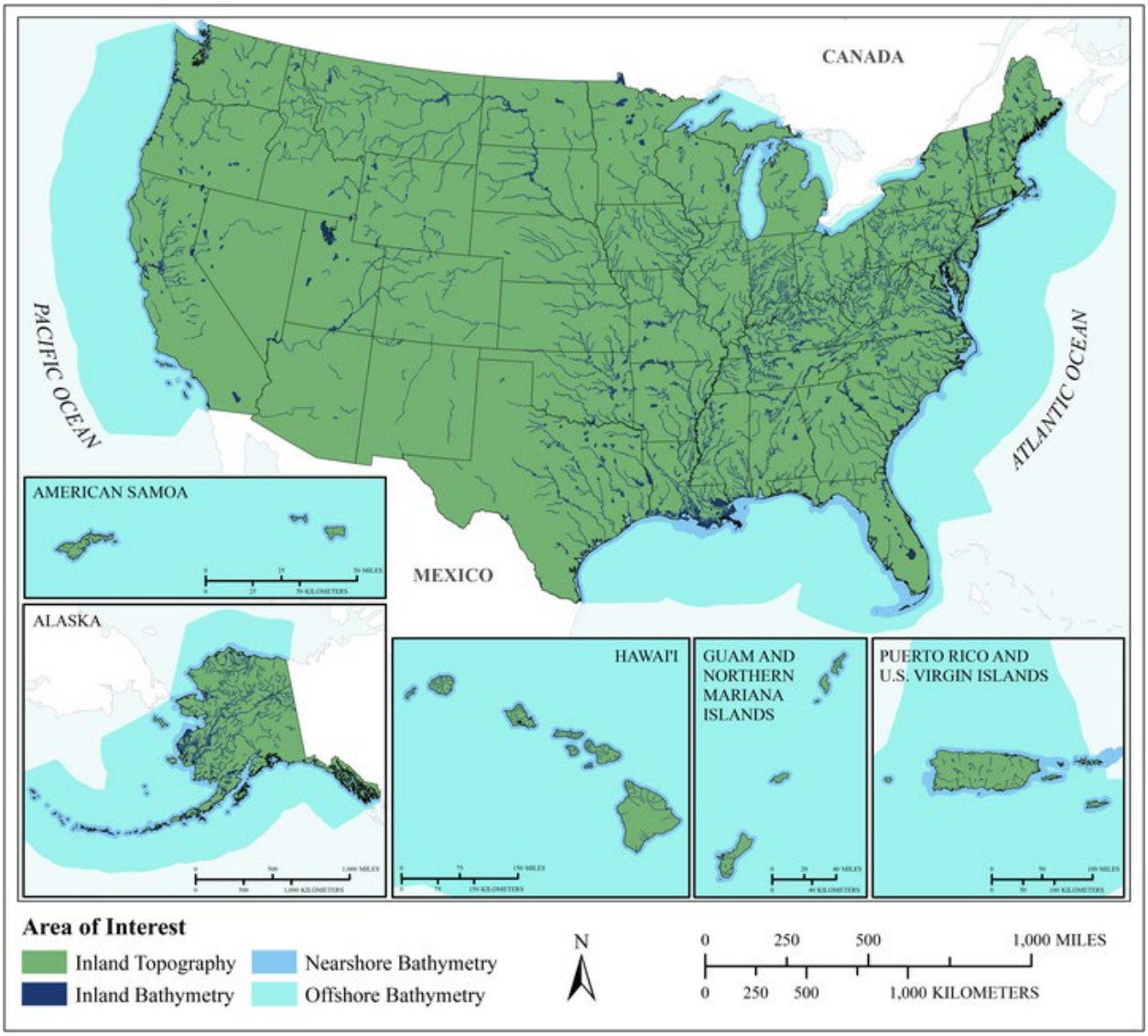
Current elevation data provide major to moderate operational, customer service, and societal benefits. Future annual benefits of having more accurate or current data for Protection of Critical Infrastructure, Public Health and Safety, and Force Protection are largely major providing cost savings and increased program effectiveness. Future annual benefits of having more accurate or current topographic elevation data for National Defense are moderate. Benefits include faster response and recovery after events and improved projections.

DTRA has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 18 – Homeland Security	DoD: Defense Threat Reduction Agency (DTRA)	21580	Protection of Critical Infrastructure, Public Health and Safety, and Force Protection	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	None	Moderate	Major
				Inland Bathy	QL3B	4-5 years	Unable to quantify	Unable to quantify	None	I don't know	Major
				Nearshore Bathy	QL3B	4-5 years	Unable to quantify	Unable to quantify	None	I don't know	Major
				Offshore Bathy	I don't know	4-5 years	Unable to quantify	Unable to quantify	None	I don't know	Major
BU 18 – Homeland Security	DoD: Defense Threat Reduction Agency (DTRA)	21644	National Defense	Inland Topo	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Protection of Critical Infrastructure, Public Health and Safety, and Force Protection



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable	Highly desirable	Nice to have
Geographic Area Requirements	States and/or Territories	States and/or Territories	All study waters	All study waters
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		

MCA Description	Response
Mission Critical Activity	Protect critical infrastructure. Mission Assurance. Force protection. Major event planning. Elevation data are needed for airborne contaminant and explosives modeling and analysis. Bathymetry is needed for underwater explosives and how blasts reflect, etc. Bottom composition (rock, sand, etc.) as well as shape are important. Elevation data are also needed for the following: Health emergency response. Habitat modeling and disease prevention. Defining boundaries for health advisories for swimming and fishing. Marine-based bioproducts and pharmaceuticals. Public health and safety. Prevention of waterborne diseases. To counter the threats posed by the full spectrum of weapons of mass destruction (WMD), including chemical, biological, radiological, nuclear, and high-yield explosives. To counter the threats posed by the growing, evolving categories of improvised threats, including improvised explosive devices, car bombs and weaponized consumer drones, as well as the tactics, technologies and networks that put them on the battlefield. To ensure the U.S. military maintains a safe, secure, effective and credible nuclear weapons deterrent. Elevation data are most critically needed near U.S. bases, major cities, and major ports.
MCA Title	Protection of Critical Infrastructure, Public Health and Safety, and Force Protection
MCA ID	21580
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Defense Threat Reduction Agency (DTRA)
Sub-Agency or Division	RD-ISR (Technical Reachback)
Organization Mission	The Defense Threat Reduction Agency enables the DoD and the U.S. Government to prepare for and combat weapons of mass destruction and improvised threats and to ensure nuclear deterrence.
Program Name	Technical Reachback
Total Annual Program Budget	$11,000,000
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 29 - Military
Tertiary Business Use	BU 24 - Health and Human Services

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Worldwide
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)

General Geographic Area and Size	
Description of smallest 3D features	Surface shape in general, building heights

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL3B	QL3B	I don't know
Update Frequency	2-3 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 5 meters	Up to 5 meters	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	Up to 10 cm	Up to 1 meter	Up to 1 meter	I don't know
How far onshore needed			To the fall line	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Nice to have	Highly desirable
DTM	Required	Required	Required	Highly desirable
DEM	Required	Required	Required	Highly desirable
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Nice to have	Nice to have	Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Nice to have
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Not required	Nice to have
Bottom type			Not required	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Not required	Not required
Geologic and seismic data	Required	Highly desirable	Nice to have	Nice to have
Water column properties - Physical			Not required	Nice to have
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Not required
Boundaries			Nice to have	Nice to have
Routes			Not required	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Required	
Land use/land cover	Required	Highly desirable	Nice to have	Highly desirable
Wetlands	Nice to have	Nice to have	Not required	Nice to have
Estuaries			Not required	Not required
Inland surface water features	Required	Highly desirable	Required	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Not required	Not required	
Coastal and riverine structures	Highly desirable	Nice to have	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	DTED2	Best available	Best available	Best available
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI	Yes			
Open Topography	Yes			
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	DTED2			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	I don't know	I don't know
Cost savings/cost reduction	Moderate	I don't know	I don't know	I don't know

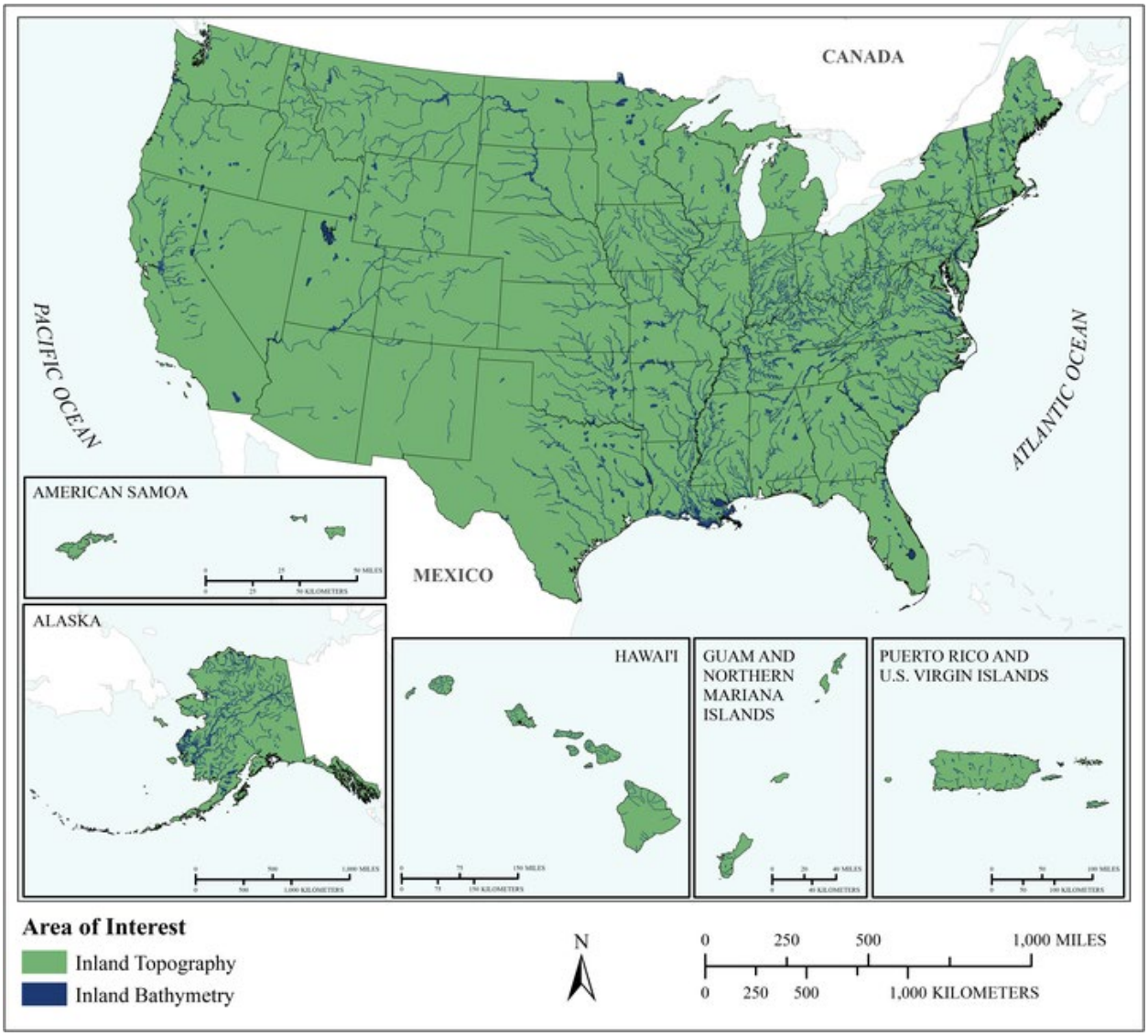
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Moderate	I don't know	I don't know	I don't know
Increased revenues	Moderate	I don't know	I don't know	I don't know
Mission-driven performance improvements	Major	I don't know	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	I don't know	I don't know
Improved response or timeliness	Major	I don't know	I don't know	I don't know
Improved customer experience	Major	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	I don't know	None
Environmental	Major	I don't know	I don't know	I don't know
Public safety, including life and property	Major	I don't know	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Increased revenues	Moderate	Unable to provide		None			I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Annual percent improvement	35%	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements description	All we do is modeling.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None			None			None		
Environmental	Moderate			I don't know			I don't know			I don't know		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps				
Curvature maps	Yes	Yes	Yes	Yes
Cross sections				
Height-Above-Ground maps	Yes	Yes	Yes	Yes
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: National Defense



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	States and/or Territories	States and/or Territories		
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		

MCA Description	Response
Mission Critical Activity	National Defense
MCA Title	National Defense
MCA ID	21644
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Defense Threat Reduction Agency (DTRA)
Sub-Agency or Division	Research and Development
Organization Mission	The Defense Threat Reduction Agency enables the DoD and the U.S. Government to prepare for and combat weapons of mass destruction and improvised threats and to ensure nuclear deterrence.
Program Name	National Defense
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Sign, curb, road line, mailbox, rock, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	To MHHW			
Tide correction requirement				
Cross sections and/or transects meet needs	Yes	Yes		
Cross section/transect requirement	Best as possible	Best as possible		

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Nice to have	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Nice to have	Nice to have		
DEM	Highly desirable	Highly desirable		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Nice to have		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available	Best available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes		
Other description	Various	Various		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	Minor		
Cost savings/cost reduction	I don't know	None		
Cost avoidance	None	I don't know		
Increased revenues	None	None		
Mission-driven performance improvements	Minor	Minor		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Minor		
Improved response or timeliness	Minor	Minor		
Improved customer experience	Minor	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	I don't know		
Environmental	None	I don't know		
Public safety, including life and property	None	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide							
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Moderate	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide							
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	I don't know			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Environmental Protection Agency (EPA)

The mission of EPA is to protect human health and the environment.

EPA works to ensure that:

- Americans have clean air, land and water;
- National efforts to reduce environmental risks are based on the best available scientific information;
- Federal laws protecting human health and the environment are administered and enforced fairly, effectively and as Congress intended;
- Environmental stewardship is integral to U.S. policies concerning natural resources, human health, economic growth, energy, transportation, agriculture, industry, and international trade, and these factors are similarly considered in establishing environmental policy;
- All parts of society--communities, individuals, businesses, and state, local and tribal governments--have access to accurate information sufficient to effectively participate in managing human health and environmental risks;
- Contaminated lands and toxic sites are cleaned up by potentially responsible parties and revitalized; and
- Chemicals in the marketplace are reviewed for safety.

EPA accomplishes its mission by developing and enforcing environmental regulations; giving grants to state environmental programs, non-profits, and educational institutions; studying environmental issues; sponsoring partnerships with businesses, NPOs, and state and local governments; educating the public about environmental protection; and publishing publicly-accessible scientific information.

EPA uses elevation data to monitor and model air quality. The Office of Air and Radiation (OAR) develops national programs, policies, and regulations for controlling air pollution and radiation exposure. Its primary mission is to improve air quality in the U.S. OAR compiles and reviews air pollution data; develops regulations to limit and reduce air pollution; assists states and local agencies with monitoring and controlling air pollution; and makes information about air pollution available to the public. Elevation data are also used for water quality modeling and monitoring, coastal zone management, riverine ecosystem management, and sea level rise and subsidence.

EPA in general requires Quality Level 1 (QL1) inland topography and QL2B inland and nearshore bathymetry for the 48 conterminous states, Alaska, Hawai'i, and Puerto Rico updated every 4-5 years. Order 1a offshore bathymetry is required for sea level rise and subsidence and Order 1b offshore bathymetry is needed for coastal zone management. Offshore bathymetry should be updated every 6-10 years.

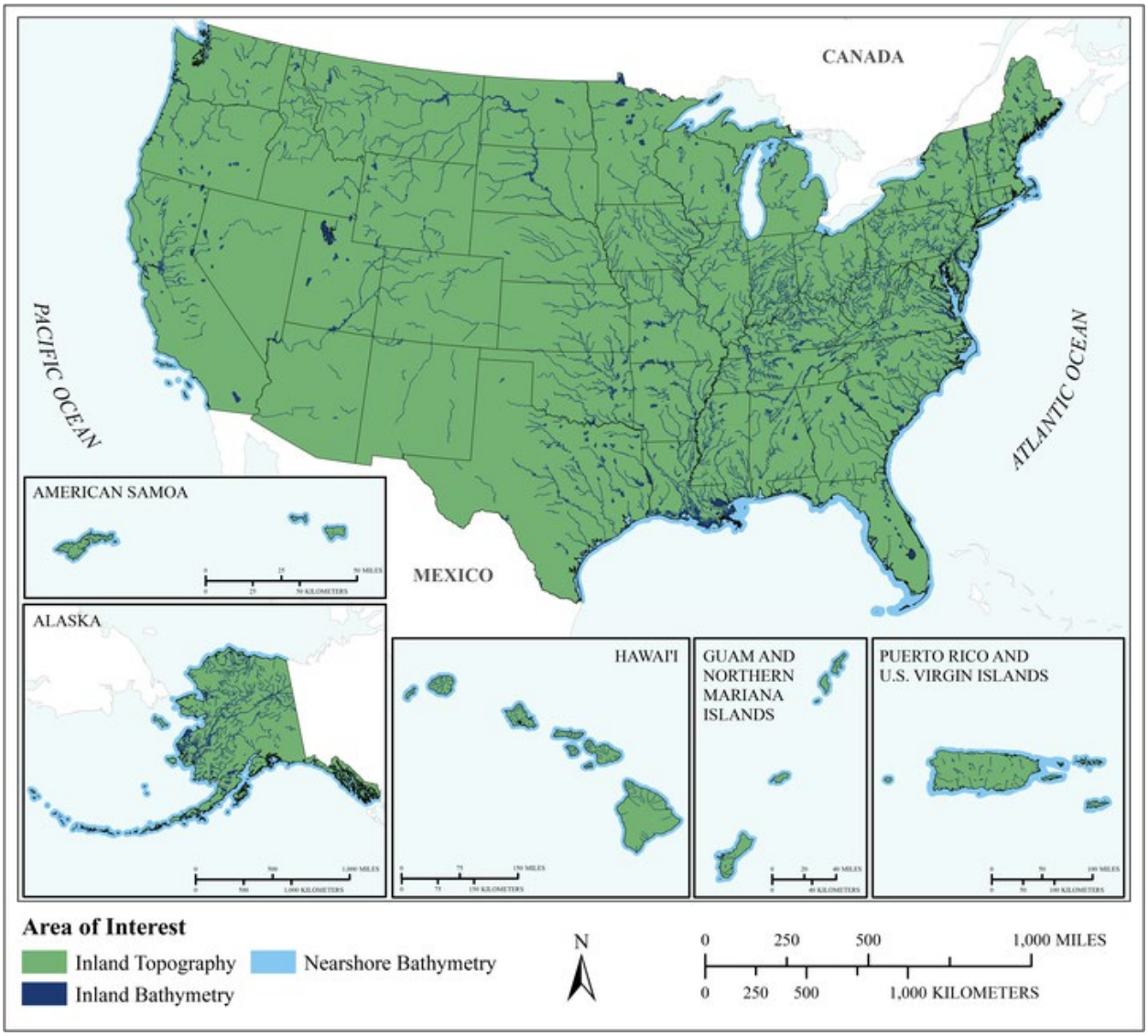
EPA currently receives major performance, environmental, and public safety benefits from available elevation data. Future annual benefits to EPA from having its elevation data needs met as described above would also be major.

EPA has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	Environmental Protection Agency (EPA)	50011	Water Quality	Inland Topo	QL1	4-5 years	$18,208,275	$2,089,711	I don't know	I don't know	I don't know
				Inland Bathy	QL2B	4-5 years	$70,615,844	$4,099,749	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	4-5 years	$3,763,786	$3,100,198	I don't know	I don't know	I don't know
				Offshore Bathy	Cross sections meet needs		$5,505,568	$27,527,840	Moderate	Major	I don't know
BU 02 – Riverine Ecosystem Management	Environmental Protection Agency (EPA)	60720	Riverine Ecosystem Management	Inland Topo	QL1	6-10 years	$5,503,923	$329,856	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$2,931,795	$137,819	Major	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$11,414,676	$4,361,309	Moderate	Moderate	Moderate
BU 03 – Coastal Zone Management	Environmental Protection Agency (EPA)	50012	Coastal Zone Management	Inland Topo	QL1	4-5 years	$72,279,842	$7,448,562	Major	Major	I don't know
				Inland Bathy	QL2B	4-5 years	$33,165,372	$11,504,962	Moderate	Major	I don't know
				Nearshore Bathy	QL2B	4-5 years	$21,328,019	$19,778,611	Major	Major	I don't know
				Offshore Bathy	Order 1b	6-10 years	$8,862,355	$1,415,022	Minor	Moderate	I don't know
BU 16 – Sea Level Rise and Subsidence	Environmental Protection Agency (EPA)	50010	Sea Level Rise and Subsidence	Inland Topo	QL1	4-5 years	$34,644,173	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	Order 1a	6-10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 24 – Health and Human Services	Environmental Protection Agency (EPA)	22436	Air Quality Monitoring and Modeling	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major

MCA Title: Water Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	States and/or Territories	States and/or Territories	States and/or Territories	States and/or Territories
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau

MCA Description	Response
Mission Critical Activity	Water quality. High accuracy elevation data are mission-critical for EPA to understand urban area modeling, to understand characteristics and hydrodynamics of streams and estuaries, and to make decisions on how to protect and/or restore the water we drink, and/or the environment that sustains us.
MCA Title	Water Quality
MCA ID	50011
Organization Type	Federal Agencies and Commissions
Organization Name	Environmental Protection Agency (EPA)
Sub-Agency or Division	Office of Water
Organization Mission	The mission of EPA is to protect human health and the environment. The Office of Water (OW) ensures drinking water is safe, and restores and maintains oceans, watersheds, and their aquatic ecosystems to protect human health, support economic and recreational activities, and provide healthy habitat for fish, plants and wildlife. OW is responsible for implementing the Clean Water Act and Safe Drinking Water Act, and portions of the Coastal Zone Act Reauthorization Amendments of 1990, Resource Conservation and Recovery Act, Ocean Dumping Ban Act, Marine Protection, Research and Sanctuaries Act, Shore Protection Act, Marine Plastics Pollution Research and Control Act, London Dumping Convention, the International Convention for the Prevention of Pollution from Ships and several other statutes.
Program Name	
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)

General Geographic Area and Size	
Description of smallest 3D features	We would be looking for features large enough to influence our modeling outputs for fate and transport or habitat distribution that size or volume varies depending on the site we are trying to characterize. For example being able to resolve seagrass beds to a m2 scale would be very helpful, but not required. Also being able to distinguish topography differences that would serve as collection points for chemicals or debris would help our models and our operational response for clean up efforts along shorelines.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL2B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Required	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Not required	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Required
Underwater videography			Nice to have	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Highly desirable	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Required
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available	Best available	Best available	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI		Yes	Yes	
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Moderate	Moderate	Moderate	Moderate
Cost avoidance	Moderate	Minor	Moderate	Moderate
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Moderate	Minor

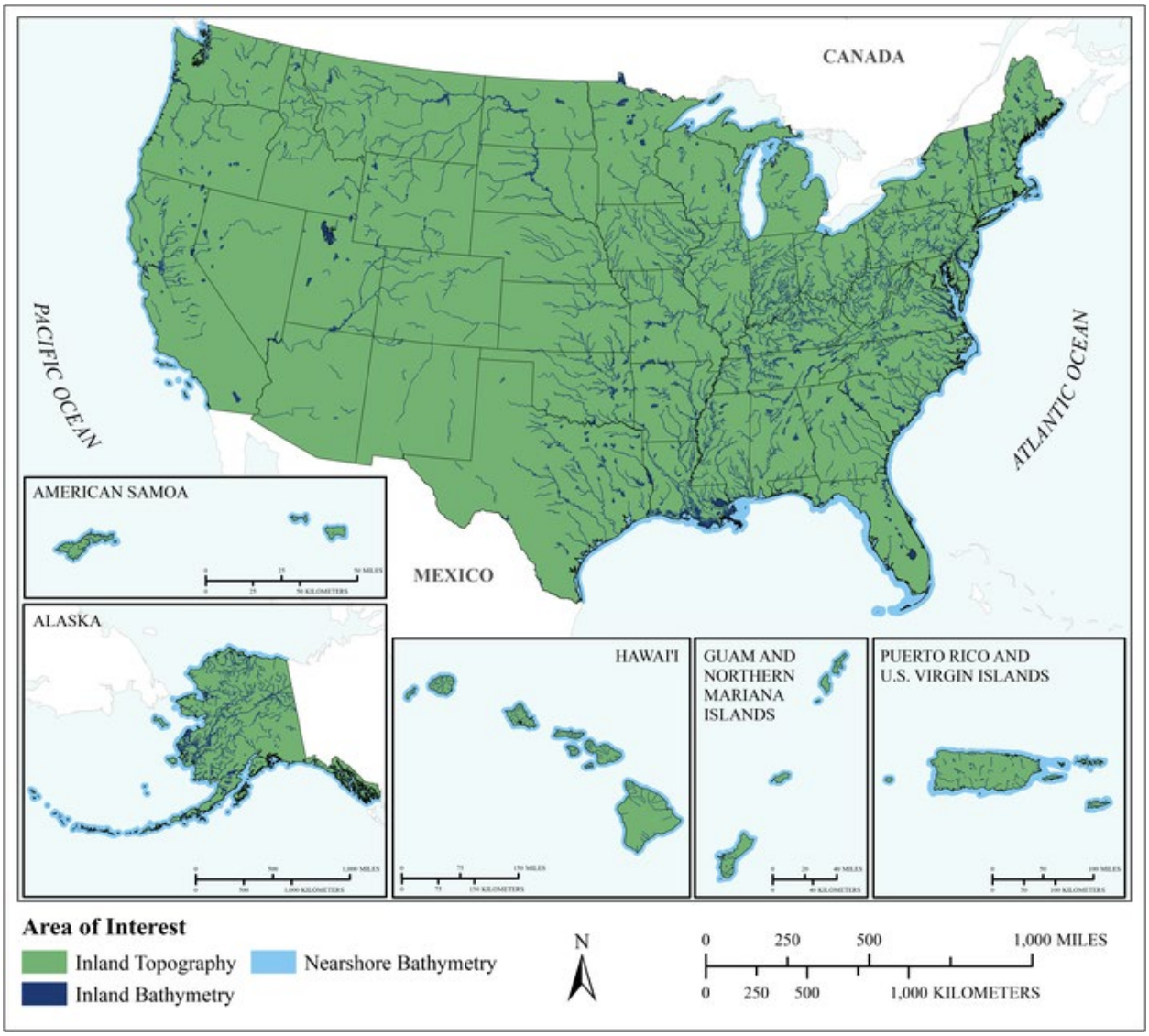
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Moderate	Moderate	Moderate
Improved customer experience	Moderate	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Moderate	
Environmental	Moderate	Moderate	Moderate	
Public safety, including life and property	Moderate	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide	
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Minor	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		None		
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$18,208,275		Annual dollars saved/ realized	$70,615,844		Annual dollars saved/ realized	$3,763,786		Annual dollars saved/ realized	$5,505,568
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,089,711		Annual dollars saved/ realized	$4,099,749		Annual dollars saved/ realized	$3,100,198		Annual dollars saved/ realized	$27,527,840
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know			Moderate		
Environmental	I don't know			I don't know			I don't know			Major		
Public safety, including life and property	I don't know			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes	Yes	Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60720
Organization Type	Federal Agencies and Commissions
Organization Name	Environmental Protection Agency (EPA)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	
Update Frequency	6-10 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required		Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Highly desirable	Required	Required	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Required	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Not required	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Highly desirable	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	
Cost savings/cost reduction	Moderate	Moderate	Moderate	
Cost avoidance	Moderate	Minor	None	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	

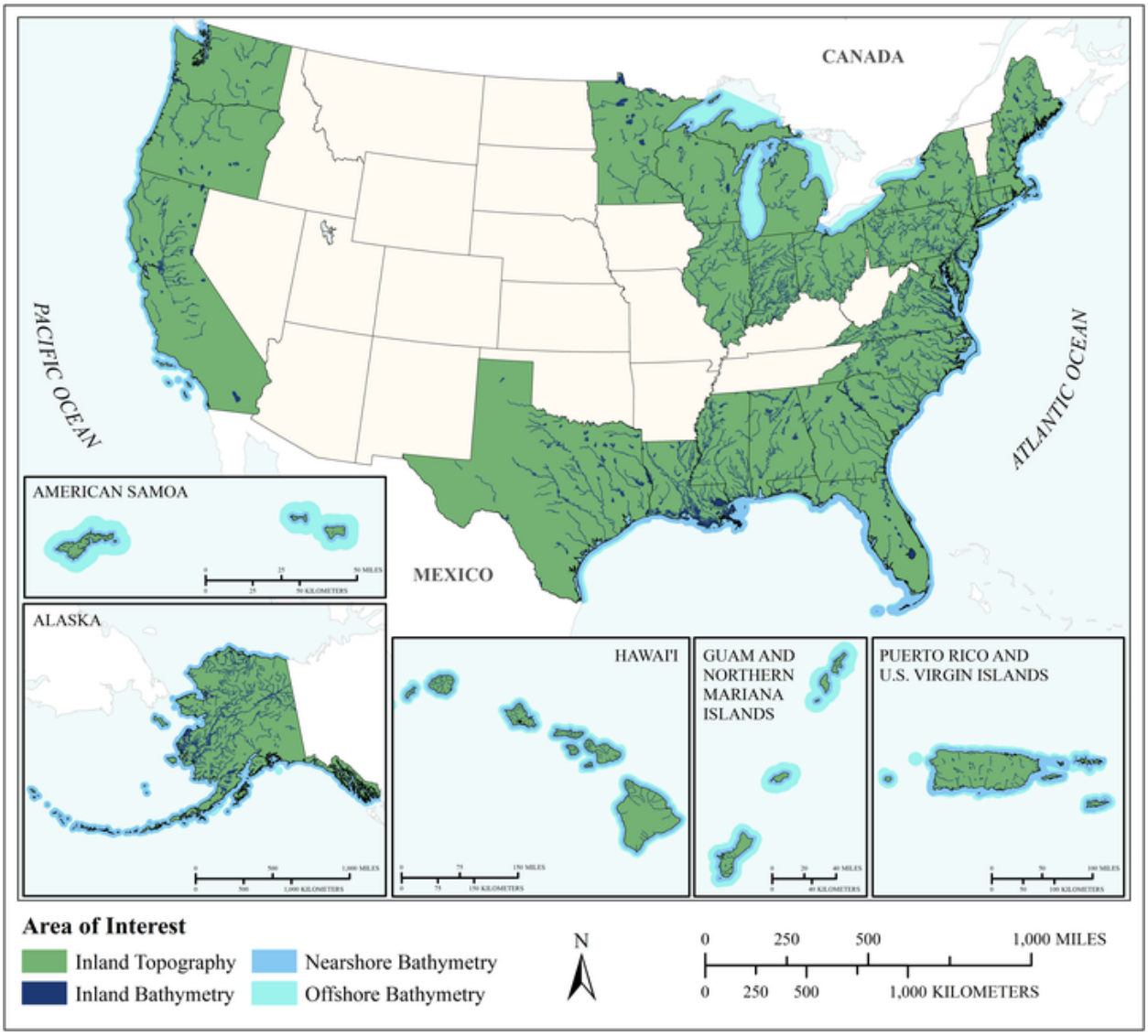
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Minor	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	
Environmental	Major	Major	Moderate	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,503,923		Annual dollars saved/ realized	$2,931,795		Annual dollars saved/ realized	$11,414,676			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$329,856		Annual dollars saved/ realized	$137,819		Annual dollars saved/ realized	$4,361,309			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Major			Major			Moderate					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Coastal Zone Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Custom description	Custom description	States and/or Territories	States and/or Territories
Sub Area Requirements	Coastal states	Coastal states	Areas not shown on map: U.S. Minor Outlying Islands	Areas not shown on map: U.S. Minor Outlying Islands

MCA Description	Response
Mission Critical Activity	Coastal zone management. Analysis of coastal erosion and inundation. Hurricane storm surge and wind damage modeling and assessment. Coastal hazard modeling and mapping. Coastal hazard mitigation. Tsunami modeling. Land use and environmental planning. Coastal resiliency. Oil spill modeling. Littoral zone management including dunes and beaches.
MCA Title	Coastal Zone Management
MCA ID	50012
Organization Type	Federal Agencies and Commissions
Organization Name	Environmental Protection Agency (EPA)
Sub-Agency or Division	
Organization Mission	The mission of EPA is to protect human health and the environment. EPA works to provide the knowledge, data, and tools needed to meet today's needs without compromising the ability of future generations to meet their needs in ways that are economically viable, beneficial to human health and well-being, and socially just while supporting local communities seeking to become more sustainable.
Program Name	
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Houses, buildings, archaeological sites, roads, pipelines, and other infrastructure; jetties, breakwaters, impediments to wave models; small submerged features, included submerged docks or pillars; submerged aquatic vegetation.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL2B	Order 1b
Update Frequency	4-5 years	4-5 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	Less than 1 meter
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MHW	No requirement for tide correction
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	Nice to have
DTM	Required	Highly desirable	Highly desirable	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	Nice to have
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Highly desirable	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available	Best available	Best available	Best available
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI		Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Moderate	Moderate	Moderate	Moderate
Cost avoidance	Moderate	Minor	Moderate	Minor
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Moderate	Moderate

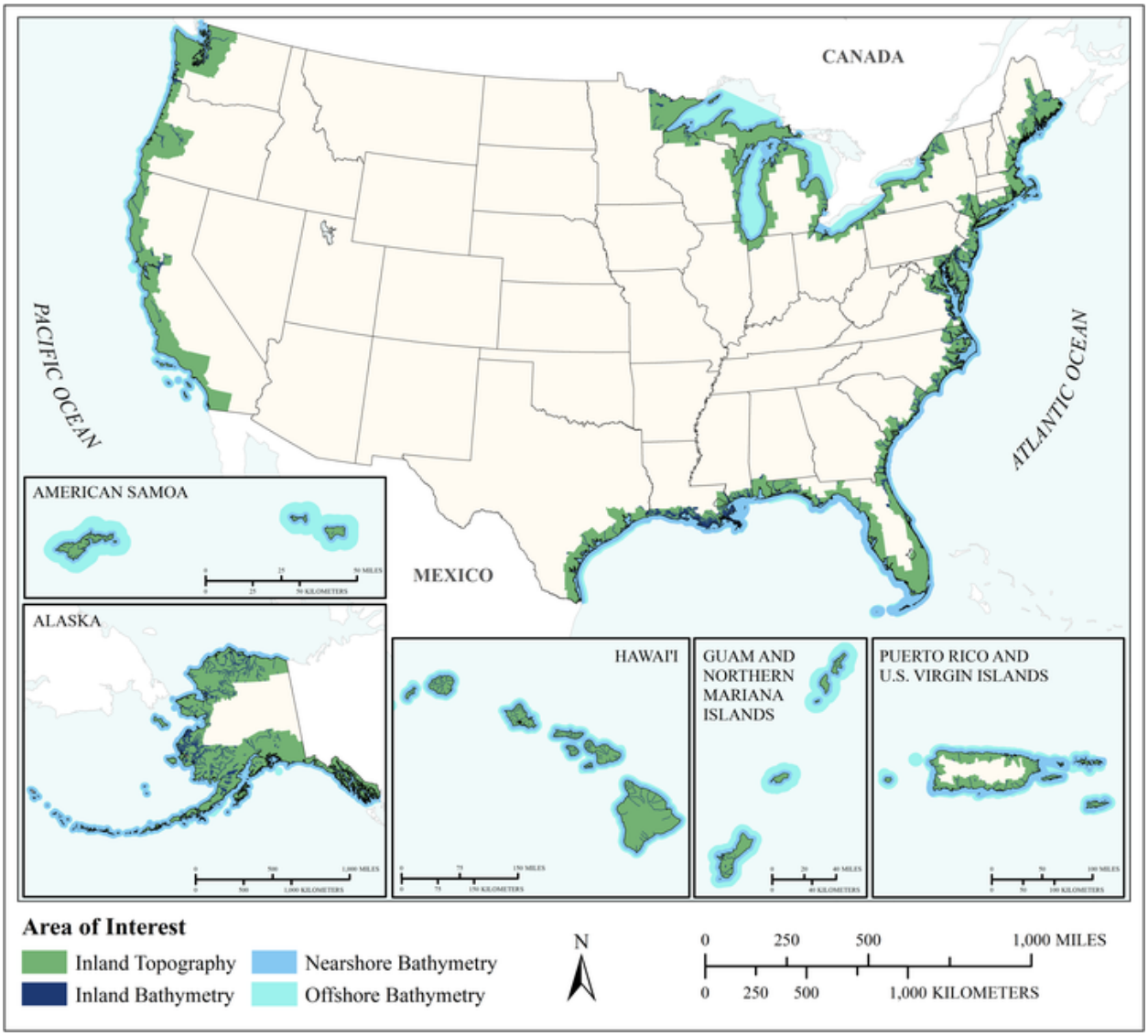
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Moderate	Moderate	Minor
Improved customer experience	Moderate	Moderate	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Moderate	Moderate
Environmental	Moderate	Moderate	Moderate	Moderate
Public safety, including life and property	Moderate	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$72,279,842		Annual dollars saved/ realized	$33,165,372		Annual dollars saved/ realized	$21,328,019		Annual dollars saved/ realized	$8,862,355
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$7,448,562		Annual dollars saved/ realized	$11,504,962		Annual dollars saved/ realized	$19,778,611		Annual dollars saved/ realized	$1,415,022
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major			Minor		
Environmental	Major			Major			Major			Moderate		
Public safety, including life and property	I don't know			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			
Curvature maps	Yes	Yes	Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness		Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	States and/or Territories	States and/or Territories
Sub Area Requirements	Coastal counties	Coastal counties	Areas not shown on map: U.S. Minor Outlying Islands	Areas not shown on map: U.S. Minor Outlying Islands

MCA Description	Response
Mission Critical Activity	Sea level rise and subsidence. Elevation data are needed for spatially explicit vulnerability maps and estimates of populations, land cover types, infrastructure and economic activity affected by sea level rise, and steps taken to mitigate these vulnerabilities. Environmental Impact Assessments (EIAs) depend upon accurate elevation data for vulnerability mapping and estimates of SLR threats to human populations, infrastructure, and the natural environment, including coastal wetlands, marshes, and sub-aquatic vegetation that affect the fish and shellfish industries. Credible EIAs cannot be performed without accurate elevation data.
MCA Title	Sea Level Rise and Subsidence
MCA ID	50010
Organization Type	Federal Agencies and Commissions
Organization Name	Environmental Protection Agency (EPA)
Sub-Agency or Division	
Organization Mission	The mission of EPA is to protect human health and the environment.
Program Name	
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Coastal geomorphic features such as sand ridges, barrier islands; coastal engineering structures, e.g., sea walls, revetments, groins or jetties; buildings, roads

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL2B	Order 1a
Update Frequency	4-5 years	4-5 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	Less than 1 meter
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MHW	No requirement for tide correction
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Required	Highly desirable	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	Nice to have
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Highly desirable
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Nice to have
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available	Best available	Best available	Best available
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Moderate	Minor	Moderate	Moderate
Cost avoidance	Major	Moderate	Moderate	Minor
Increased revenues	Minor	Minor	None	Minor
Mission-driven performance improvements	Major	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Moderate	Moderate

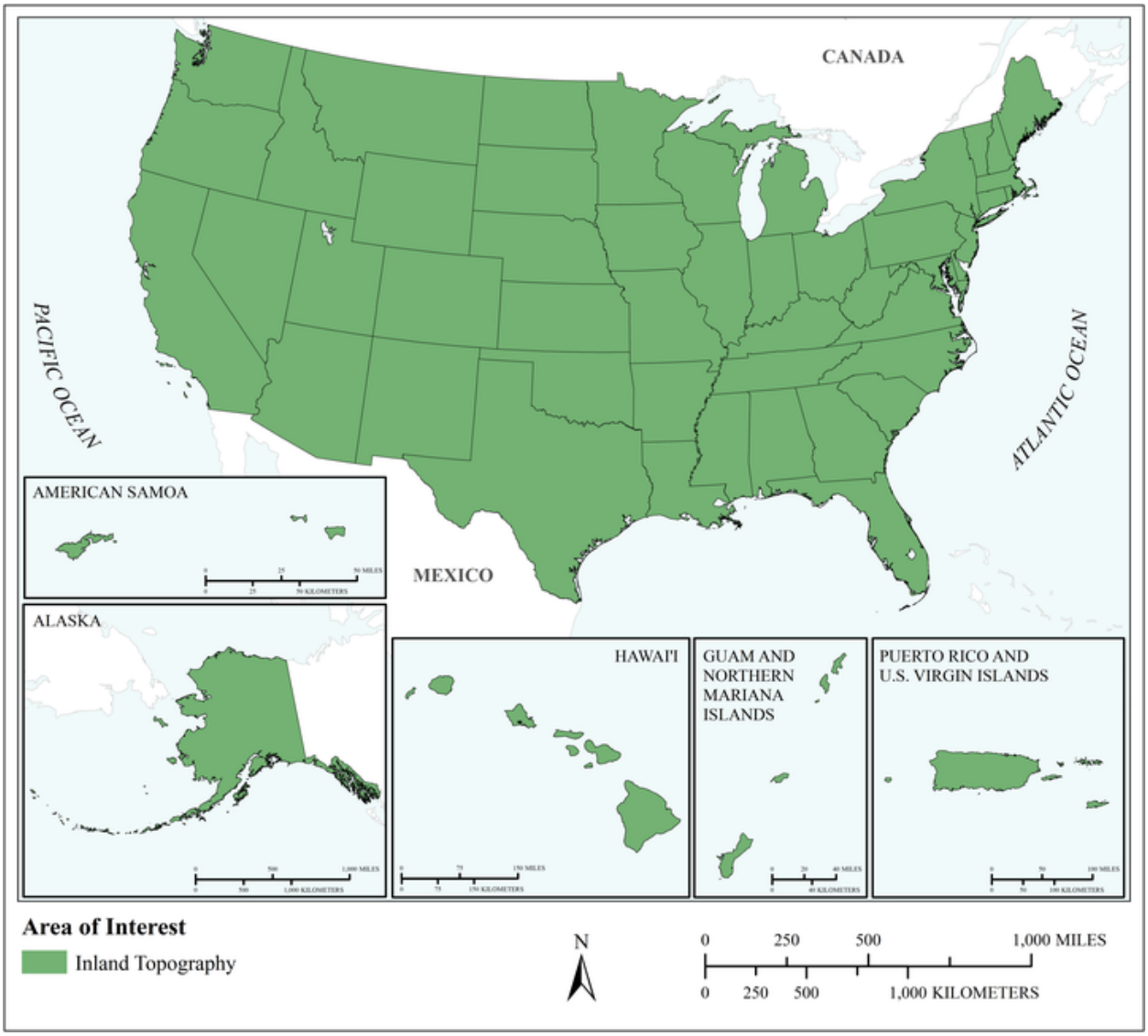
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate	Moderate	Minor
Improved customer experience	Moderate	Moderate	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Moderate
Environmental	Major	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$34,644,173									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know			I don't know		
Environmental	I don't know			I don't know			I don't know			I don't know		
Public safety, including life and property	I don't know			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes			
Aspect maps	Yes	Yes	Yes	
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Air Quality Monitoring and Modeling



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	States and/or Territories			
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau			

MCA Description	Response
Mission Critical Activity	Monitor and analyze ambient air quality data. Model ambient air quality e.g. Air Quality Dispersion Modeling, Photochemical Modeling. Monitor air pollution emissions. Model and estimate air pollution emissions – Air and meteorlogical modeling (dispersion models, etc.) and conditions analyses require elevation data. Chemical models are larger scale (whole U.S.); less detail is required. Vegetation has volatile emissions. Data for both leaf on and leaf off conditions could help with modeling to see vegetation contribution to Volatile Organic Compounds (VOCs).
MCA Title	Air Quality Monitoring and Modeling
MCA ID	22436
Organization Type	Federal Agencies and Commissions
Organization Name	Environmental Protection Agency (EPA)
Sub-Agency or Division	Office of Air / Office of Air Quality Planning and Standards (OAQPS)
Organization Mission	The Office of Air and Radiation (OAR) develops national programs, policies, and regulations for controlling air pollution and radiation exposure. Our primary mission is to improve air quality in the US. We compile and review air pollution data; develop regulations to limit and reduce air pollution; assist states and local agencies with monitoring and controlling air pollution; and make information about air pollution available to the public
Program Name	Air quality modeling supporting regulatory programs required by the Clean Air Act
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 24 - Health and Human Services
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	For dispersion modeling we are mostly interested in buildings and trees

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	4-5 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	Main focus is CONUS plus AK, HI, PR, less detail needed elsewhere			
Acceptable Horizontal Error	Up to 20 meters			
Acceptable Vertical Error	Up to 1 meter			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Not required			
DEM	Nice to have			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Not required			
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Land Use Land Cover (LULC) plus NED 30 m			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	LULC			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	Major	Unable to provide										
Cost avoidance description	Better air quality models would improve regulatory actions against air pollution - providing public health benefits in return. Air quality modeling after certain disasters (e.g. 9-11).											
Increased revenues	None											
Mission-driven performance improvements	Major	Unable to provide										
Other operational benefits	Moderate	Unable to provide										
Other operational benefits description	Regualtory decision making.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Education or outreach description	We regularly provide public information about their current, past and future air quality (i.e., airnow.gov). Improved and more accurate air quality warnings would have tremendous public benefits											
Environmental	Major											
Environmental description	Better regulatory actions against air pollution											
Public safety, including life and property	Major											
Public safety, including life and property description	Improved air quality modeling would help the agency to take informed action against the adverse consequences of exposure to environmental pollutants, including both human health and ecological effects.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Federal Aviation Administration (FAA)

The mission of the FAA is to provide the safest, most efficient airspace system in the world. The FAA provides a safe, secure, and efficient global airspace system that contributes to the promotion of U.S. airspace safety and national security. As the leading authority in the international airspace community, FAA is responsive to the dynamic nature of stakeholder needs, economic conditions, and environmental concerns.

The FAA develops and maintains approach departure procedures for over 4,100 airfields in the U.S. and its territories. It is most important for the FAA to know the elevations of the bare earth terrain, and secondly to know the elevations of any features above the bare earth in defined areas of terminal air space. The FAA maintains an Integration agreement with the National Geodetic Survey (NGS) to survey and validate 3rd party surveys of potential obstacles along sloped parallelograms extending outward from the ends of runways, the less accuracy required beyond five miles of the runways. The FAA strives to ensure that growing trees and new manmade structures (e.g., buildings, towers) do not encroach upon flight paths within specific tolerance levels. The FAA needs high-accuracy, high-density elevation data to reduce requirements for expensive ground surveys for assessing obstacle clearance around airfields and designing aviation instrument approach and departure procedures which allow aircraft to safely navigate around or above obstacles. The FAA uses such elevation data for production of analog Visual Flight Rule (VFR) Aviation Charts, Enroute Aviation Charts, Instrument Flight Rule (IFR) Aviation Charts, as well as digital IFR, Enroute, and VFR charts.

The Obstacle Data Team and Obstacle Instrument Flight Procedure Impact Team have identified high-quality elevation data as essential for their operations. Operational tasks that include elevation data revolve around knowledge of the bare earth ground and elevated obstacles. The data are used to direct appropriate elevation buffers for aircrafts taking off and landing and to regulate the construction of new buildings near airfields. FAA currently uses the best available elevation data for any given area, derived from a variety of sources. Sources include, but are not limited to, the National Map, USGS Digital Elevation Web Services, National Geodetic Surveys, and USGS Quads. FAA is currently not using nearshore elevation data.

FAA has identified a need for Quality Level 1 (QL1) topographic data for all airfield terminal areas and QL2-QL3 data elsewhere in the U.S. states and territories updated every 4-5 years though aeronautical charting requires an annual update frequency. QL2B bathymetric data for coastal waters up to 10 meters in depth and IHO Order 1a bathymetric data for the territorial sea (12 nautical miles off U.S. shorelines) is required and data should be updated every 2-3 years.

FAA identified an estimated $24.75 to $32.1 million per year would be saved along with other major benefits FAA or its stakeholders would receive if their elevation data needs were met:

- A lot of time is currently spent verifying locations and vertical accuracies of obstacles, airport environments, and Minimum Safe Altitude Warning (MSAW) sites; having a single, complete, and standardized DEM would greatly reduce the time spent verifying discrepancies or lack of data. For each airfield, with a single accurate and authoritative source of elevation data, FAA's Aeronautical Information Specialists would save a majority of their time now spent researching multiple data sources to identify and update information for its aeronautical charts and digital datasets listed above. One manager stated: "the efficiency gains from time spent looking for sources of data coverage would be major." An estimate could be translated into annual cost savings of $4.5 M/yr.
- If lidar can be demonstrated to consistently identify and map vertical obstacles currently identified and mapped by NGS land surveyors with theodolites and GPS receivers, then an

estimated $5.5M/yr could be saved from costs currently spent for land surveys of potential obstacles.

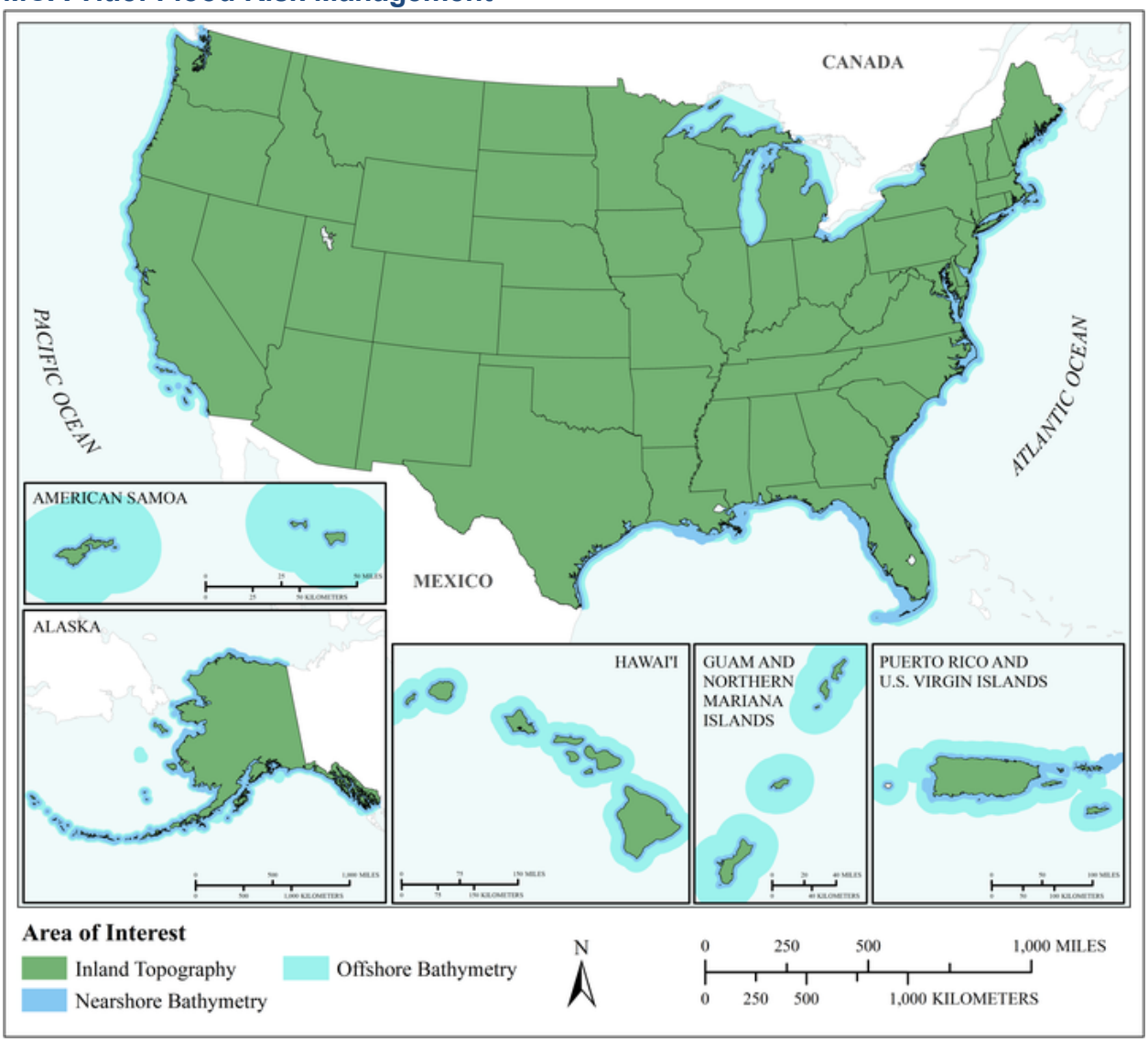
- A national lidar elevation dataset will help minimize potential impacts of the current 4-D site elevations on IFR arrival and departure procedures during Obstruction Evaluation (OE) aeronautical studies. The OE aeronautical study processes and the severity of any IFR effects may be eliminated or reduced with more accurate site elevations (estimated savings $3.3M/yr).
- Stakeholders of FAA products and services include air carriers; airport authorities; shippers; foreign, state, and local governments; aerospace manufacturers; military aviation; commercial space launch companies; and others such as the National Transportation Safety Board (NTSB), OMB, and Congress.
- When available, QL1 lidar data for terminal air space will provide major benefits for all of the above-listed stakeholders, especially air traffic controllers and airport operators who serve these stakeholders (estimated benefit $3.3M/yr).
- Increased vertical and horizontal accuracy of aeronautical products results in improved IFR instrument approach procedures, lower minimum vectoring altitudes in both the terminal and low enroute environments, and increases the number of GPS-derived terminal approach procedures. This improves operational efficiencies and reduces aviation fuel consumption by commercial and military aviation (estimated benefit $4.6M/yr).
- Savings for airport owners who currently procure elevation data from consulting contractors; major time/cost savings for airport design and obstruction analysis (estimated benefit $3.3M/yr).
- ArcGIS's BU 22 Infrastructure and Construction Management overlays help FAA professionals to identifying areas where UAS are likely to cause significant damage to structures. The overlays could yield a significant benefit through enhanced identification of high-risk structures (estimated benefit $253K to $7.6M/yr).
- Increased cargo capacity for stakeholders.
- High tide sea surface would allow for better predictions of ocean vessel heights in takeoff and approach zones.
- Safer flights would improve public safety, both in lives and property.

FAA has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 15 – Flood Risk Management	DoT: Federal Aviation Administration (FAA)	60689	Flood Risk Management	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Major	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Major	Moderate	Major
				Offshore Bathy	Order 1a	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
BU 16 – Sea Level Rise and Subsidence	DoT: Federal Aviation Administration (FAA)	60690	Sea Level Rise and Subsidence	Inland Topo	QL0	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
				Offshore Bathy	Order 1a	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Moderate
BU 21 – Aviation Navigation	DoT: Federal Aviation Administration (FAA)	1192	Airway and Instrument Flight Procedure Development and Instrument Flight Procedure Impact, Aeronautical Charting	Inland Topo	(a) QL1 (b) QL2	Annually	$21,200,000	$3,300,000	None	Moderate	Major
				Nearshore Bathy	QL4B	Annually	Unable to quantify	Unable to quantify	None	Moderate	Major
				Offshore Bathy	Order 2	Annually	Unable to quantify	Unable to quantify	None	Moderate	Major
BU 22 – Infrastructure Management	DoT: Federal Aviation Administration (FAA)	60691	Infrastructure and Construction Management	Inland Topo	QL0	4-5 years	$152,866 to $4,578,240	$98,003 to $2,935,120	Minor	Moderate	Major
				Nearshore Bathy	QL1B	4-5 years	$2,538 to $76,000	$355 to $10,640	Minor	Moderate	Moderate
				Offshore Bathy	Special Order	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Minor

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	Federal Review AOIs		Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas		All nearshore study waters	Offshore waters to the Territorial sea

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60689
Organization Type	Federal Agencies and Commissions
Organization Name	DoT: Federal Aviation Administration (FAA)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL2B	Order 1a
Update Frequency	4-5 years		4-5 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Highly desirable	Highly desirable		Highly desirable
Entire AOI under same environmental conditions	Highly desirable		Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Highly desirable	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless	Required		Required	Highly desirable		Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have		Highly desirable	Highly desirable
DTM	Required		Highly desirable	Highly desirable
DEM	Required		Required	Required
Raw point cloud data	Highly desirable		Highly desirable	Nice to have
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform	Nice to have		Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)			Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Required			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have		Nice to have	Highly desirable
Ground control/ground truthing	Required		Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required		Required	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Not required	Nice to have
Geologic and seismic data	Nice to have		Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Nice to have		Highly desirable	
Land use/land cover	Highly desirable		Highly desirable	Nice to have
Wetlands	Highly desirable		Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Highly desirable		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Required		Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Minor	Moderate
Cost savings/cost reduction	Major		Minor	Moderate
Cost avoidance	Major		Minor	Moderate
Increased revenues	Minor		None	None
Mission-driven performance improvements	Major		Minor	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Minor	Minor

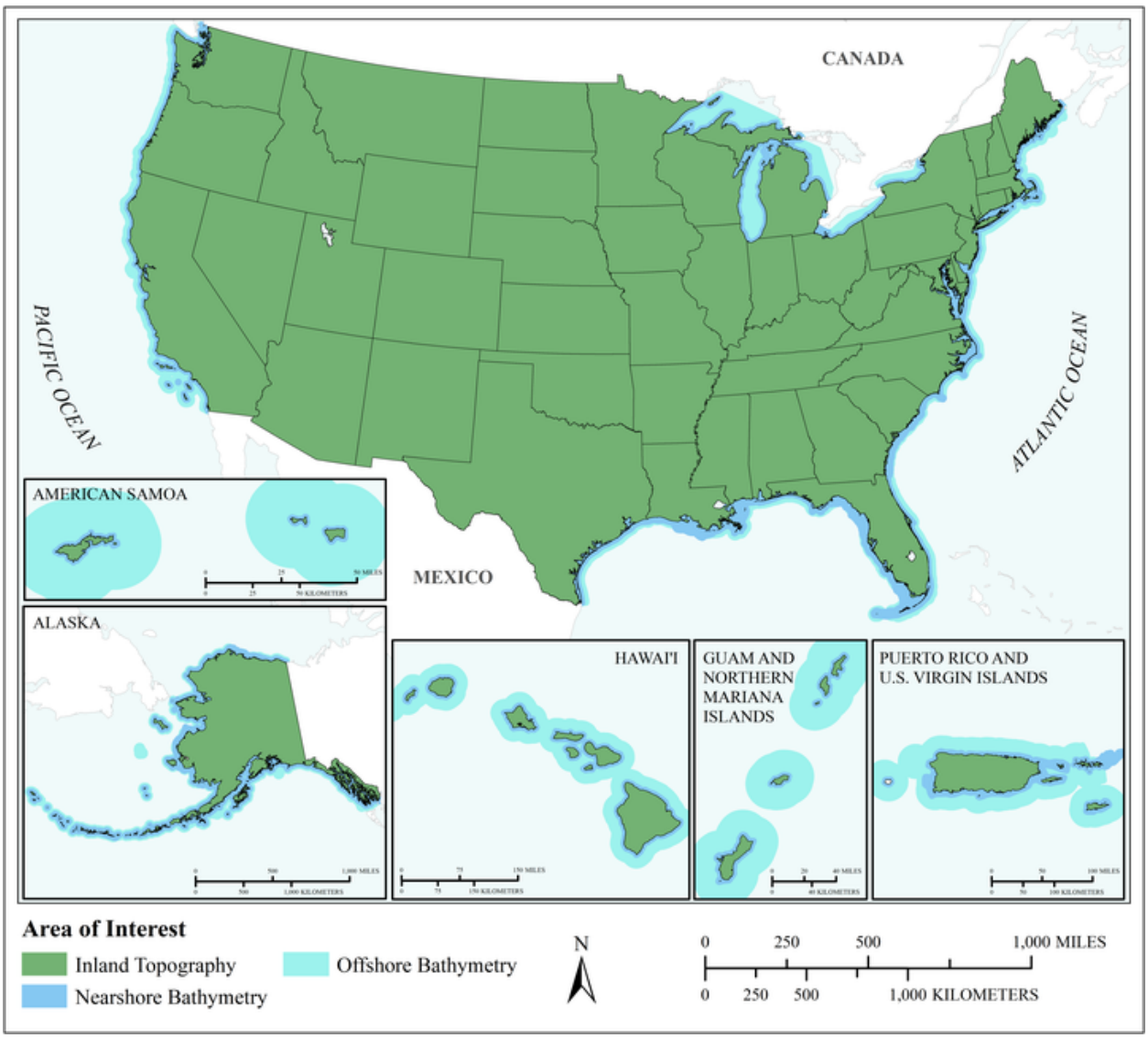
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major		Minor	Major
Improved customer experience	Major		Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Minor	Minor
Environmental	Moderate		Moderate	Minor
Public safety, including life and property	Major		Moderate	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide					Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide					Major	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major						Major			Moderate		
Environmental	Moderate						Moderate			Moderate		
Public safety, including life and property	Major						Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	Yes
Contours	Yes		Yes	Yes
Hillshades	Yes			
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps			Yes	
Viewshed maps				
Hydrologic Flow Direction Grids	Yes		Yes	
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	Federal Review AOIs		Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas		All nearshore study waters	Offshore waters to the Territorial sea

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60690
Organization Type	Federal Agencies and Commissions
Organization Name	DoT: Federal Aviation Administration (FAA)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0		QL1B	Order 1a
Update Frequency	4-5 years		2-3 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm		Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 10 cm		Up to 30 cm	Less than 1 meter
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Required	Nice to have		Required
Entire AOI under same environmental conditions	Highly desirable		Required	Nice to have		Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required	Required		Required
DEM for entire AOI needs to be seamless	Required		Required	Required		Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	Highly desirable
DTM	Required		Highly desirable	Highly desirable
DEM	Required		Required	Required
Raw point cloud data	Highly desirable		Nice to have	Nice to have
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Not required	Not required
Full waveform	Not required		Not required	Not required
Bathymetric Attributed Grid (BAG)			Not required	Not required
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Required
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	Highly desirable
Ground control/ground truthing	Required		Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required		Required	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Not required	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have		Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Not required
Water column properties - Biological			Nice to have	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required		Required	
Land use/land cover	Required		Highly desirable	Nice to have
Wetlands	Required		Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Highly desirable		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Required		Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Major	Moderate
Cost savings/cost reduction	Major		Major	Moderate
Cost avoidance	Major		Major	Moderate
Increased revenues	None		Minor	None
Mission-driven performance improvements	Major		Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	Major

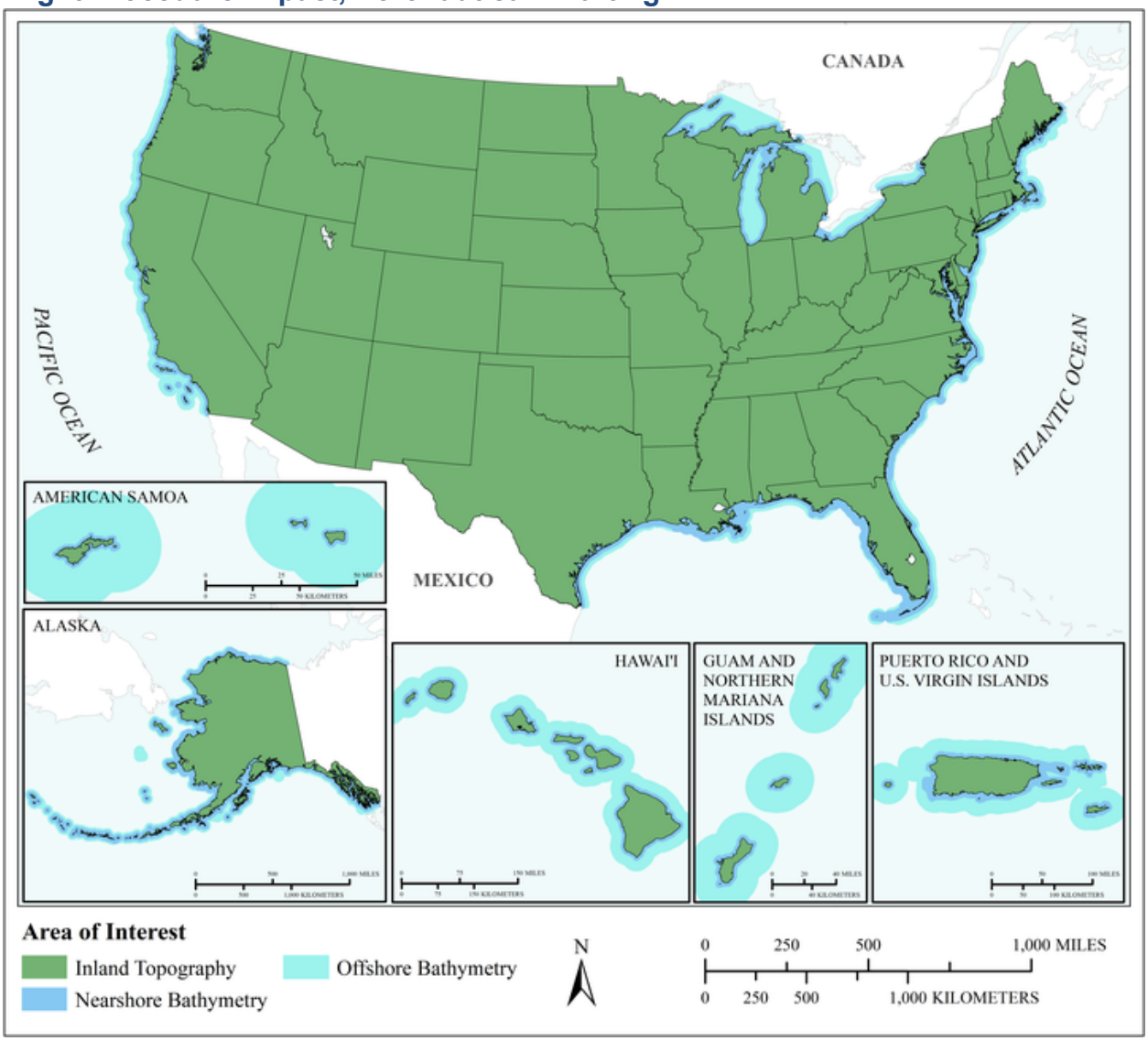
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate		Moderate	Moderate
Improved customer experience	Moderate		Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Moderate	Moderate
Environmental	Major		Major	Moderate
Public safety, including life and property	Major		Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide					Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide					Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide					Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Major			Major		
Environmental	Moderate						Major			Major		
Public safety, including life and property	Moderate						Minor			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours	Yes		Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes		Yes	
Aspect maps	Yes		Yes	
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Airway and Instrument Flight Procedure Development and Instrument Flight Procedure Impact, Aeronautical Charting



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	Area split by varying quality level or update frequency		One or more national maritime boundaries	One or more national maritime boundaries
Sub Area Requirements	All US States and Territories		State waters, Territorial sea (12 nautical miles)	State waters, Territorial sea (12 nautical miles)

MCA Description	Response
Mission Critical Activity	Aeronautical Information includes obstacle evaluation of structures. Develop instrument procedures in the NAS; evaluate vertical obstructions. Validating obstacle heights for purposes of charting and electronic flight management systems. Critical to this process is accurate ground elevation and accurate horizontal positioning. BU-21 Aviation Navigation and Safety - Minimum Safe Altitude Warning (MSAW)/-Sector Design Analysis Tool (SDAT)/-Instrument Flight Procedure Publication (IFP). For simulating possible maritime obstacles to aviation, the tallest ships are placed in waters at high tide within the approach course to identify possible impacts to flight approaches.
MCA Title	Airway and Instrument Flight Procedure Development and Instrument Flight Procedure Impact, Aeronautical Charting
MCA ID	1192
Organization Type	Federal Agencies and Commissions
Organization Name	DoT: Federal Aviation Administration (FAA)
Sub-Agency or Division	FAA/ATO/MSS/AIS - Aeronautical Information Services/Aeronautical Information Management/Obstacle Data - Aeronautical Information Services (AJV-5)
Organization Mission	Aeronautical Information Group: AJV-53 serves as the authoritative government source for collecting, validating, maintaining, and disseminating aeronautical data concerning the U.S. and its territories. The group plans, coordinates, and processes Instrument Flight Procedures (IFPs) for publication in the NAS; review, analyzes, and documents the impact of proposed obstructions on IFPs. Development and maintenance of instrument flight procedures in support of the National Air System.
Program Name	Obstacle Data Team and Obstacle Instrument Flight Procedure Impact Team - Aeronautical Information Services AJV-5
Total Annual Program Budget	$20,000,000
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Worldwide
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Structures, i.e. towers, buildings, wind turbines, bridges, poles, etc. Trees and other vegetation. Buildings on and around airports and heliports.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL1 (b) QL2		QL4B	Order 2
Update Frequency	Annually		Annually	Annually
Event type(s)				
Quality Level and/or update frequency variability across AOI	QL1 data for airfield terminal areas, QL2-QL3 data elsewhere			
Acceptable Horizontal Error	Up to 1 meter		Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm		Up to 1 meter	Up to 2 meters
How far onshore needed				
How far down the beach profile needed	To MHHW			
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Nice to have	Nice to have		Not required
Entire AOI under same environmental conditions	Nice to have		Nice to have	Nice to have		Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required	Required		Required
DEM for entire AOI needs to be seamless	Required		Required	Required		Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know		I don't know	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		Required	Required
DTM	Required		Nice to have	Nice to have
DEM	Required		Highly desirable	Highly desirable
Raw point cloud data	Not required		Not required	Not required
Classified point cloud	Not required		Not required	
Edited/cube XYZ			Not required	Not required
Full waveform	Not required		Not required	Not required
Bathymetric Attributed Grid (BAG)			Not required	Not required
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Not required		Required	Required
Ground control/ground truthing	Required		Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	Not required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required		Required	Required
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Nice to have	Nice to have
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Not required		Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Required	Required
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates	Required		Required	
Land use/land cover	Required		Required	Required
Wetlands	Not required		Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Not required	Not required
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Required		Required	
Cultural resources	Highly desirable		Highly desirable	
Coastal and riverine structures	Required		Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	National Map Program, USGS Digital Elevation Web Services, DEM, NGA's DTED, National Geodetic Surveys; other mono and stereographic imagery. USGS Quads. Web service that checks elevation data against USGS DEM and then visually using historical Topo maps. NGA DTED, USGS DEM, USGS National Map.		None	None
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				

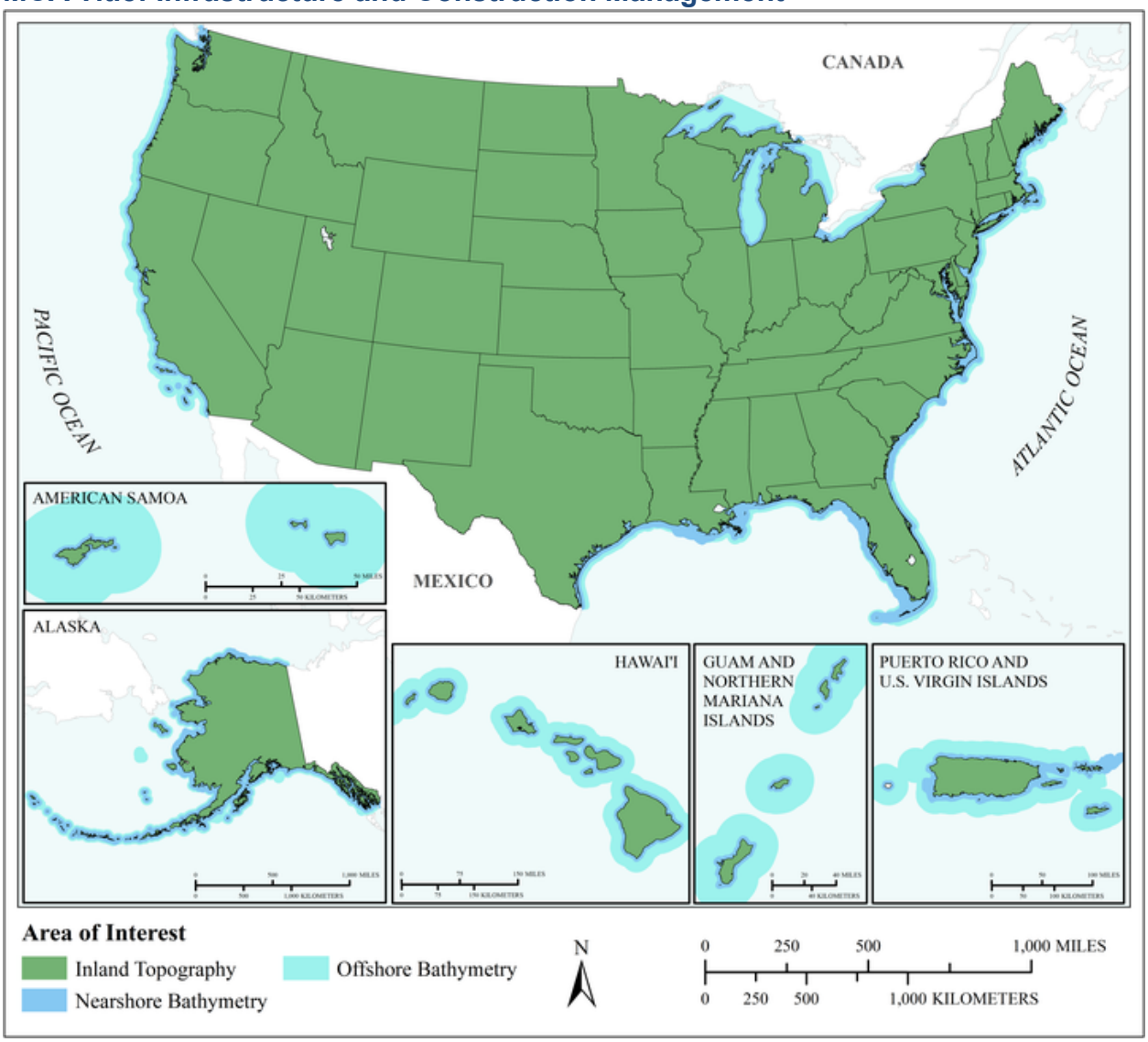
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State Repositories				
State repositories used				
Other	Yes			
Other description	Using online available historical topo map collection			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		None	None
Cost savings/cost reduction	Major		None	None
Cost avoidance	Major		None	None
Increased revenues	Major		None	None
Mission-driven performance improvements	Major		None	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		None	None
Improved response or timeliness	Major		None	None
Improved customer experience	Major		None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None		None	None
Environmental	None		None	None
Public safety, including life and property	Major		None	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Annual dollars saved/realized	$16,700,000				Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction description	Time saved by airport users. Seamless data would mean less time spent verifying discrepancies. Fewer field visits for surveying. Less fuel consumption by commercial and military aviation.											
Cost avoidance	Major	Annual dollars saved/realized	$4,500,000				Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Major	Unable to provide					Moderate	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Annual dollars saved/realized	$3,300,000				Major	Unable to provide		Major	Unable to provide	
Improved customer experience description	Airports would not need to procure elevation data to comply with regulations.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None						None			None		
Environmental	Moderate						Moderate			Moderate		
Public safety, including life and property	Major						Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes		Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps	Yes		Yes	Yes
Cross sections				
Height-Above-Ground maps	Yes		Yes	Yes
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	Federal Review AOIs		Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas		All nearshore study waters	Offshore waters to the Territorial sea

MCA Description	Response
Mission Critical Activity	Airport construction. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change. The integration of Unmanned Aircraft Systems (UAS) in to the National Air Space (NAS) poses several challenges to public safety. One of the most widespread is possible damage to property within the United States. Identifying where UAS are most likely to damage property and investing in appropriate counter measures could yield significant savings to both the FAA and the public. ArcGIS's BU 22 Infrastructure and Construction Management overlays help FAA professionals to identify areas where UAS are likely to cause significant damage to structures. Moreover, other ArcGIS overlays are likely to contribute to limiting the damage caused by UAS operations as well. However, BU 22 Infrastructure and Construction Management overlays is the most likely to have the greatest impact.
MCA Title	Infrastructure and Construction Management
MCA ID	60691
Organization Type	Federal Agencies and Commissions
Organization Name	DoT: Federal Aviation Administration (FAA)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0		QL1B	Special Order
Update Frequency	4-5 years		4-5 years	2-3 years
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm		Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 10 cm		Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Nice to have	Nice to have		Nice to have
Entire AOI under same environmental conditions	Highly desirable		Nice to have	Nice to have		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Highly desirable	Not required		Highly desirable
DEM for entire AOI needs to be seamless	Required		Highly desirable	Nice to have		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have		Highly desirable	Highly desirable
DTM	Required		Required	Highly desirable
DEM	Required		Required	Required
Raw point cloud data	Highly desirable		Nice to have	Highly desirable
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform	Nice to have		Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)			Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Nice to have		Nice to have	Nice to have
Ground control/ground truthing	Required		Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required		Highly desirable	Nice to have
Underwater videography			Not required	Nice to have
Bottom texture			Not required	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have		Nice to have	Highly desirable
Water column properties - Physical			Not required	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Highly desirable	Nice to have
Shorelines – current, historic, change rates	Nice to have		Highly desirable	
Land use/land cover	Highly desirable		Highly desirable	Highly desirable
Wetlands	Highly desirable		Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Highly desirable		Highly desirable	
Cultural resources	Highly desirable		Nice to have	
Coastal and riverine structures	Required		Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Minor	Moderate
Cost savings/cost reduction	Major		Minor	Minor
Cost avoidance	Major		Minor	Minor
Increased revenues	None		None	Minor
Mission-driven performance improvements	Major		Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Minor	Moderate

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major		Minor	Moderate
Improved customer experience	Moderate		Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor		Minor	Moderate
Environmental	Moderate		Minor	Minor
Public safety, including life and property	Moderate		Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide					Minor	Unable to provide		Minor	Unable to provide	
Cost avoidance	Major	Unable to provide					Minor	Unable to provide		Minor	Unable to provide	
Increased revenues	None						None			None		
Mission-driven performance improvements	Major	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$152,866					Annual dollars saved/ realized	$2,538			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$98,003					Annual dollars saved/ realized	$355			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor						Minor			Minor		
Environmental	Moderate						Moderate			Moderate		
Public safety, including life and property	Major						Moderate			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	Yes
Contours	Yes		Yes	Yes
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes		Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes		Yes	Yes
Hydrologic Flow Accumulation Grids	Yes		Yes	Yes
Hydrologic networks (e.g. streams, lakes)	Yes		Yes	Yes
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)			Yes	Yes
Building footprints	Yes			Yes
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Federal Bureau of Investigation (FBI)

The mission of the FBI is to protect the American people and uphold the Constitution of the United States. The FBI protects and defends the U.S. against terrorist and foreign intelligence threats, upholds and enforces the criminal laws of the U.S., and provides leadership and criminal justice services to federal, state, municipal, and international agencies and partners. The FBI performs these responsibilities in a manner that is responsive to the needs of the public and is faithful to the Constitution of the United States.

Elevation data are used for telecommunications propagation modeling and tower siting, and law enforcement and national security matters including infrastructure and border protection; line-of-sight analysis in urban areas; flood risk analysis resulting from acts of terrorism; coastal search and rescue; mapping in support of criminal, counterintelligence, counterterrorism, and cyber threats; and disaster response. Law enforcement uses elevation data to view large data sets spatially to identify source recruitment opportunities and perform predictive analysis.

To protect the American people, the FBI requires the routine use of 3D elevation data. The FBI leverages this data for activities such as identifying possible sniper positions, determining personnel recovery, planning continuity of operations, and determining new sites for facilities. Without this data, the FBI would have less confidence in many of its assessments on a multitude of threats.

The FBI requires Quality Level 2 (QL2) inland topography updated annually, QL0B inland bathymetry updated every 2-3 years, QL1B nearshore bathymetry updated every 2-3 years, and Order 2 offshore bathymetry every 2-3 years for telecommunication modeling and tower siting. For law enforcement and national security purposes, the FBI requires QL0 inland topography, QL0B inland bathymetry, QL1B nearshore bathymetry, and Order 2 offshore bathymetry, all updated every 2-3 years.

On average, Mission Critical Activities identified by the FBI during federal review require Quality Level 0 HD for inland topography, QL0B for inland bathymetry, QL1B for nearshore bathymetry, and Special Order 1 for offshore bathymetry, each averaging an update frequency of every 2-3 years.

Benefits from having more accurate elevation data include moderate time savings from avoided data manipulation and better data availability, and major benefits from data acquisition cost savings, improved customer assistance, increased customer confidence in products, providing new services, and increased resources for analysis.

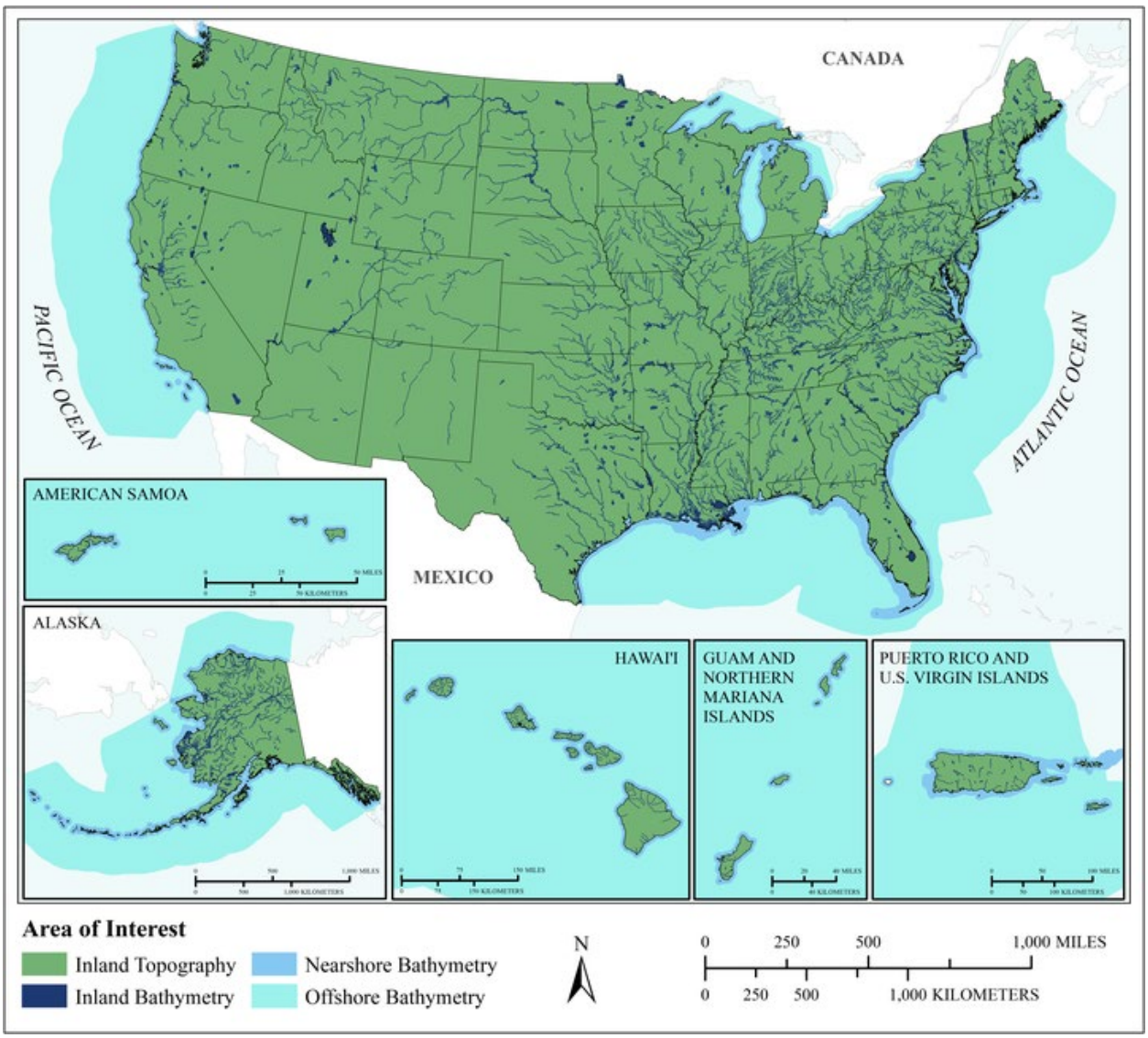
FBI has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 13 – Oil and Gas Resources	DoJ: Federal Bureau of Investigation (FBI)	60709	Oil and Gas Resources	Inland Topo	QL1 HD	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Major
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	None	Minor	Minor
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Offshore Bathy	Order 1	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 14 – Cultural Resource Management	DoJ: Federal Bureau of Investigation (FBI)	60710	Cultural Resources Preservation and Management	Inland Topo	QL0 HD	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Minor
				Offshore Bathy	Order 1	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Minor
BU 15 – Flood Risk Management	DoJ: Federal Bureau of Investigation (FBI)	60711	Flood Risk Management	Inland Topo	QL0 HD	2-3 years	Unable to quantify	Unable to quantify	Major	Moderate	Major
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Moderate	Major
				Offshore Bathy	Order 1	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
BU 18 – Homeland Security	DoJ: Federal Bureau of Investigation (FBI)	1234	Law Enforcement and National Security Matters	Inland Topo	QL0	2-3 years	$53,064	Unable to quantify	I don't know	I don't know	Major
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	None	None	Major
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	None	None	Major
				Offshore Bathy	Order 2	2-3 years	Unable to quantify	Unable to quantify	None	None	Major
BU 18 – Homeland Security	DoJ: Federal Bureau of Investigation (FBI)	22002	Telecommunications Propagation Modeling and Tower Siting	Inland Topo	QL2	Annually	$1,447	$1,447	None	None	None
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Major
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Minor	Minor	Major
				Offshore Bathy	Order 2	2-3 years	Unable to quantify	Unable to quantify	Minor	Minor	Major
BU 19 – Land Navigation	DoJ: Federal Bureau of Investigation (FBI)	60712	Land Navigation and Safety	Inland Topo	QL0 HD	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Major
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	None	Moderate	Moderate
				Offshore Bathy	Order 1	2-3 years	Unable to quantify	Unable to quantify	None	Moderate	Moderate

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 20 – Marine and Riverine Navigation	DoJ: Federal Bureau of Investigation (FBI)	60713	Marine and Riverine Navigation and Safety	Inland Topo	QL0 HD	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Major
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Major
				Offshore Bathy	Order 1	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
BU 21 – Aviation Navigation	DoJ: Federal Bureau of Investigation (FBI)	60714	Aviation Navigation and Safety	Inland Topo	QL0 HD	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Major
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	None	Moderate	Major
				Offshore Bathy	Order 1	2-3 years	Unable to quantify	Unable to quantify	None	Moderate	Major
BU 22 – Infrastructure Management	DoJ: Federal Bureau of Investigation (FBI)	60715	Infrastructure and Construction Management	Inland Topo	QL0 HD	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Major
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Minor	Minor	Moderate
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
				Offshore Bathy	Order 1	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Minor
BU 23 – Urban and Regional Planning	DoJ: Federal Bureau of Investigation (FBI)	60716	Urban and Regional Planning	Inland Topo	QL0 HD	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Offshore Bathy	Order 1	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 24 – Health and Human Services	DoJ: Federal Bureau of Investigation (FBI)	60717	Health and Human Services	Inland Topo	QL0 HD	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Major
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Major
				Offshore Bathy	Order 1	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Major
BU 28 – Telecom-munications	DoJ: Federal Bureau of Investigation (FBI)	60718	Telecommunications	Inland Topo	QL0 HD	Annually	Unable to quantify	Unable to quantify	Minor	Minor	Minor
				Inland Bathy	QL0B	Annually	Unable to quantify	Unable to quantify	Minor	Minor	Major
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	None	None	None
				Offshore Bathy	Order 1	2-3 years	Unable to quantify	Unable to quantify	None	None	None
BU 30 – Maritime and Land Boundary Management	DoJ: Federal Bureau of Investigation (FBI)	60719	Maritime and Land Boundary Management	Inland Topo	QL0 HD	Annually	Unable to quantify	Unable to quantify	Major	Major	Major
				Inland Bathy	QL0B	Annually	Unable to quantify	Unable to quantify	Minor	Moderate	Major
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major

MCA Title: Oil and Gas Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Oil and gas exploration and production. Pipeline and route selection. Facility siting to mitigate geologic hazards. Construction planning. Environmental impact assessment and mitigation. Regulatory compliance.
MCA Title	Oil and Gas Resources
MCA ID	60709
Organization Type	Federal Agencies and Commissions
Organization Name	DoJ: Federal Bureau of Investigation (FBI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL1B	Order 1
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Highly desirable	Highly desirable	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Required	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Required	Highly desirable
DEM	Required	Highly desirable	Required	Highly desirable
Raw point cloud data	Highly desirable	Nice to have	Required	Nice to have
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Nice to have	Nice to have
Full waveform	Nice to have	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Nice to have	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Underwater videography			Nice to have	Required
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Required
Geologic and seismic data	Highly desirable	Nice to have	Highly desirable	Required
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Required
Routes			Highly desirable	Required
Offshore cadastral			Highly desirable	Required
Lease areas			Highly desirable	Required
Fixed obstructions			Highly desirable	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Nice to have	Nice to have	Required	
Land use/land cover	Nice to have	Nice to have	Highly desirable	Highly desirable
Wetlands	Highly desirable	Nice to have	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Nice to have	Nice to have	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Nice to have	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	None	Moderate	Major
Cost savings/cost reduction	Minor	None	Moderate	Moderate
Cost avoidance	Minor	None	Moderate	Minor
Increased revenues	None	None	None	Minor
Mission-driven performance improvements	Minor	Minor	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Moderate	Major

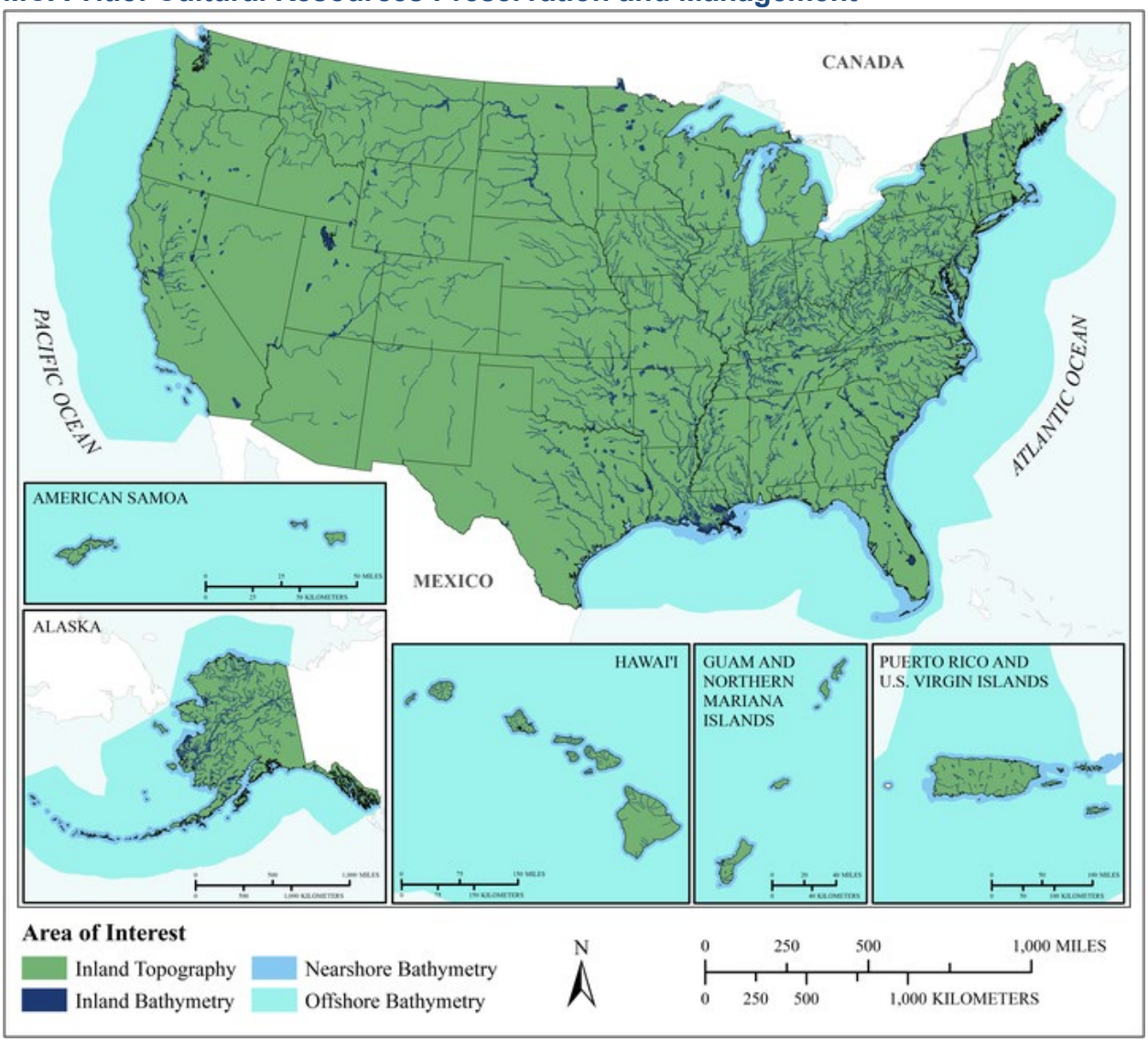
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	None	None	Major
Improved customer experience	Minor	None	None	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	None	Moderate	Major
Environmental	Minor	Minor	Major	Major
Public safety, including life and property	Minor	Minor	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		None			Major	Unable to provide		None		
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Increased revenues	None			None			I don't know	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Minor	Unable to provide		None			I don't know	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			None			Major			Major		
Environmental	Major			Minor			Major			Major		
Public safety, including life and property	Major			Minor			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps			Yes	Yes
Curvature maps			Yes	Yes
Cross sections	Yes		Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60710
Organization Type	Federal Agencies and Commissions
Organization Name	DoJ: Federal Bureau of Investigation (FBI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL1B	Order 1
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Nice to have	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Highly desirable	Nice to have	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Not required	Nice to have
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Nice to have
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Highly desirable	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Nice to have	Highly desirable
Wetlands	Nice to have	Highly desirable	Nice to have	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Nice to have	Highly desirable	Nice to have	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Moderate	Minor	Minor	Minor
Increased revenues	Minor	Minor	None	None
Mission-driven performance improvements	Moderate	Minor	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	Minor

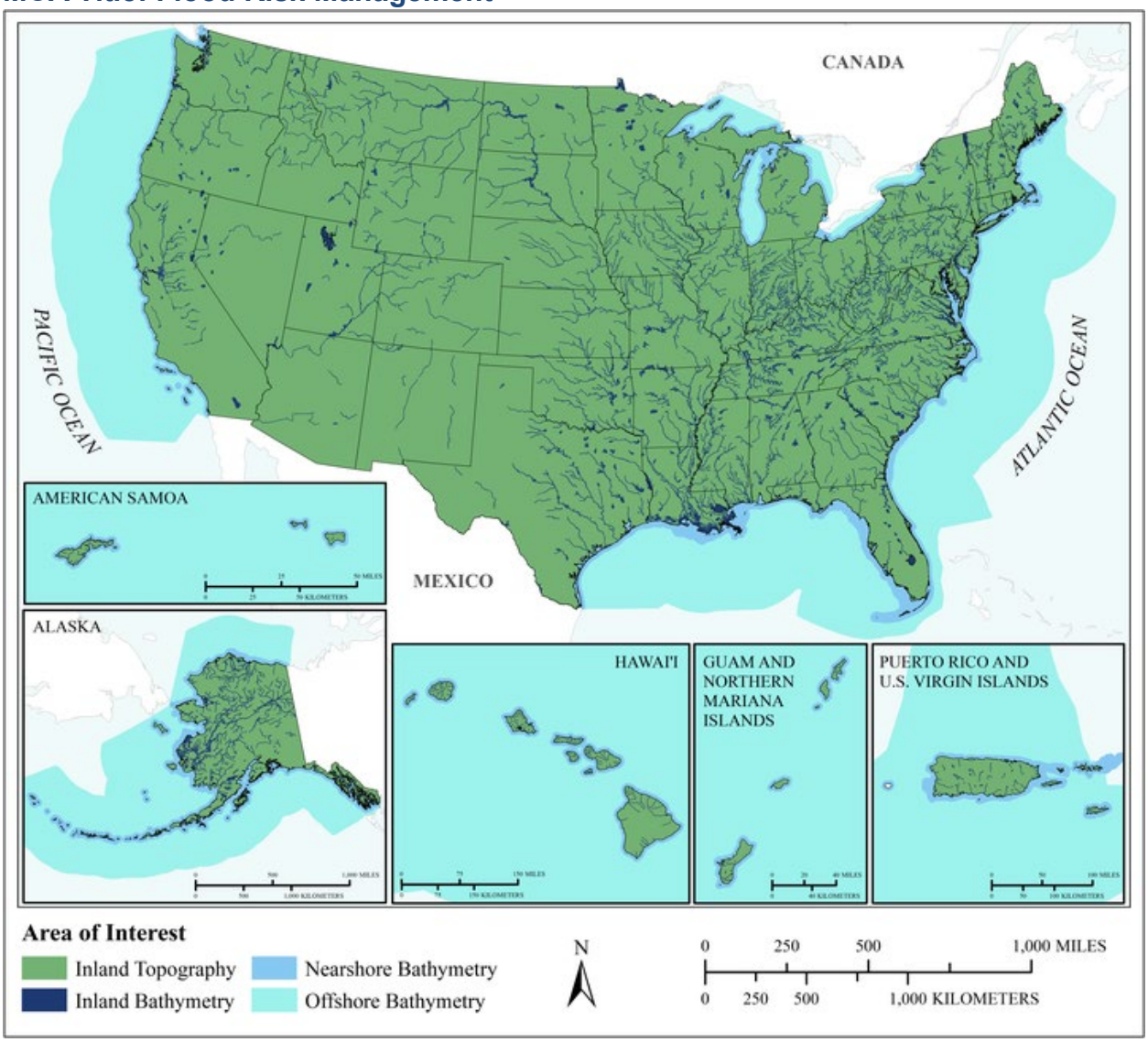
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Major	Minor	Moderate
Improved customer experience	Moderate	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	Minor
Environmental	Moderate	Moderate	Minor	Moderate
Public safety, including life and property	Minor	Moderate	None	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Minor			Minor		
Environmental	Moderate			Moderate			Moderate			Moderate		
Public safety, including life and property	Minor			Minor			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60711
Organization Type	Federal Agencies and Commissions
Organization Name	DoJ: Federal Bureau of Investigation (FBI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL1B	Order 1
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Nice to have
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Not required	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Moderate
Cost avoidance	Major	Moderate	Minor	Moderate
Increased revenues	Minor	Minor	None	None
Mission-driven performance improvements	Major	Moderate	Minor	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	Minor

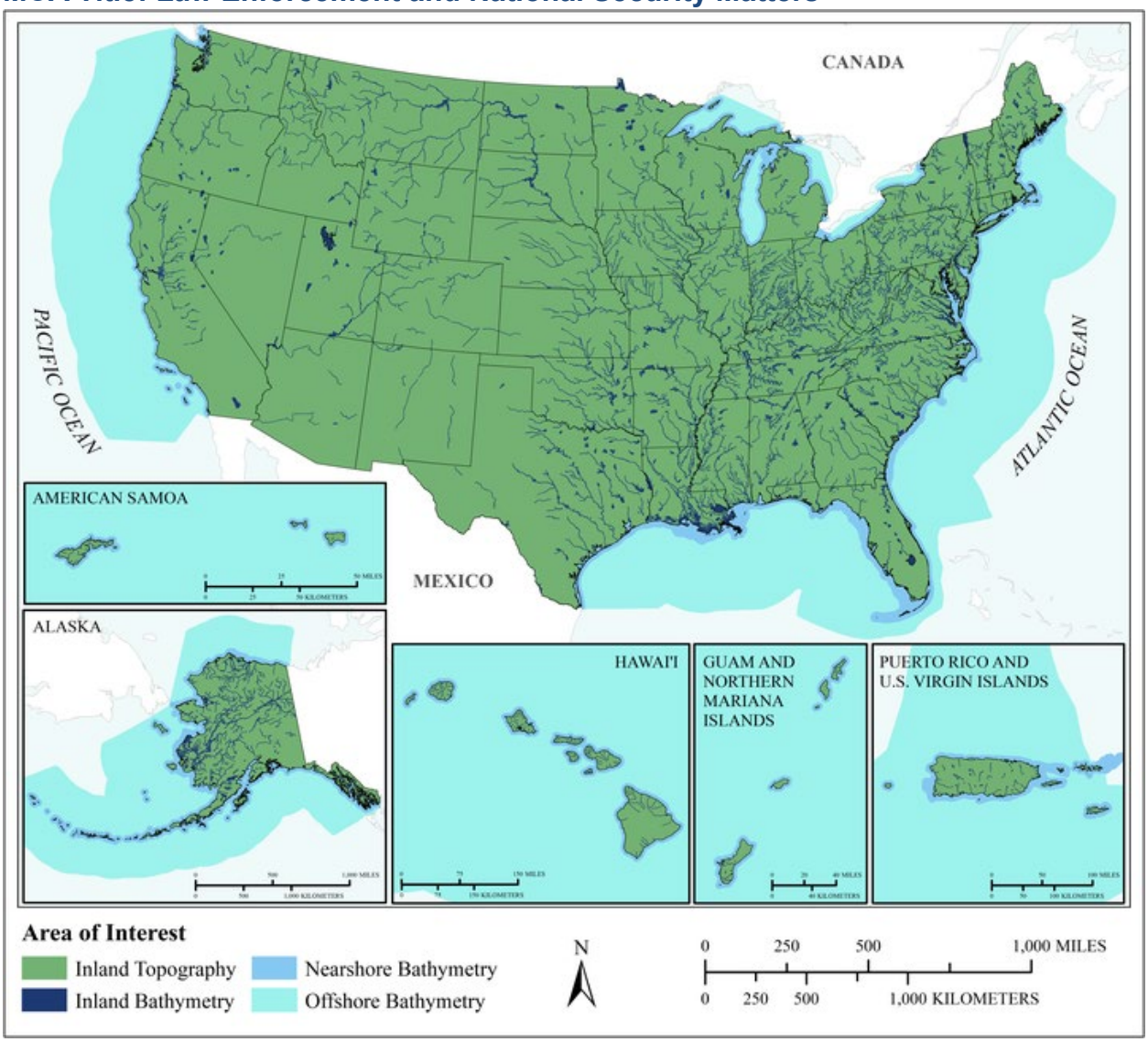
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Minor	Minor	Major
Improved customer experience	Major	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Minor	Minor
Environmental	Moderate	Moderate	Moderate	Minor
Public safety, including life and property	Major	Moderate	Moderate	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major			Moderate		
Environmental	Moderate			Moderate			Moderate			Moderate		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes		Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps			Yes	
Viewshed maps				
Hydrologic Flow Direction Grids	Yes		Yes	
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Law Enforcement and National Security Matters



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	States and/or Territories	States and/or Territories	All study waters	All study waters
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		

MCA Description	Response
Mission Critical Activity	Law Enforcement and national security matters. Infrastructure and border protection. Population dynamics. Line-of-sight analysis in urban areas. Emergency fuel supply and movement. Flood risk analysis resulting from acts of terrorism. Critical infrastructure monitoring. Coastal search and rescue. Mapping in support of criminal, counterintelligence, counterterrorism, and cyber threats. Law enforcement: View large data sets spatially to identify source recruitment opportunities and perform predictive analysis. Tactical operational planning. Disaster response. To protect the American people, the FBI requires the routine use of 3D elevation data. The FBI leverages this data for everything from identifying possible sniper positions, to determining personnel recovery, to continuity of operations planning, to determining new sites for facilities. Without this data, the FBI would have less confidence in many of its assessments on a multitude of threats.
MCA Title	Law Enforcement and National Security Matters
MCA ID	1234
Organization Type	Federal Agencies and Commissions
Organization Name	DoJ: Federal Bureau of Investigation (FBI)
Sub-Agency or Division	Criminal Investigative Division, Intelligence Division
Organization Mission	Protect the American people and uphold the constitution of the United States of America.
Program Name	Law Enforcement and intelligence analysis
Total Annual Program Budget	$3,000,000
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 29 - Military
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Vehicles of all types; Buildings and structures in an urban setting for line-of-sight analysis; Buildings/homes and curtilage.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL1B	Order 2
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	Highly populated areas are more important since they tend to change more often			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 1 meter	Less than 50 cm	I don't know
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm	Less than 10 cm	I don't know
How far onshore needed			500 meters inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Not required	Not required
Full waveform	Nice to have	Nice to have	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Not required
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Nice to have	Nice to have	Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Nice to have
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Not required	Not required
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Nice to have	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Nice to have	Nice to have	Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	Nice to have
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Using basically whatever is in the National Map; also LIDAR collected by the Army Geospatial unit in 2018	Best available from Federal sources	Best available from Federal sources	Best available from Federal sources
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast			Yes	Yes
NCEI	Yes		Yes	Yes
Open Topography	Yes			
NOAA nautical charts			Yes	Yes
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	Multiple	Multiple	Multiple	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Moderate	Moderate
Cost savings/cost reduction	Major	Minor	Moderate	Moderate
Cost avoidance	Major	Major	Major	Major
Increased revenues	I don't know	None	None	None

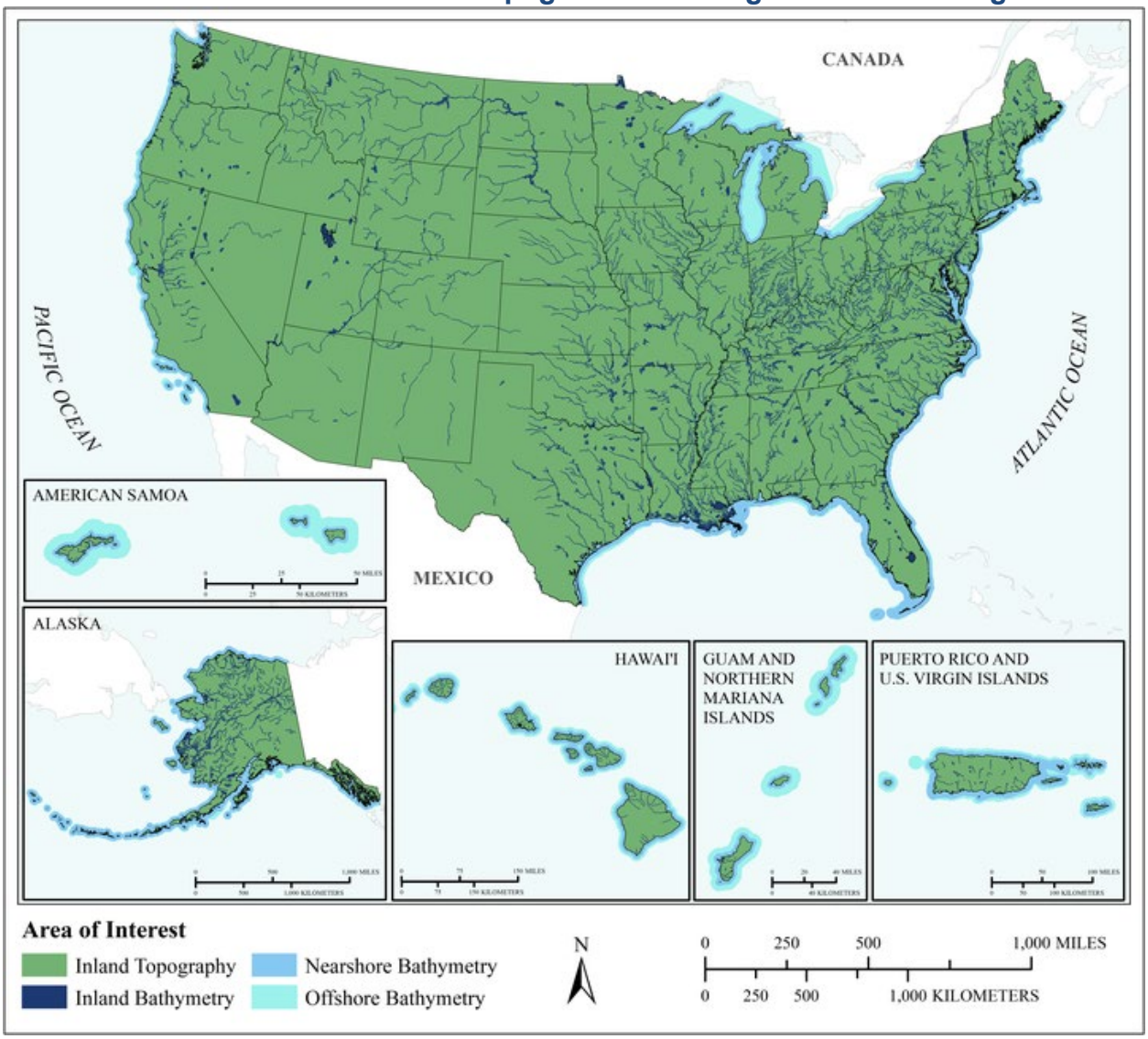
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Major	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	Moderate
Improved response or timeliness	Moderate	Moderate	Moderate	Moderate
Improved customer experience	Moderate	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	None	None	None
Environmental	Minor	None	None	None
Public safety, including life and property	Major	Major	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$53,064	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Time savings description	Would reduce field visits and make areas that are hard to get to, much easier to study. If I don't have to process anything, it will speed up my response time. If the errors are that bad I just dump the data. Doesn't take long when the system is working right. Time saved by not having to acquire and combine datasets to get the desired views.											
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction description	Free is best.											
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance description	Proper 3D data would assist with tactical operations planning and officer safety.											
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Moderate	Annual percent improvement	18%	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements description	Would increase capability. Better information the better the analysis.											
Other operational benefits				Moderate	Unable to provide							
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		None			Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience description	New capabilities.											
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	Would increase our resources for analysis.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			None			None			None		
Environmental	I don't know			None			None			None		
Public safety, including life and property	Major			Major			Major			Major		
Public safety, including life and property description	Some of this could be used for protection of life for both operators and victims											
Other												
Other benefits	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes		
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Telecommunications Propagation Modeling and Tower Siting



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	States and/or Territories	States and/or Territories	States and/or Territories	States and/or Territories
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau

MCA Description	Response
Mission Critical Activity	Radio Frequency (RF) propagation modeling; Telecommunications-tower site locations
MCA Title	Telecommunications Propagation Modeling and Tower Siting
MCA ID	22002
Organization Type	Federal Agencies and Commissions
Organization Name	DoJ: Federal Bureau of Investigation (FBI)
Sub-Agency or Division	Operational Technology Division; Field Office
Organization Mission	Countering threats through technology
Program Name	Antenna Systems Development Facility
Total Annual Program Budget	$300,000
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 28 - Telecommunications
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Building architectural features

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL1B	Order 2
Update Frequency	Annually	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 2 meters	Up to 2 meters	Up to 20 meters
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	Up to 2 meters
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	Nice to have	Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Required	Required
DTM	Required	Highly desirable	Highly desirable	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	Required
Classified point cloud	Not required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Not required	Nice to have	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Not required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Nice to have	Required
Bottom type			Nice to have	Nice to have
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Required
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Nice to have	Required
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Required
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Highly desirable	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Nice to have	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Highly desirable	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Highly desirable	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	1/3 arc-second NED			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate	Moderate	Moderate
Cost savings/cost reduction	Major	Moderate	Moderate	Minor
Cost avoidance	Major	Moderate	Moderate	Minor
Increased revenues	None	None	None	None
Mission-driven performance improvements	Moderate	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Minor	Minor

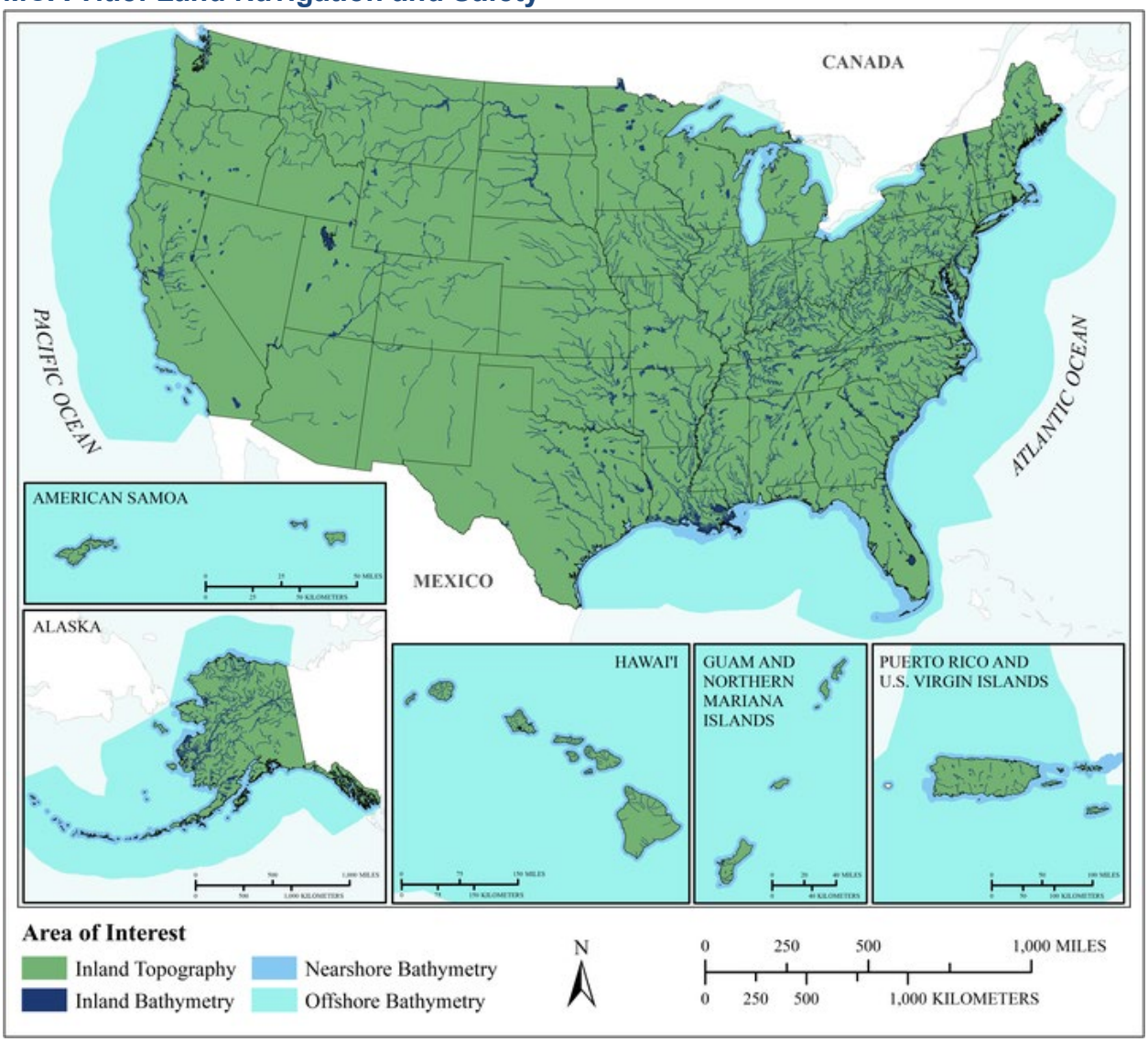
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Moderate	Moderate	Moderate
Improved customer experience	Major	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Moderate	Minor	None
Environmental	None	Moderate	Minor	Minor
Public safety, including life and property	None	Major	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$1,447	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	None			Major	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Cost avoidance	None			Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Annual dollars saved/realized	$1,447	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			Minor			Minor			Minor		
Environmental	None			Moderate			Minor			Minor		
Public safety, including life and property	None			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades			Yes	
Slope maps			Yes	
Aspect maps				
Curvature maps		Yes		
Cross sections		Yes	Yes	
Height-Above-Ground maps	Yes	Yes	Yes	Yes
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness		Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60712
Organization Type	Federal Agencies and Commissions
Organization Name	DoJ: Federal Bureau of Investigation (FBI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Day-to-day is not needed
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL1B	Order 1
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	Highly desirable	Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Highly desirable	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	Highly desirable
Full waveform	Nice to have	Nice to have	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Highly desirable	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Highly desirable	Required
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	Required
Water column properties - Physical			Highly desirable	Required
Water column properties - Chemical			Highly desirable	Required
Water column properties - Biological			Highly desirable	Required
Currents			Highly desirable	Required
Tide/wave heights			Highly desirable	Required
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Highly desirable	Required
Boundaries			Highly desirable	Required
Routes			Highly desirable	Required
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Required
Fixed obstructions			Highly desirable	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Nice to have	Required	Highly desirable	
Land use/land cover	Highly desirable	Required	Highly desirable	Required
Wetlands	Required	Required	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Required
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	Minor
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Moderate	Minor	Minor	Minor
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Minor	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	None

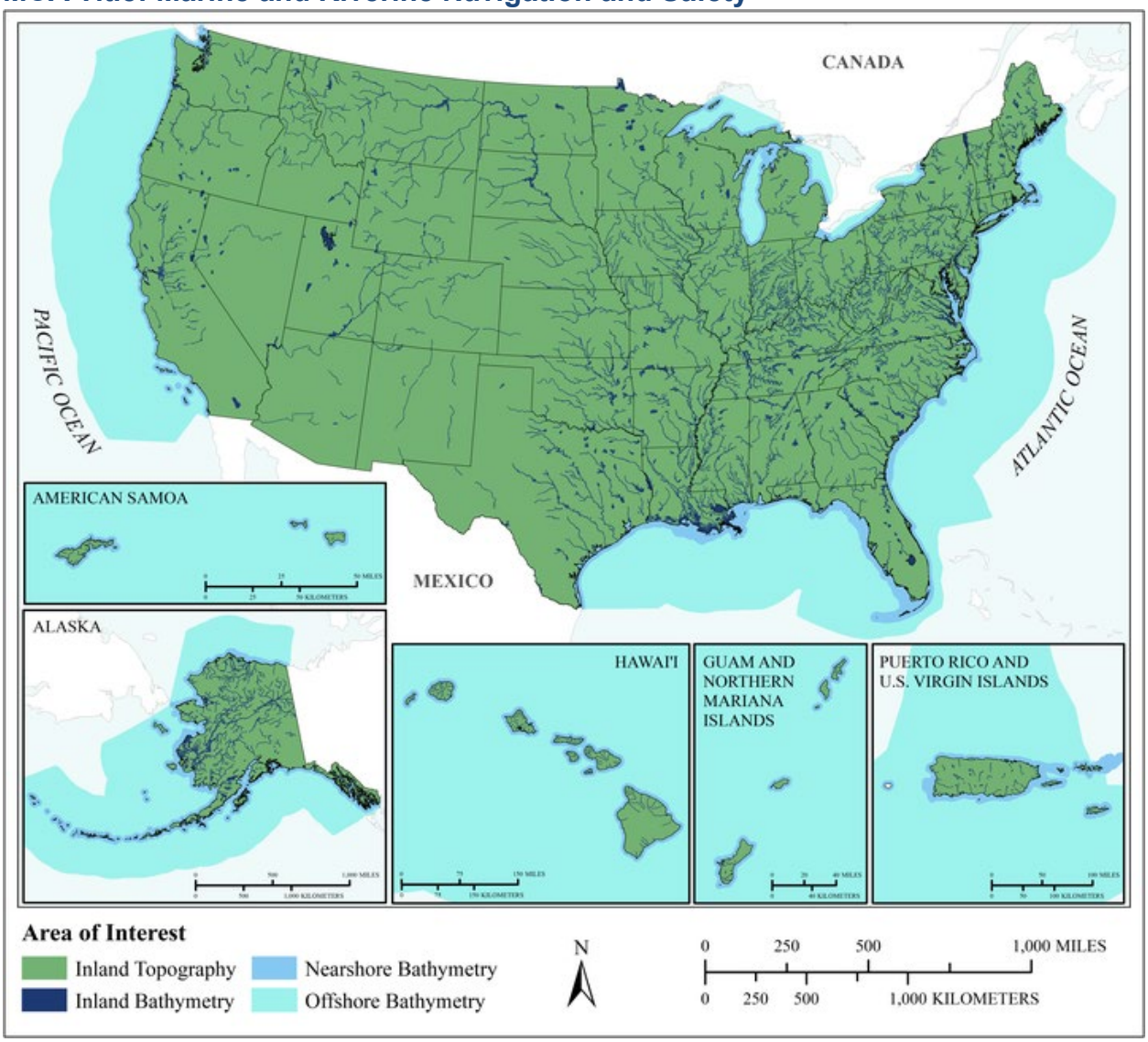
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Minor	None	None
Improved customer experience	Major	Minor	None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	None	None
Environmental	Moderate	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None			None		
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			None			None		
Environmental	Major			Moderate			Moderate			Moderate		
Public safety, including life and property	Major			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60713
Organization Type	Federal Agencies and Commissions
Organization Name	DoJ: Federal Bureau of Investigation (FBI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL1B	Order 1
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Required	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required	Required	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Required	Required
DTM	Required	Highly desirable	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Nice to have	Required	Highly desirable
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Highly desirable	Highly desirable
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Nice to have	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Nice to have	Not required
Bottom texture			Required	Highly desirable
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Highly desirable	Required
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Required
Tide/wave heights			Required	Required
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Required
Routes			Required	Required
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Required	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	Required
Wetlands	Highly desirable	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Required	
Cultural resources	Required	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast			Yes	
NCEI	Yes		Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Moderate	Major	Major
Increased revenues	Moderate	Minor	Minor	Minor
Mission-driven performance improvements	Moderate	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major

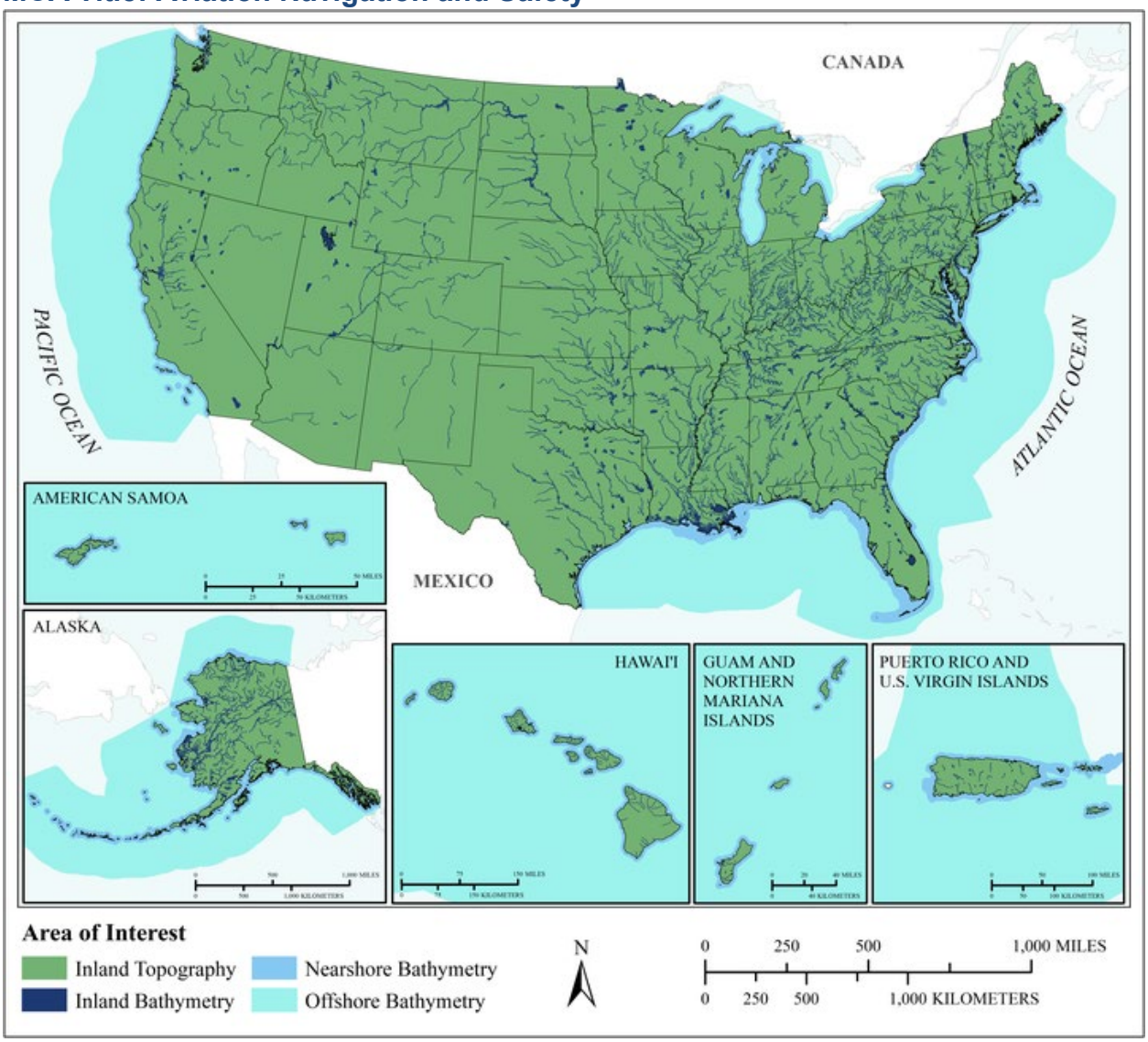
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Major	Major	Major
Improved customer experience	Moderate	Moderate	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Moderate	Moderate
Environmental	Major	Moderate	Major	Major
Public safety, including life and property	Major	Major	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			Minor			Moderate		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60714
Organization Type	Federal Agencies and Commissions
Organization Name	DoJ: Federal Bureau of Investigation (FBI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Worldwide
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL1B	Order 1
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 10 meters	Up to 20 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 50 cm	Up to 2 meters
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Not required
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Required	Required	Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Highly desirable	Required	Required	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Highly desirable	Required
DTM	Required	Required	Highly desirable	Nice to have
DEM	Required	Required	Highly desirable	Highly desirable
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	Not required
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	Not required
Full waveform	Highly desirable	Nice to have	Nice to have	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Not required
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Highly desirable
Tide Predictions			Nice to have	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	Required
Ground control/ground truthing	Required	Required	Required	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Not required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Highly desirable	Nice to have
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Not required	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Nice to have
Tide/wave heights			Highly desirable	Required
Sea ice conditions			Nice to have	Highly desirable
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Nice to have	Nice to have
Lease areas			Not required	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	Required
Wetlands	Highly desirable	Required	Highly desirable	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Not required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Nice to have	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	None
Cost savings/cost reduction	Major	Major	Minor	None
Cost avoidance	Major	Major	Minor	None
Increased revenues	Major	None	None	None
Mission-driven performance improvements	Major	Major	None	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	None

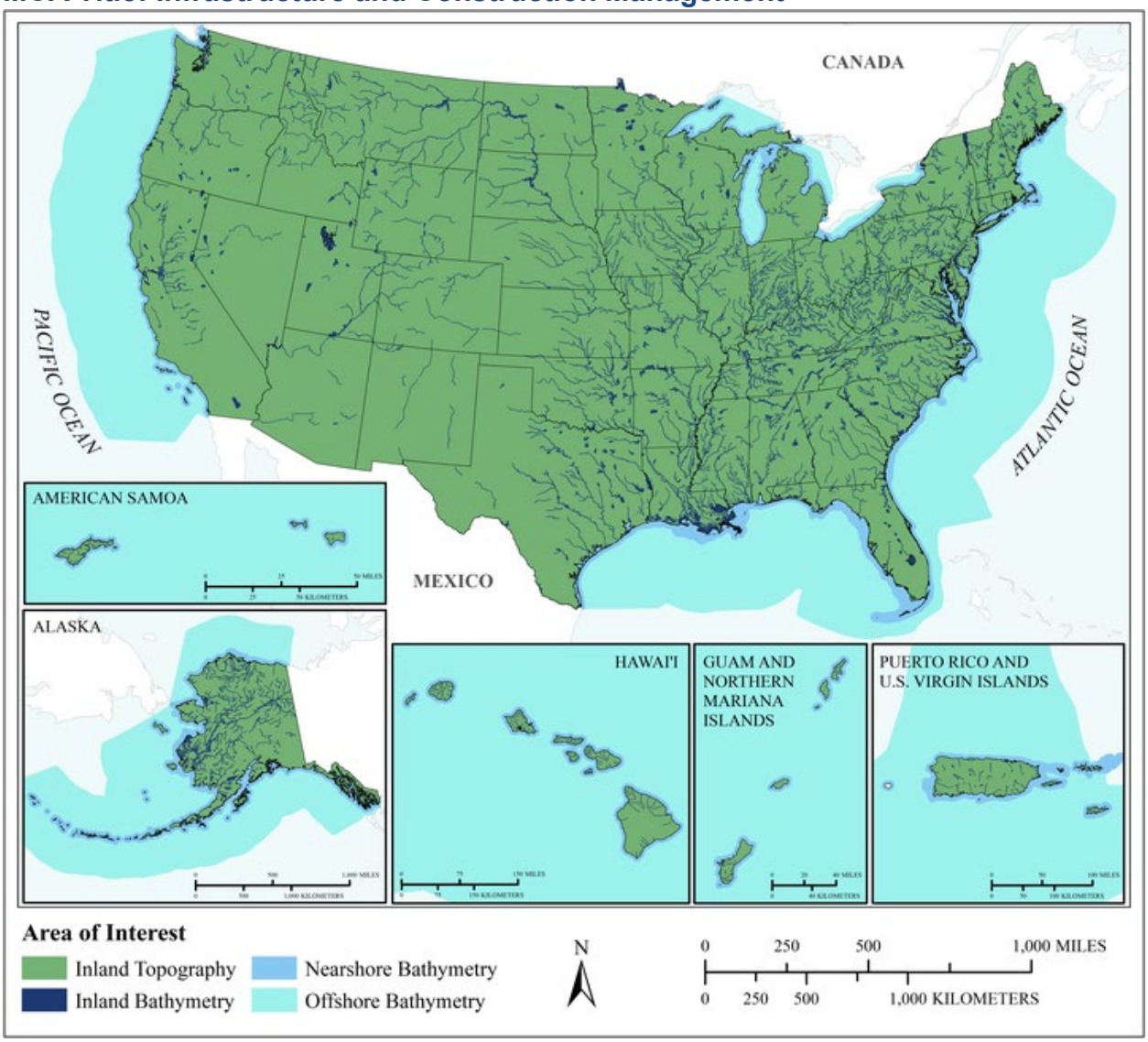
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	None	None
Improved customer experience	Major	Major	None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Minor	None	None
Environmental	Major	Moderate	None	None
Public safety, including life and property	Major	Moderate	None	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			None			None		
Environmental	Moderate			Major			Moderate			Moderate		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes		Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps	Yes		Yes	Yes
Cross sections				
Height-Above-Ground maps	Yes		Yes	Yes
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60715
Organization Type	Federal Agencies and Commissions
Organization Name	DoJ: Federal Bureau of Investigation (FBI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL1B	Order 1
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Not required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Required	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Highly desirable	Nice to have
Underwater videography			Not required	Nice to have
Bottom texture			Not required	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Not required	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Highly desirable	Nice to have
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	Moderate
Cost savings/cost reduction	Major	Moderate	Minor	Minor
Cost avoidance	Major	Moderate	Minor	Minor
Increased revenues	None	None	None	Minor
Mission-driven performance improvements	Major	Moderate	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	Moderate

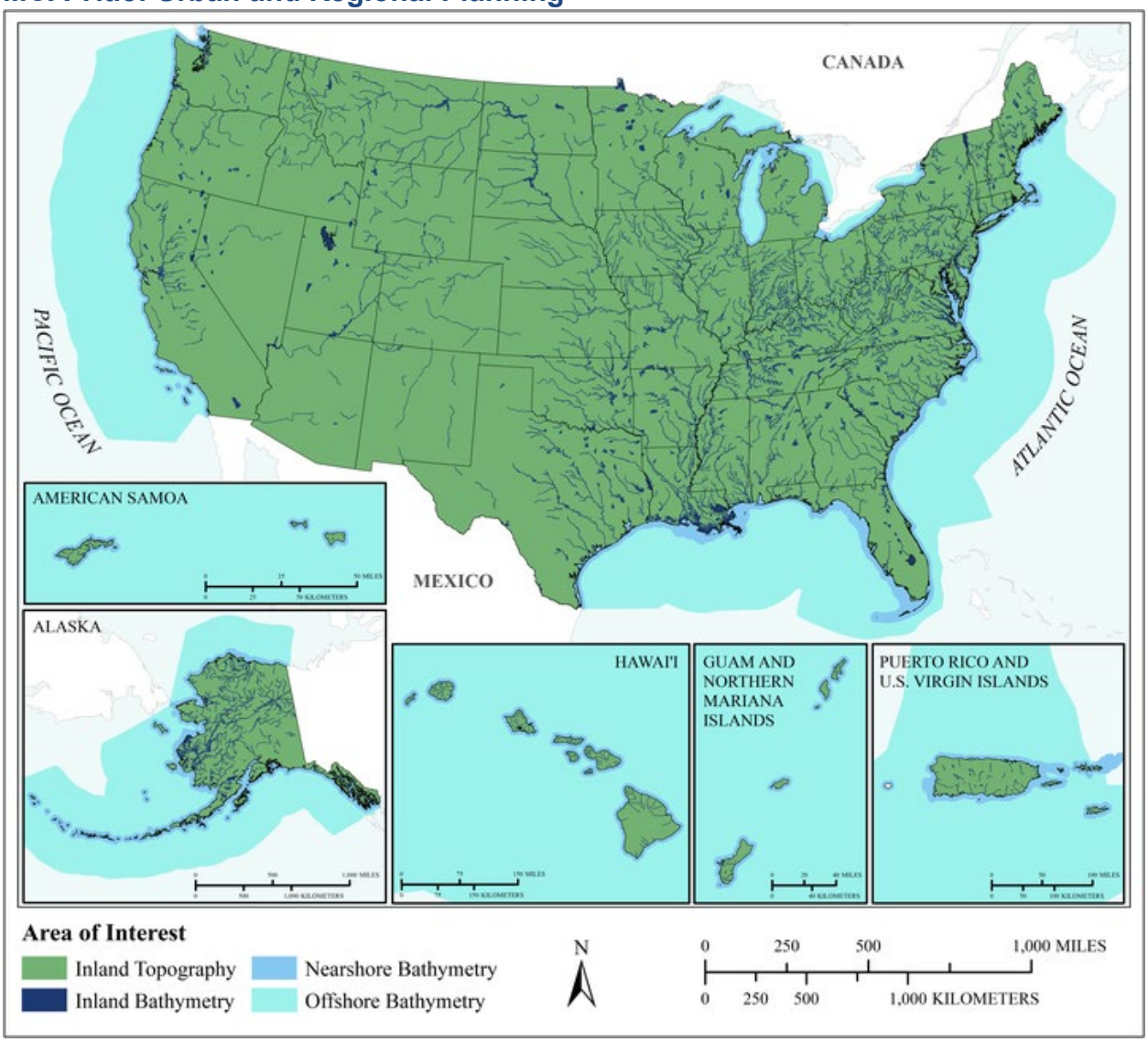
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Moderate	Minor	Moderate
Improved customer experience	Moderate	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	Moderate
Environmental	Moderate	Minor	Minor	Minor
Public safety, including life and property	Moderate	Moderate	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor			Minor		
Environmental	Moderate			Minor			Moderate			Moderate		
Public safety, including life and property	Major			Moderate			Moderate			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	Yes
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	Yes
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	Yes
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes	Yes	Yes
Building footprints	Yes			Yes
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60716
Organization Type	Federal Agencies and Commissions
Organization Name	DoJ: Federal Bureau of Investigation (FBI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL1B	Order 1
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Required	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	Required
DTM	Required	Required	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Nice to have	Highly desirable	Highly desirable
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Highly desirable
Full waveform	Nice to have	Nice to have	Nice to have	Required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Highly desirable
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Not required	Nice to have
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Not required	Highly desirable
Water column properties - Chemical			Not required	Highly desirable
Water column properties - Biological			Not required	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Nice to have	Required
Routes			Nice to have	Highly desirable
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	Major
Cost savings/cost reduction	Major	Minor	Minor	Major
Cost avoidance	Major	Minor	Minor	Major
Increased revenues	Minor	None	None	Moderate
Mission-driven performance improvements	Major	Moderate	Minor	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	Major

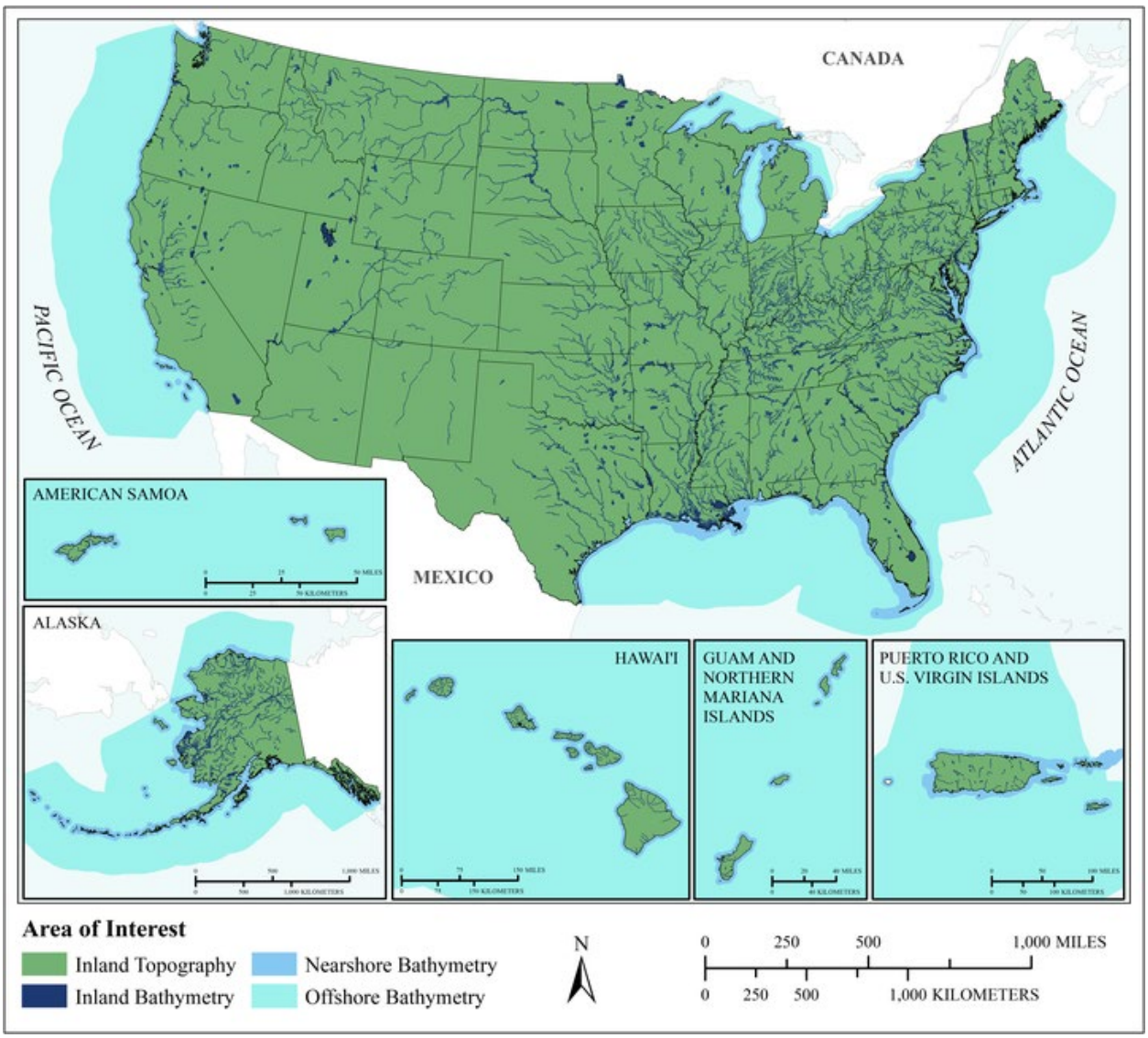
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Minor	Minor	Major
Improved customer experience	Major	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	Major
Environmental	Major	Minor	Minor	Major
Public safety, including life and property	Major	Moderate	Minor	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Major		
Environmental	Major			Moderate			Moderate			Major		
Public safety, including life and property	Major			Major			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours	Yes	Yes		
Hillshades		Yes		
Slope maps		Yes		
Aspect maps		Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps		Yes		
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Health and Human Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Health emergency response. Habitat modeling and disease prevention. Defining boundaries for health advisories for swimming and fishing. Marine-based bioproducts and pharmaceuticals. Public health and safety. Prevention of waterborne diseases.
MCA Title	Health and Human Services
MCA ID	60717
Organization Type	Federal Agencies and Commissions
Organization Name	DoJ: Federal Bureau of Investigation (FBI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 24 - Health and Human Services
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL1B	Order 1
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 20 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Up to 2 meters
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Nice to have	Nice to have	Nice to have
DEM	Highly desirable	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Nice to have
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Highly desirable	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Not required	Not required	Not required
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Not required	Not required
Acoustic imagery of the seafloor			Not required	Not required
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Not required	Not required
Geologic and seismic data	Nice to have	Nice to have	Not required	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Not required	Not required
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Not required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Nice to have	Highly desirable	Highly desirable	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	None	None	None
Cost savings/cost reduction	Minor	None	None	None
Cost avoidance	Minor	None	None	None
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Minor	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	Moderate

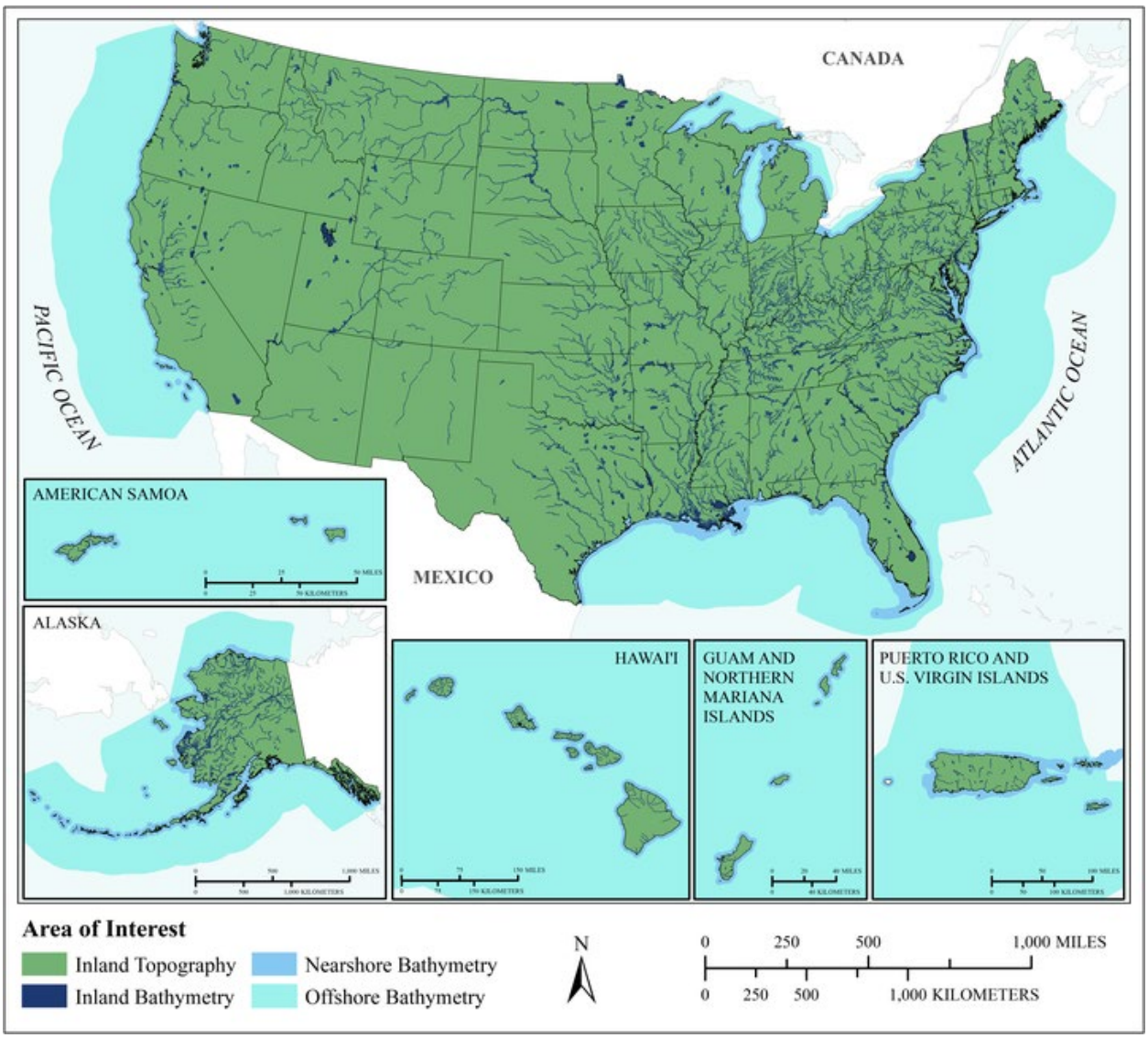
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Moderate	Moderate	Moderate
Improved customer experience	Major	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	Minor
Environmental	Moderate	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Major	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	None			I don't know	Unable to provide		I don't know	Unable to provide		None		
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor			Minor			Minor		
Environmental	Moderate			Moderate			Moderate			Moderate		
Public safety, including life and property	Major			Major			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes	Yes		
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps	Yes	Yes	Yes	Yes
Cross sections				
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)		Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Telecommunications



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Telecommunication tower site selection. Design of radio and radar systems. Interference analysis. Path profiles. Undersea telecommunication route selection and deployment.
MCA Title	Telecommunications
MCA ID	60718
Organization Type	Federal Agencies and Commissions
Organization Name	DoJ: Federal Bureau of Investigation (FBI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL1B	Order 1
Update Frequency	Annually	Annually	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Highly desirable	Nice to have	Required	Required
Entire AOI under same environmental conditions	Required	Not required	Highly desirable	Nice to have	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have	Not required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Not required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	Nice to have
DTM	Highly desirable	Nice to have	Highly desirable	Nice to have
DEM	Highly desirable	Nice to have	Highly desirable	Nice to have
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	Nice to have
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	Required
Full waveform	Highly desirable	Nice to have	Highly desirable	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Highly desirable	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Not required	Highly desirable	Nice to have
Ground control/ground truthing	Highly desirable	Nice to have	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Not required
Nautical and/or navigation charts			Nice to have	Not required
Acoustic imagery of the seafloor			Nice to have	Not required
Aerial and/or satellite imagery	Required	Required	Highly desirable	Not required
Underwater videography			Nice to have	Not required
Bottom texture			Nice to have	Not required
Bottom type			Nice to have	Not required
Submerged features			Nice to have	Not required
Subbottom characteristics			Nice to have	Not required
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Not required
Water column properties - Physical			Nice to have	Not required
Water column properties - Chemical			Nice to have	Not required
Water column properties - Biological			Nice to have	Not required
Currents			Nice to have	Not required
Tide/wave heights			Nice to have	Not required
Sea ice conditions			Nice to have	Not required
Habitat distribution and classification			Nice to have	Not required
Boundaries			Highly desirable	Not required
Routes			Nice to have	Not required
Offshore cadastral			Highly desirable	Not required
Lease areas			Nice to have	Not required
Fixed obstructions			Highly desirable	Not required
Floating observation/navigation systems			Nice to have	Not required
Shorelines – current, historic, change rates	Nice to have	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Not required
Wetlands	Required	Required	Highly desirable	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	Not required
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Required	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI		Yes		
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	None
Cost savings/cost reduction	Major	Major	Moderate	None
Cost avoidance	Major	Major	Moderate	None
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Moderate	Minor	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	None

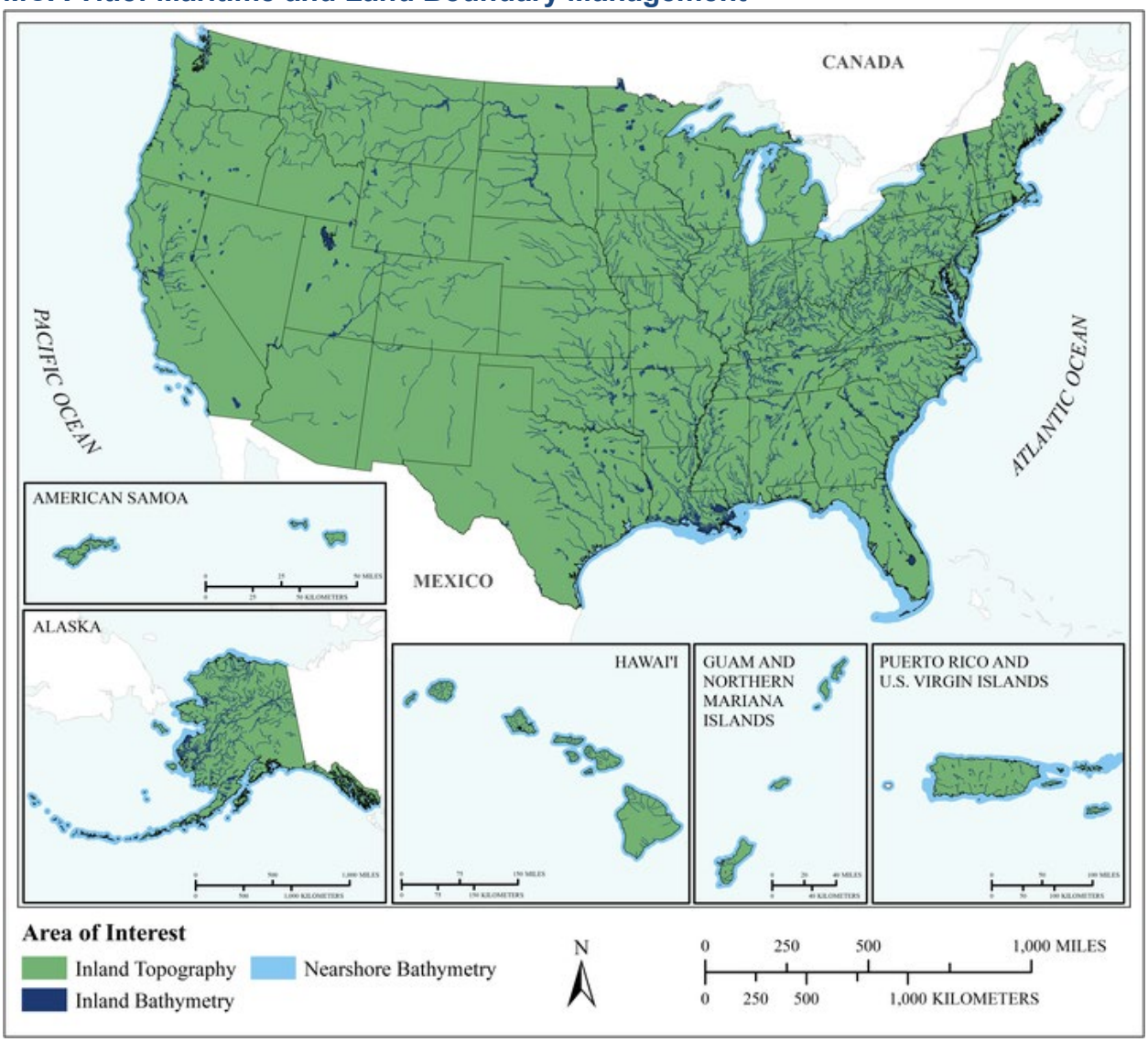
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Moderate	None
Improved customer experience	Major	Major	Moderate	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Minor	Minor	None
Environmental	None	Minor	Minor	None
Public safety, including life and property	Major	Major	Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		None		
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		None		
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		None			None		
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		None		
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			None			None		
Environmental	Minor			Minor			None			None		
Public safety, including life and property	Minor			Major			None			None		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60719
Organization Type	Federal Agencies and Commissions
Organization Name	DoJ: Federal Bureau of Investigation (FBI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B	QL1B	
Update Frequency	Annually	Annually	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have		Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Required	Required	Required	
DEM	Highly desirable	Required	Required	
Raw point cloud data	Nice to have	Highly desirable	Required	
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	
Ground control/ground truthing	Highly desirable	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Required	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate	None	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Moderate	Minor	Minor	
Increased revenues	None	Moderate	None	
Mission-driven performance improvements	Major	Minor	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Minor	Minor	
Improved customer experience	Major	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	
Environmental	Major	Moderate	Minor	
Public safety, including life and property	Minor	Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Minor			Moderate					
Environmental	Major			Moderate			Moderate					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

Federal Communications Commission (FCC)

The FCC regulates interstate and international communications by radio, television, wire, satellite, and cable in all 50 states, the District of Columbia, and U.S. territories. An independent U.S. government agency overseen by Congress, the Commission is the federal agency responsible for implementing and enforcing America's communications law and regulations.

The availability of accurate and consistent nationwide elevation data would benefit the agency's work facing economic opportunities and challenges associated with rapidly evolving advances in global communications. This includes the following:

- Promoting competition, innovation and investment in broadband services and facilities.
- Supporting the nation's economy by ensuring an appropriate competitive framework for the unfolding of the communications revolution.
- Encouraging the highest and best use of spectrum domestically and internationally.
- Revising media regulations so that new technologies flourish alongside diversity and localism.
- Providing leadership in strengthening the defense of the nation's communications infrastructure.

Current status of elevation data for FCC

Elevation data are used to determine line-of-sight conditions between transmit and receive locations and as inputs to automated propagation prediction software that informs radiofrequency spectrum sharing policies to foster the efficient use of spectrum nationwide.

Importance of elevation data to FCC

Elevation data are used throughout the FCC. Office of Engineering and Technology is one of the offices in FCC that uses elevation data for propagation modeling and analysis of communications services utilizing the radiofrequency spectrum. Those analyses are used to inform policies established by the Commission and its Bureaus that are responsible for major business sectors, such as media, satellite, and wireless telecommunication networks and service companies.

High-level summary of elevation data requirements

Many communications towers are located either in or adjacent to urban areas with high population density and in low-lying areas near shorelines or adjacent to water. Quality Level 1 data will be crucial in performing propagation modeling and analysis of radiofrequency spectrum usage in urban areas because the behavior of radio waves depends on the topology as well as the underlying terrain. Having more accurate lidar information will result in higher confidence in the modeling results. Cross sections and/or transects suffice for inland and nearshore bathymetric requirements. Offshore bathymetric requirements are unknown. Inland topography and bathymetry require an update frequency of every 2-3 years while nearshore and offshore bathymetry require updates every 10 years.

High-level summary of benefits that would come from higher resolution elevation data

Benefits to FCC and applicants include the ability to provide simplified, consistent, and reliable processes for radiofrequency spectrum usage and interference analyses. Better spectrum management, frequency coordination, and licensing of non-federal radio communications facilities will be possible when using accurate and consistent higher resolution elevation data nationwide. More accurate and reliable propagation studies by can be performed by applicants for radio licenses. Simpler and quicker approvals will be possible when the FCC and applicants all use the same nationwide coverage of lidar data for radiofrequency spectrum usage and interference analyses. As a consequence, better use will be made of

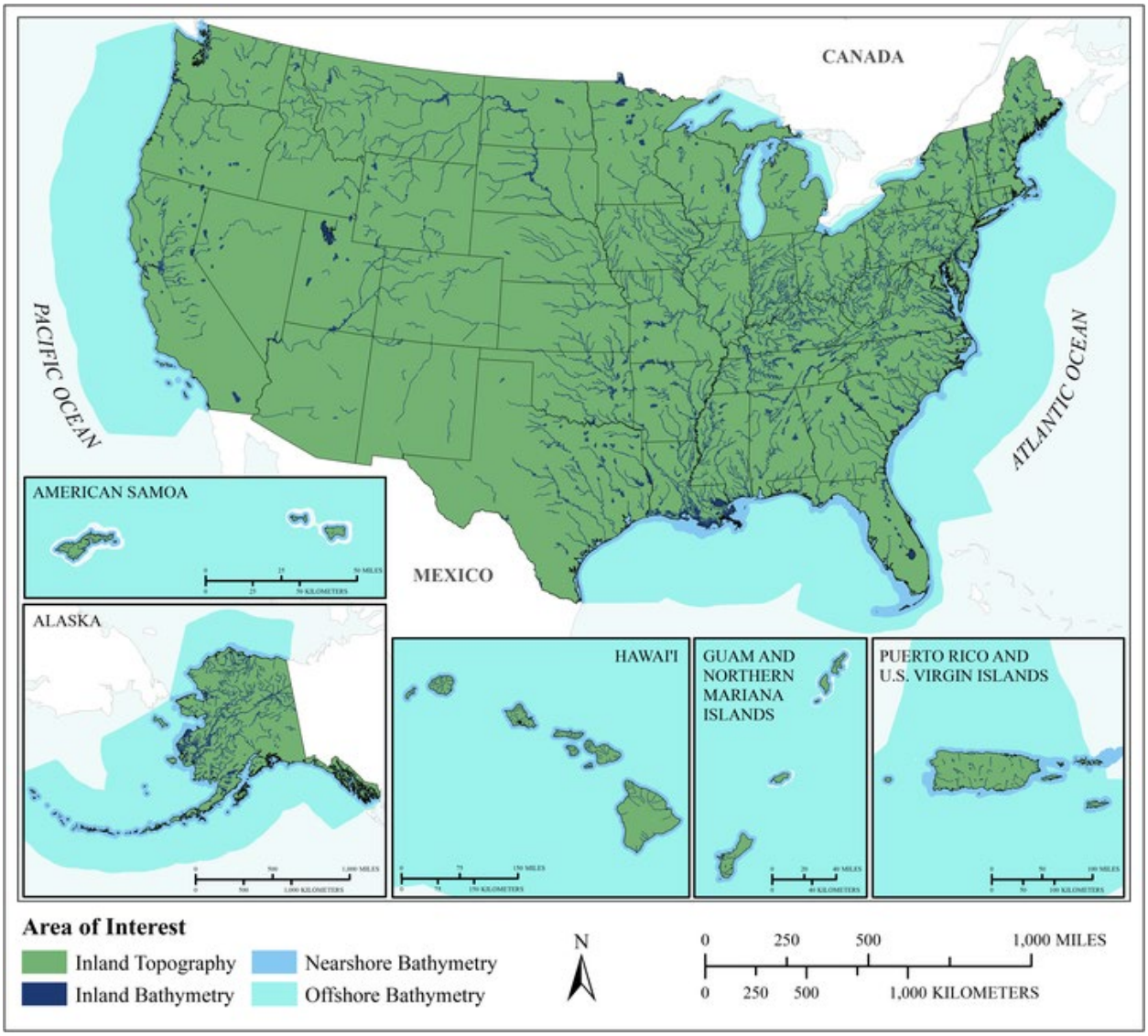
the spectrum, benefitting all who use broadband services for improved productivity and competitiveness. The public benefits when better data can be harnessed to enable communications technologies to spur economic growth, job creation, U.S. competitiveness, and public safety.

FCC has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 28 – Telecom-munications	Federal Communications Commission (FCC)	1201	Communication Network Management	Inland Topo	QL1	2-3 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
				Inland Bathy	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
				Nearshore Bathy	Cross sections and/or transects meet needs	>10 years	Unable to quantify	Unable to quantify	None	None	None
				Offshore Bathy	I don't know	>10 years	Unable to quantify	Unable to quantify	None	None	None

MCA Title: Communication Network Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	States and/or Territories	States and/or Territories	All study waters	One or more national maritime boundaries
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		Federal waters

MCA Description	Response
Mission Critical Activity	Analysis of advanced radio and radar systems. Interference analysis. Incumbent wireless provider coverage analysis. Ensure that all Americans have access to robust, affordable broadband and voice services. Evaluate devices and technologies to determine interference risk potential and applicable standards. Harmonize frequencies with Canada. Bathymetry may also be used for verification of depth to undersea cables.
MCA Title	Communication Network Management
MCA ID	1201
Organization Type	Federal Agencies and Commissions
Organization Name	Federal Communications Commission (FCC)
Sub-Agency or Division	Office of Engineering Technology (OET); Wireless Telecommunications Bureau (WTB) - Technology, Systems and Innovation Division; and Wireline Competition Bureau (WCB); Office of Economics and Analytics (OEA)
Organization Mission	FCC's mission is to make available a rapid and efficient wire and radio communication service network for the purpose of national defense and promoting safety of life and property, to promote reliable, interconnected, and interoperable communications infrastructure, to assist in preparing for and responding to emergencies and major disasters, to utilize technical knowledge of public safety, homeland security, and disaster management issues, and to employ effective technical and economic analysis to develop policies that enhance spectrum access, management, and use so as to maximize the availability of broadband
Program Name	Office of Engineering Technology (OET); Wireless Telecommunications Bureau (WTB) - Technology, Systems and Innovation Division; and Wireline Competition Bureau (WCB); Office of Economics and Analytics (OEA)
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 28 - Telecommunications
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Individual buildings

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	I don't know
Update Frequency	2-3 years	2-3 years	>10 years	>10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 1 meter	I don't know
Acceptable Vertical Error	Up to 10 cm	Up to 50 cm	Up to 1 meter	I don't know
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	To MLLW		Below MLLW	
Tide correction requirement			I don't know	I don't know
Cross sections and/or transects meet needs		Yes	Yes	
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Nice to have	Nice to have	Nice to have	Required	Required
Entire AOI under same environmental conditions	Required	Nice to have	Nice to have	Nice to have	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Not required	Not required	Not required	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Nice to have	Nice to have	Not required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Nice to have	Not required
DTM	Required	Highly desirable	Nice to have	Not required
DEM	Required	Required	Nice to have	Not required
Raw point cloud data	Nice to have	Not required	Not required	Not required
Classified point cloud	Nice to have	Not required	Not required	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Not required	Not required	Not required
Ground control/ground truthing	Nice to have	Highly desirable	Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	Not required
Nautical and/or navigation charts			Not required	Not required
Acoustic imagery of the seafloor			Not required	Not required
Aerial and/or satellite imagery	Required	Required	Highly desirable	Not required
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Not required	Not required
Submerged features			Not required	Not required
Subbottom characteristics			Not required	Not required
Geologic and seismic data	Highly desirable	Not required	Nice to have	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Not required	Not required
Boundaries			Nice to have	Not required
Routes			Not required	Not required
Offshore cadastral			Highly desirable	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Not required
Floating observation/navigation systems			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	Not required
Wetlands	Required	Required	Highly desirable	Not required
Estuaries			Not required	Not required
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Required	Nice to have	Nice to have	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS 3DEP data	Best available	Best available	Best available
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI	Yes	Yes	Yes	
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server		Yes		
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	None
Cost savings/cost reduction	Major	Major	Moderate	None
Cost avoidance	Major	Major	Moderate	None
Increased revenues	None	None	None	None

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Moderate	None	Minor	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Moderate	None
Improved response or timeliness	Moderate	Moderate	Moderate	None
Improved customer experience	Moderate	Moderate	Moderate	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Minor	Minor	None
Environmental	None	Minor	Minor	None
Public safety, including life and property	Moderate	Minor	Minor	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		None			Minor	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		None		
Mission-driven performance improvements description	Better spectrum management, frequency coordination and licensing of non-Federal radio communications facilities will be possible when using accurate and consistent elevation data nationwide.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		None		
Value added to products or services description	Better use will be made of the spectrum, benefitting all who use broadband services for improved productivity and competitiveness.											
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		None			None		
Improved response or timeliness description	More accurate propagation studies can be performed by applicants for radio licenses. Simpler and quicker approvals will be possible when the FCC and applicants all use the same, nationwide coverage of elevation data for frequency interference analyses.											
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		None		
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			None			None		
Environmental	Minor			Minor			None			None		
Public safety, including life and property	Minor			Minor			None			None		
Public safety, including life and property description	The public benefits when elevation data helps to harness communications technologies to spur economic growth, job creation, U.S. competitiveness, and public safety.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Federal Emergency Management Agency (FEMA)

The mission of FEMA is to help people before, during, and after disasters. FEMA coordinates the federal government's role in preparing for, preventing, mitigating the effects of, responding to, and recovering from all domestic disasters, whether natural or man-made, including acts of terror. FEMA can trace its beginnings to the Congressional Act of 1803. This act, generally considered the first piece of disaster legislation, provided assistance to a New Hampshire town following an extensive fire. In the century that followed, ad hoc legislation was passed more than 100 times in response to hurricanes, earthquakes, floods and other natural disasters. FEMA's activities span the life cycle of disasters. The disaster life cycle describes the process through which emergency managers prepare for emergencies and disasters, respond to them when they occur, help people and institutions recover from them, mitigate their effects, reduce the risk of loss, and prevent disasters from occurring.

Elevation data are an integral input into the rapid damage assessment process, primarily for events that cause damage due to inundation and storm surge. Elevation data are used to develop inundation/depth grids to predict pre-event impacts and to conduct post-event damage assessments by intersecting the depth grid with infrastructure data. For events like hurricanes, both inland and coastal topographic/bathymetric data are required to assess storm surge dynamics and improve storm surge models. Additionally, repeat, high-resolution data can assess changes in landscapes following major disasters that might change overland water flow patterns or amplify storm surge impacts. Likewise, detecting changes in landscape due to landslides, earthquakes, and erosion is possible only with repeat coverage.

Elevation data also inform the National Flood Insurance Program (NFIP), which was established in 1968 to reduce future flood damage through hazard identification and mapping, effective community floodplain management, and insurance protection for property owners. FEMA's management of the NFIP has evolved to best manage mounting flood losses and escalating costs of disaster relief. As originally conceived, the NFIP was the means to get communities and citizens to understand their risk from flooding and to mitigate against future flood damage. Congress provided the incentives to do this by encouraging community participation, discounting premiums for structures built prior to the publication of a Flood Insurance Rate Map (FIRM) for their community, mandating the purchase of flood insurance, and authorizing grant programs to mitigate repetitively damaged structures. The NFIP's flood risk identification and floodplain management land use and building standards reduced the costs and consequences of flooding by an estimated $14 billion from 2000 through 2010. It would be difficult to comprehend what the costs of flooding would be for all levels of government if these standards were not in place. Elevation data support overall NFIP operations including insurance rating and floodplain management.

Elevation requirements vary on the Mission Critical Activity. To perform rapid damage assessments, Quality Level 1 (QL1) inland topography, QL1B inland bathymetry, and QL1B nearshore bathymetry is required every 2-3 years. The NFIP requires QL2 inland topography and cross sections for inland bathymetry updated every 6-10 years, and QL1B nearshore bathymetry and Order 1a offshore bathymetry updated every 10 or more years.

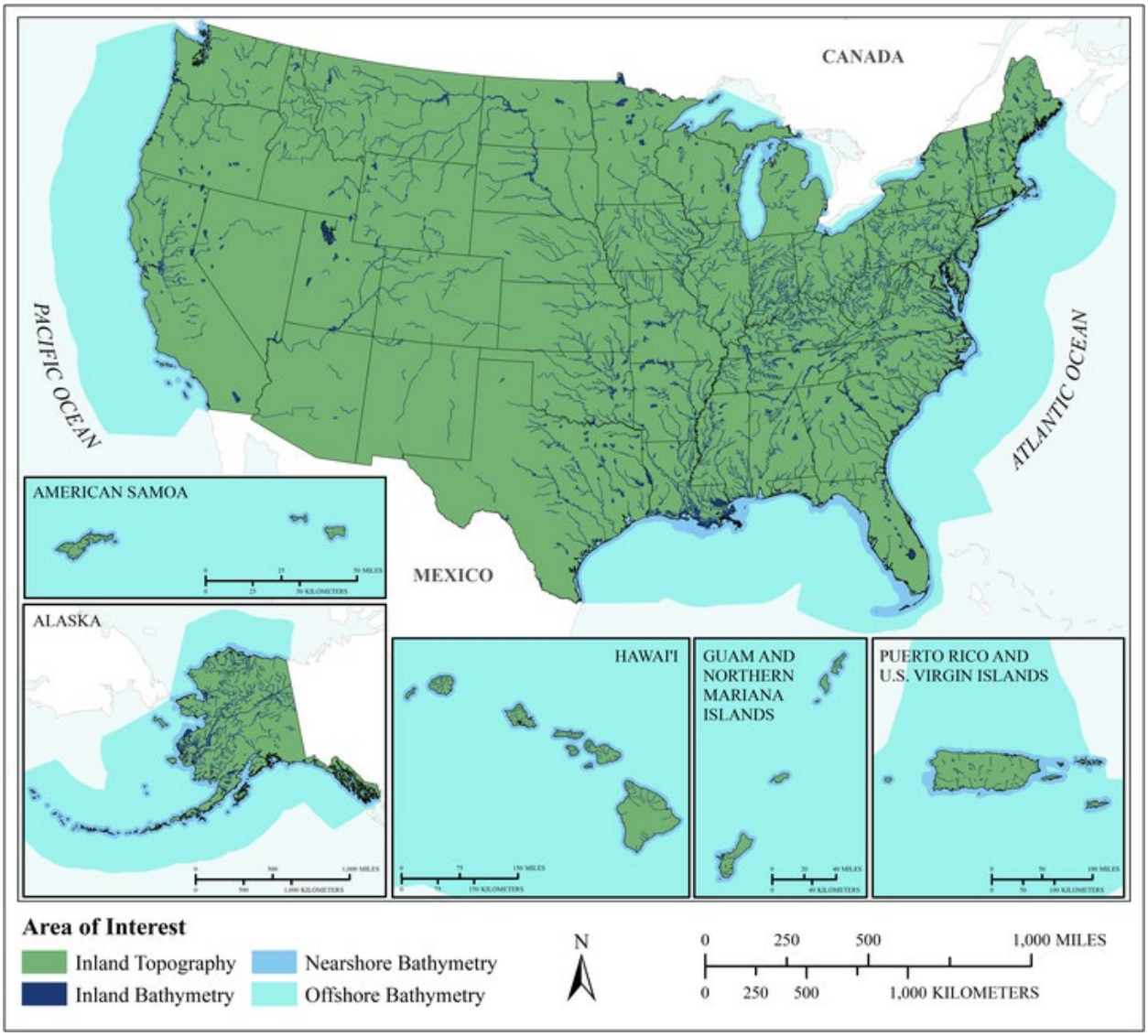
Benefits accruing from higher resolution elevation data include major time savings due to hours saved during field visits, increased data accuracy for inundation mapping and modeling, and reduced data manipulation and errors. There would also be significant data acquisition costs savings.

FEMA has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 15 – Flood Risk Management	DHS: Federal Emergency Management Agency (FEMA)	22354	National Flood Insurance Program	Inland Topo	QL2	6-10 years	$36,909,250	$22,612,500	Moderate	None	Moderate
				Inland Bathy	Cross sections and/or transects meet needs	6-10 years	$4,070,250	Unable to quantify	Minor	None	Minor
				Nearshore Bathy	QL1B	>10 years	$361,800	Unable to quantify	Minor	None	Minor
				Offshore Bathy	(a) Order 1a (b) Order 3	>10 years	Unable to quantify	Unable to quantify	None	None	None
BU 18 – Homeland Security	DHS: Federal Emergency Management Agency (FEMA)	1340	Rapid Damage Assessments for Emergency Response Planning	Inland Topo	QL1	2-3 years	$1,809	Unable to quantify	Moderate	Major	Moderate
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Major

MCA Title: National Flood Insurance Program



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Nationwide, inland areas	Nationwide, inland areas	Custom description	Area split by varying quality level or update frequency
Sub Area Requirements			States and Territories out to the Outer Continental Shelf	States and Territories out to the Outer Continental Shelf

MCA Description	Response
Mission Critical Activity	National Flood Insurance Program. Elevation data support overall operations including insurance rating, floodplain management, LOMAs, etc.
MCA Title	National Flood Insurance Program
MCA ID	22354
Organization Type	Federal Agencies and Commissions
Organization Name	DHS: Federal Emergency Management Agency (FEMA)
Sub-Agency or Division	Resilience
Organization Mission	Helping people before, during, and after disasters.
Program Name	National Flood Insurance Program
Total Annual Program Budget	$4,300,000,000
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Dams, Jetties, Weirs, Seawalls, Levees. Storm surge modeling, slope, depth.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable
Other	Required
Other description	For water bodies, bathymetry is only needed in some circumstances where the waterbody is a segment in a riverine hydraulic system or a subject to closed basin flooding or other unusual flooding circumstances

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs	QL1B	(a) Order 1a (b) Order 3
Update Frequency	6-10 years	6-10 years	>10 years	>10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	In low risk, low population areas our vertical accuracy and update frequency requirements are less. Needs are driven by population and risk. Low population and low risk = less need. AK, outlying islands = lower population, needs a bit lower. Geodetic framework, access also drives availability of data. QL2 in moderate to high risk areas, QL3 in low risk areas.			Offshore needed for storm surge modeling. Low resolution OK for offshore. Nearshore requires finer detail, not even as much as onshore. Order 1a from 10m depth to ½ mi offshore, Order 3 from ½ mi offshore to Outer Continental Shelf
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	Greater than 20 meters
Acceptable Vertical Error	Up to 30 cm	Up to 50 cm	Up to 1 meter	Up to 10 meters
How far onshore needed			We need data that extends from offshore all the way inland across the nation. Normally we use inland topo to cover from mean tide inland	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	To MHW		We need data that extends from offshore all the way inland across the nation. Normally we use inland topo to cover from mean tide inland	
Tide correction requirement			NAVD88	NAVD88
Cross sections and/or transects meet needs		Yes	Partial	Partial
Cross section/transect requirement		FEMA has historically done 1-D step backwater hydraulic modeling on riverine systems. Typically cross section may be 1000 feet apart in open reaches, with additional cross section immediately upstream and downstream of hydraulic structures (culverts, bridges, weirs, etc.) However, full bathymetry better supports 2-D hydraulic modeling which may be one methodology / technology shift that produces major technical capability advances and cost efficiencies. Conversely, many insurance models do not rely on inland bathymetry very much and that is a possible future direction where these data will be less critical to the NFIP.	Historically, FEMA used scattered offshore and near-shore bathy to an AdCIRC Mesh	FEMA typically uses the best available off shore data

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Nice to have

Hydrologic Processing Required	Response
Hydro-conditioning	Nice to have
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Not required	Not required	Not required	Not required
Entire AOI under same environmental conditions	Not required	Not required	Not required	Not required	Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Not required	Not required	Not required	Not required	Not required
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Not required	Required	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	One half TVU	One half TVU	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	One half TVU	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required	Not required	Not required
DTM	Required	Not required	Not required	Not required
DEM	Nice to have	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Highly desirable	Not required	Not required	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Required	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Not required	Not required	Not required
Ground control/ground truthing	Required	Required	Highly desirable	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	Not required
Nautical and/or navigation charts			Not required	Not required
Acoustic imagery of the seafloor			Not required	Not required
Aerial and/or satellite imagery	Nice to have	Not required	Not required	Not required
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Not required	Not required
Submerged features			Not required	Not required
Subbottom characteristics			Not required	Not required
Geologic and seismic data	Not required	Not required	Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Not required	Not required
Boundaries			Not required	Not required
Routes			Not required	Not required
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Not required	Not required
Floating observation/navigation systems			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required	Not required	Not required	
Land use/land cover	Not required	Not required	Not required	Not required
Wetlands	Not required	Not required	Not required	Not required
Estuaries			Not required	Not required
Inland surface water features	Highly desirable	Highly desirable	Not required	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Not required	Not required	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Highly desirable	Highly desirable	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We currently use QL2 - QL4 data depending on the risk in the area. We only buy new QL2 data.	FEMA uses inland bathy where available from USACE, state and local sources, and contracts for field survey when necessary.	We use the best available data from NOAA	Best available
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	Yes
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	Any available state repositories	Typically, these are mission specific repositories for water supply or flood control systems, navigation applications.		
Other		Yes		
Other description		Typically, These are mission specific repositories for water supply or flood control systems, Navigation applications.		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Major	Major
Cost savings/cost reduction	Major	Minor	Major	Major
Cost avoidance	Major	Minor	Major	Major
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Minor	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	None	Minor	None
Improved response or timeliness	Major	None	Minor	None
Improved customer experience	Major	None	Minor	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	None	Major	Moderate
Environmental	Minor	None	Minor	None
Public safety, including life and property	Major	Minor	Major	Moderate

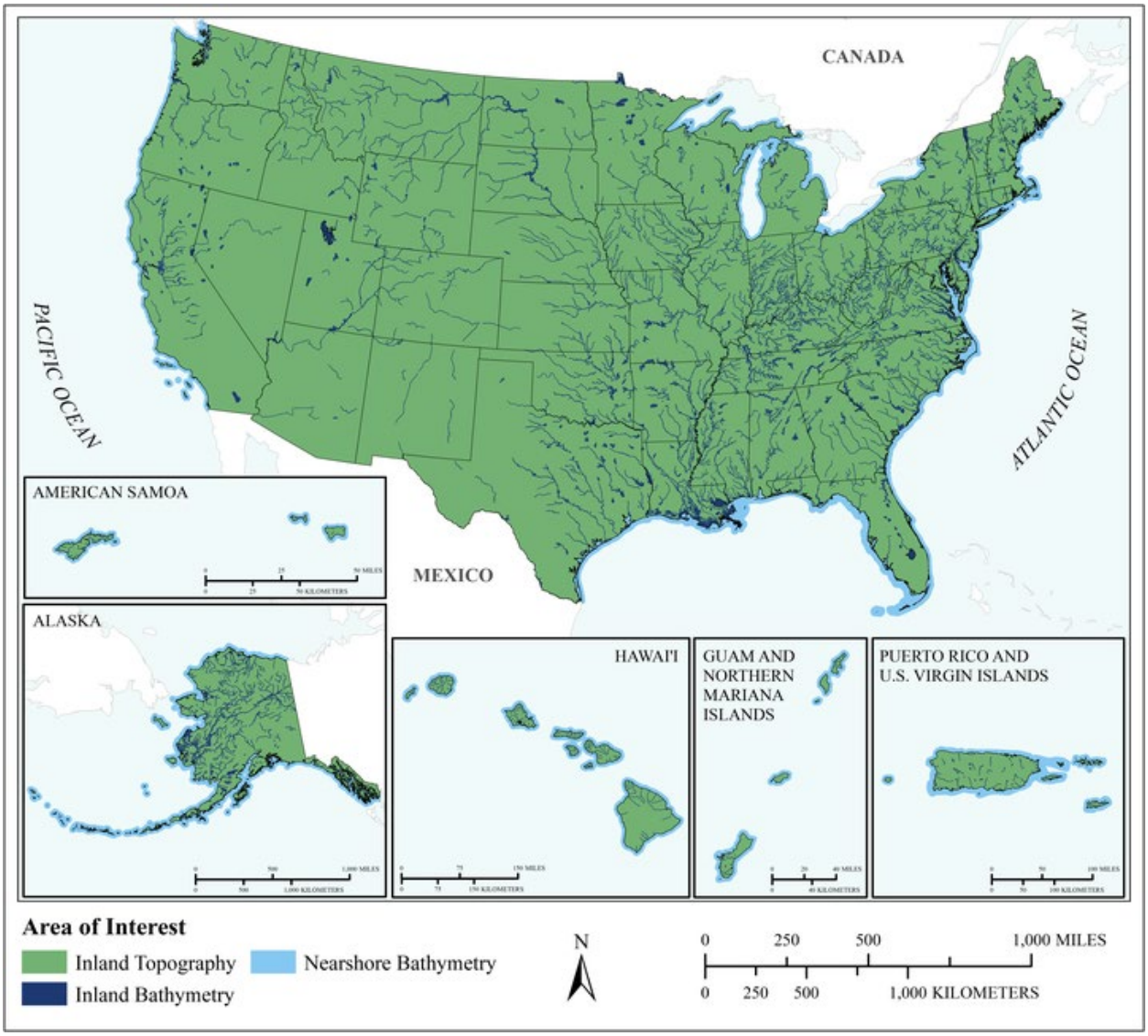
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$11,909,250	Major	Annual dollars saved/realized	$4,070,250	Moderate	Annual dollars saved/realized	$361,800	Minor	Unable to provide	
Time savings description	Reduced field survey for channel cross section. Streamlined insurance rating by avoiding elevation certificates. Possibility to streamline Community Assistance Visits and compliance reviews using digital data. Some reduction in integration of multiple lidar data sets for a given project, though that is not a substantial level of effort currently. More complete coverage will allow FEMA to do more integrated large area modeling resulting in cost efficiencies. Estimate this produce 15-20% efficiency vs. current. Overall reduction in LOMAs, LOMRs, appeals and other problems with floodplain delineations as the result of high quality, consistent data everywhere. Estimated based on 25,000 LOMC, appeals, other significant data quality problems. 10 hours per event.			Included under more efficient reviews. Inland bathy integrated with inland topo would eliminate a lot of data integration on most projects. Available data for all rivers would save substantial field survey costs for flood mapping. Some reduction in QA, fewer delays for field work.			This could avoid occasional busts that have occurred. Assuming coastal updates every 10 years. 1 or 2 major problems avoided. Included in more efficient modeling. We only do updates every 10 years or so, but seamless nearshore data would save a lot of effort in building up the Ad Circ meshes. We do not currently do any field data collection for offshore bathy.			FEMA uses best available bathy for offshore modeling. Models generally not too sensitive to data quality or detail.		
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$20,000,000	Major	Unable to provide		None			Minor	Unable to provide	
Cost savings/cost reduction description	Rough estimate of annual lidar spending going forward under current program. Would not be needed if there was an ongoing 3D Nation Program not funded through NFIP.			Included under hours saved from field visits.						FEMA uses best available bathy for offshore modeling. Models generally not too sensitive to data quality or detail.		
Cost avoidance	Moderate	Annual dollars saved/realized	$5,000,000	Moderate	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Cost avoidance description	Already counted under hours saved. Agency benefits would be related to insured NFIP losses which should be covered by insurance premiums. Uninsured losses should be captured under benefits to society. Disaster savings should be under a separate primary activity. Consistent national hydro-conditioning could reduce modeling costs by reducing data preparation and processing.			Included under hours saved. More likely to produce efficiencies rather than significantly change the understanding or risk.			Included above in hours saved. Might be some small changes in uninsured losses due to better maps.			FEMA uses best available bathy for offshore modeling. Models generally not too sensitive to data quality or detail.		
Increased revenues	Major	Unable to provide		Moderate	Unable to provide		None			None		
Increased revenues description	Nationally available, high quality elevation data will likely enable many new products and services. FEMA is looking at ways to better assess individual risk and better national elevation data will be important to this. There are many other possibilities.			Could enable better estimates for high frequency floods which might have some benefits.								
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		None		
Mission-driven performance improvements description	These benefits are captured elsewhere.			Captured elsewhere.			Included in other savings.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$22,612,500	Minor	Unable to provide		None			None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Value added to products or services description	Similar to the agency benefits for reduced errors, property owners will save time and money from reduced problems with inaccurate maps. We are hoping to replace surveyor produced elevation information with lidar derived elevations for most properties. More QL2 and better coverage will cover more insured properties. Savings 5 hours per new policy in areas that currently lack QL2 data. These savings are for property owners and the surveyors they hire.			The resulting product will not be significantly different from the present, so impacts on the public are minor and hard to define.								
Improved response or timeliness	Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		None		
Improved response or timeliness description	There could be construction savings from better information, but it is hard to estimate. There are many possibilities here. The NFIP does not have a significant response component. The FEMA response mission would have significant benefits. National data and new methodologies could enable faster mobilization of NFIP resources to help survivors claim insurance benefits and recover more quickly. Better data will also support faster development of post-flood advisory information to help guide rebuilding. Hard to estimate. Local government will be able to build more automated processes for floodplain permitting and review, but how many communities will do this, how it will affect the local permitting processes, and when the changes will happen is hard to estimate. I think these benefits are captured elsewhere.			The resulting product will not be significantly different from the present, so impacts on the public are minor and hard to define.			Most of the impact will be internal to FEMA's production. The public projects are not likely to be significantly impacted.			Better offshore bathy will not significantly impact the public products.		
Improved customer experience	Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		None		
Improved customer experience description	Trusted national data may reduce public skepticism of FEMA flood hazard information. Similar to customer assistance and new products and tools there are many possibilities.			The resulting product will not be significantly different from the present, so impacts on the public are minor and hard to define.			Most of the impact will be internal to FEMA's production. The public projects are not likely to be significantly impacted.					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor			Minor			None		
Education or outreach description	Trusted national data may reduce public skepticism of FEMA flood hazard information			The resulting product will not be significantly different from the present, so impacts on the public are minor and hard to define			Most of the impact will be internal to FEMA's production. The public projects are not likely to be significantly impacted.					
Environmental	None			None			None			None		
Environmental description				The resulting product will not be significantly different from the present, so impacts on the public are minor and hard to define								
Public safety, including life and property	Moderate			Minor			Minor			None		
Public safety, including life and property description	Better precision will likely reduce flood losses, but it is hard to estimate how different than today			The resulting product will not be significantly different from the present, so impacts on the public are minor and hard to define			Most of the impact will be internal to FEMA's production. The public projects are not likely to be significantly impacted.					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				
Other (please specify)			Yes	Yes
Other description	Ad Circ Mesh			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Rapid Damage Assessments for Emergency Response Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	States and/or Territories	States and/or Territories	States and/or Territories	
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	

MCA Description	Response
Mission Critical Activity	Pre-event exposure and post-event rapid damage assessments for disaster response. An integral part of both pre-event impact prediction and post-event damage assessment, elevation data provide a vital input into flood inundation models as well as in novel applications such as identifying isolated communities during a flood. Moreover, repeat, high-resolution elevation datasets measure landscape change following cataclysmic events such as major landslides or coastal erosion.
MCA Title	Rapid Damage Assessments for Emergency Response Planning
MCA ID	1340
Organization Type	Federal Agencies and Commissions
Organization Name	DHS: Federal Emergency Management Agency (FEMA)
Sub-Agency or Division	Office of Response & Recovery
Organization Mission	Helping people before, during, and after disasters.
Program Name	Response (i.e., Planning and Operations) and Recovery (i.e., Individual and Public Assistance)
Total Annual Program Budget	$1,000,000,000
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Individual buildings, sheds, underwater bottom surface

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed			To the fall line	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			MSL	
Cross sections and/or transects meet needs			Partial	
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Highly desirable	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Not required	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Not required	
Currents			Required	
Tide/wave heights			Required	
Sea ice conditions			Highly desirable	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Required	Required	Required	
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	At times, we use 1 arc second NED DEM and more often the 1/3 arc second NED DEM. For emergency responses, we start with lower resolution DEM analyses and move to higher resolution DEM as available, most notably 1/9 arc second or better.	Currently estimating inland bathymetry from NED and/or available FIRM or USACE cross sections.	We receive coastal bathymetry from FIS and NOAA CSC.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI			Yes	
Open Topography				
NOAA nautical charts				
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State Repositories	Yes			
State repositories used	Some state repositories are maintained online, such as South Carolina's Department of Natural Resources' lidar or from Florida Division of Emergency Management. Other times our state or county-level partners make lidar data available on a case-by-case basis that depends on quality level and/or how recently data was collected and/or processed.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	
Cost savings/cost reduction	Major	Moderate	Moderate	
Cost avoidance	Major	Moderate	Moderate	
Increased revenues	Minor	I don't know	Minor	
Mission-driven performance improvements	Major	Moderate	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	
Improved response or timeliness	Major	Minor	Moderate	
Improved customer experience	Major	Minor	Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	
Environmental	Major	Major	Major	
Public safety, including life and property	Major	Major	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$1,809	Moderate	Unable to provide		Major	Unable to provide				
Time savings description	Substantially increased accuracy of data for inundation mapping could yield more accurate damage modeling for disaster response and recovery. More efficient modeling, less time spent conditioning/reviewing DEM data. More accurate model results, less time spent reviewing errors in DEM. Avoiding data manipulation like projecting and merging DEM tiles.											
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience description	Improved accuracy of DEM-dependent models including flood and surge/coastal flood models and depth grids.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate					
Environmental	Major			Major			Major					
Public safety, including life and property	Moderate			Moderate			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes	Yes	Yes	
Slope maps			Yes	
Aspect maps	Yes			
Curvature maps		Yes		
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes	Yes	Yes	
Viewshed maps			Yes	
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Federal Energy Regulatory Commission (FERC)

FERC is an independent agency that regulates the interstate transmission of electricity, natural gas, and oil. FERC also reviews proposals to build liquefied natural gas (LNG) terminals and interstate natural gas pipelines as well as licensing hydropower projects. The Energy Policy Act of 2005 gave FERC additional responsibilities as outlined and updated Strategic Plan. As part of that responsibility, FERC:

- Regulates the transmission and wholesale sales of electricity in interstate commerce;
- Reviews certain mergers and acquisitions and corporate transactions by electricity companies;
- Regulates the transmission and sale of natural gas for resale in interstate commerce;
- Regulates the transportation of oil by pipeline in interstate commerce;
- Approves the siting and abandonment of interstate natural gas pipelines and storage facilities;
- Reviews the siting application for electric transmission projects under limited circumstances;
- Ensures the safe operation and reliability of proposed and operating LNG terminals;
- Licenses and inspects private, municipal, and state hydroelectric projects;
- Protects the reliability of the high voltage interstate transmission system through mandatory reliability standards;
- Monitors and investigates energy markets;
- Enforces FERC regulatory requirements through imposition of civil penalties and other means;
- Oversees environmental matters related to natural gas and hydroelectricity projects and other matters; and
- Administers accounting and financial reporting regulations and conduct of regulated companies.

FERC's mission is economically efficient, safe, reliable, and secure energy for consumers. **FERC assists consumers in obtaining economically efficient, safe, reliable, and secure energy services at a reasonable cost through appropriate regulatory and market means, and collaborative efforts.** The agency's two primary goals are to ensure that consumer rates, terms, and conditions are just, reasonable, and not unduly discriminatory or preferential and to promote the development of safe, reliable, and efficient energy infrastructure that serves the public interest.

Importance of elevation data to FERC

FERC currently uses elevation data for reviews of interstate oil and gas pipelines, focusing on siting, routing, and environmental impacts and ensuring that a proposed route is needed, warranted, and environmentally compliant. FERC also uses elevation data during its monitoring of pipeline construction. Once built, the Department of Transportation Office of Pipeline Safety takes over responsibility for the pipeline. Elevation data are also needed for reviews of LNG import and export facilities, as well as for reviews of regulated non-federal hydroelectric projects.

FERC engineers use elevation data and GIS along with hydrologic and hydraulic (H&H) software to review submitted models for flood mapping requirements and high-hazard dam risk analyses. Inland bathymetry would be important for H&H modeling as well as for evaluation of the stage storage of a reservoir and for flood pool routing. Offshore bathymetry is of interest for hydrokinetic power studies as well as for undersea cable routing and underwater pipeline proposals.

FERC applicants submit data to support their proposed projects. FERC reviews data submitted by the applicant, to include elevation data. Independently acquired elevation data from USGS or NOAA may be used to cross check the applicant's data where necessary, but this happens infrequently. The applicant would be the primary user of topographic and/or inland bathymetry. Building lowest floor elevation

information would also be used for flood reviews. Inland bathymetry is needed for H&H modeling and stage storage analysis for reservoirs. However, water elevation is more important than bathymetry. Bathymetry would be used for volumetric input into dam breach analysis (volume of water released). It could also be used for underwater pipeline reviews. Note that all needs are project specific.

High-level summary of elevation data requirements

FERC expressed a need for nationwide inland topography, inland bathymetry, nearshore bathymetry, and offshore bathymetry. Various data accuracy and update frequency requirements are required for numerous Business Uses. Data are needed as new applications for projects are submitted, when there are significant changes to an existing project, or when new downstream development is identified based on annual inspections.

High-level summary of benefits that would come from higher resolution elevation data

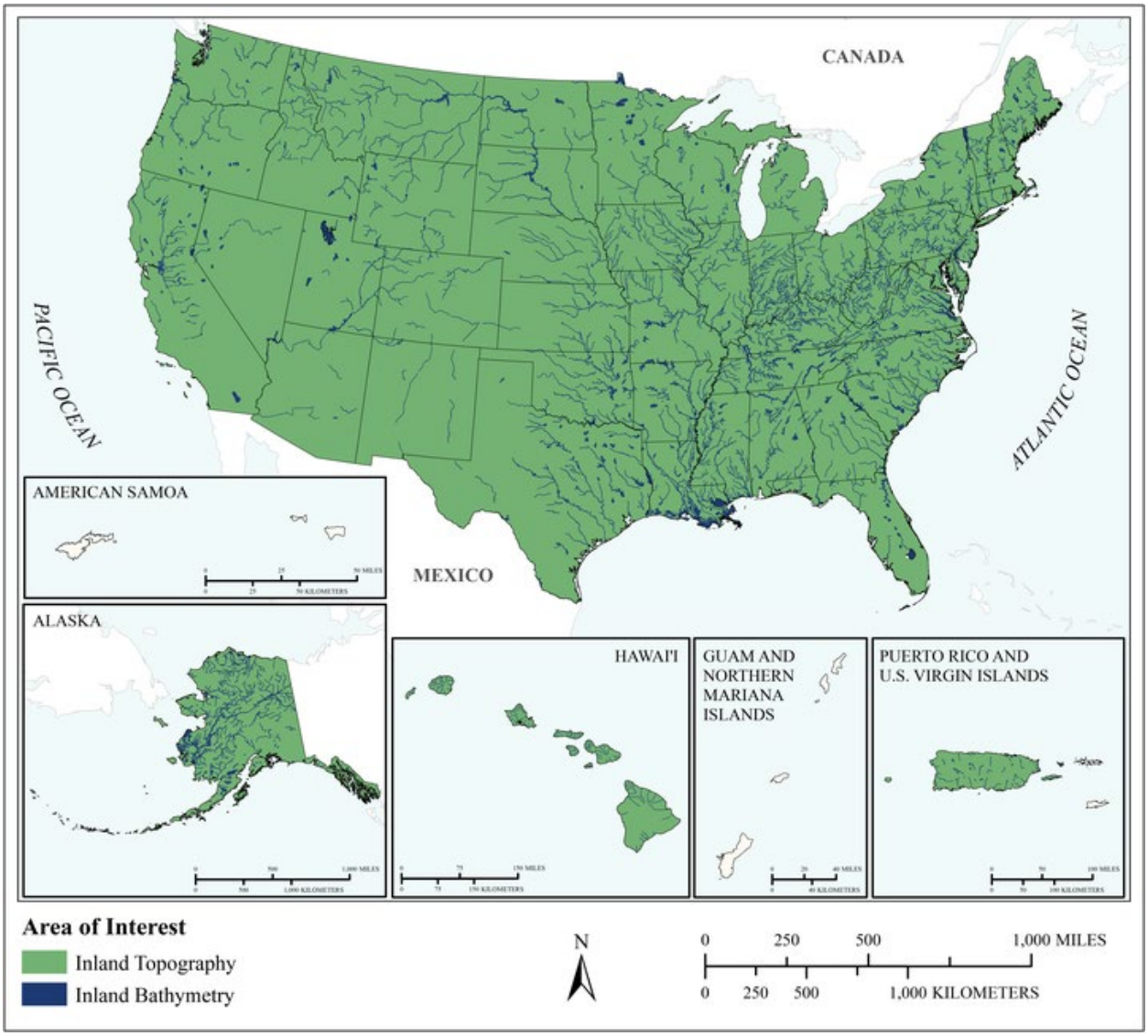
Currently realized benefits from having elevation data are minor. Future annual benefits of having more accurate or current topographic and bathymetric data are minor to major. Benefits to FERC would include being able to conduct more timely reviews and more efficient validation of applicant data. For the applicant, the benefits would include the ability to complete an application package more cost effectively.

FERC has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 12 – Renewable Energy Resources	Federal Energy Regulatory Commission (FERC)	60652	Renewable Energy Resources - Hydropower	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
BU 13 – Oil and Gas Resources	Federal Energy Regulatory Commission (FERC)	60653	Oil and Gas Resources	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Inland Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
BU 14 – Cultural Resource Management	Federal Energy Regulatory Commission (FERC)	60654	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
BU 15 – Flood Risk Management	Federal Energy Regulatory Commission (FERC)	60655	Flood Risk Management	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Major	Moderate	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
BU 18 – Homeland Security	Federal Energy Regulatory Commission (FERC)	60656	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Major
BU 22 – Infrastructure Management	Federal Energy Regulatory Commission (FERC)	1292	Regulatory Review of Hydroelectric, Pipeline, and Natural Gas Projects	Inland Topo	Cross sections and/or transects meet needs	Event driven	$142,607,338	$91,421,885	Moderate	Moderate	Moderate
				Inland Bathy	Cross sections and/or transects meet needs	Event driven	$38,921,023	$2,432,230	Minor	Minor	Major
				Nearshore Bathy	Cross sections and/or transects meet needs	Event driven	$2,374,075	$326,433	None	None	None
				Offshore Bathy	Cross sections and/or transects meet needs	Event driven	Unable to quantify	Unable to quantify	None	None	Minor

MCA Title: Renewable Energy Resources - Hydropower



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs		
Sub Area Requirements	All States and Puerto Rico	All States and Puerto Rico		

MCA Description	Response
Mission Critical Activity	Alternate energy development – hydroelectric, tidal, wave, and ocean current. Analysis of energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources - Hydropower
MCA ID	60652
Organization Type	Federal Agencies and Commissions
Organization Name	Federal Energy Regulatory Commission (FERC)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	6-10 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	I don't know			I don't know	
Entire AOI under same environmental conditions	Highly desirable	I don't know			I don't know	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	I don't know			I don't know	
DEM for entire AOI needs to be seamless	Required	I don't know			I don't know	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Nice to have		
DTM	Required	Nice to have		
DEM	Required	Nice to have		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	I don't know		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	I don't know		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	I don't know		
Land use/land cover	Highly desirable	I don't know		
Wetlands	Nice to have	I don't know		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	I don't know		
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know		
Cultural resources	Not required	I don't know		
Coastal and riverine structures	Nice to have	I don't know		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know		
Cost savings/cost reduction	Major	I don't know		
Cost avoidance	Minor	I don't know		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Moderate	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know		

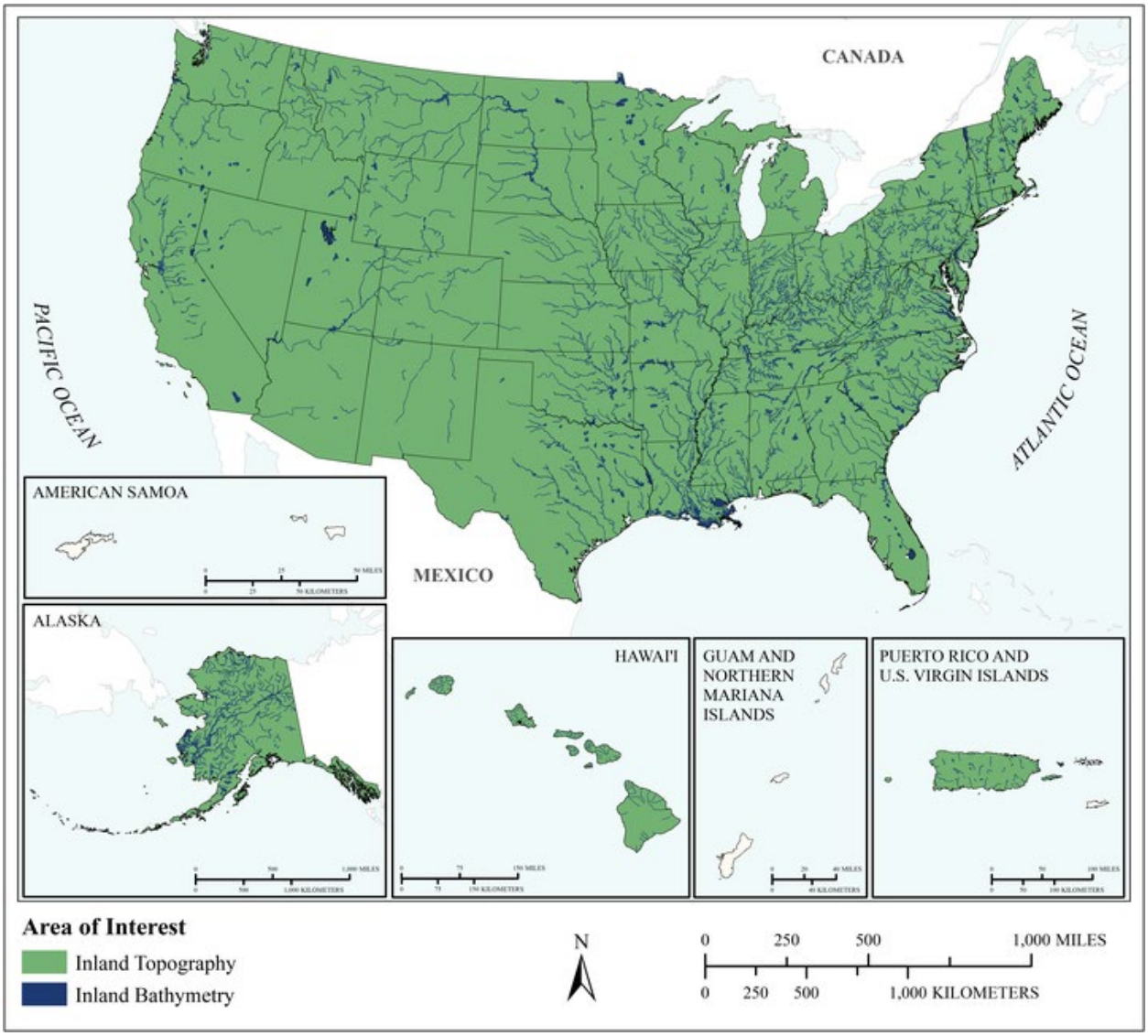
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	None	I don't know		
Improved customer experience	None	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Major	Minor		
Public safety, including life and property	Minor	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Minor	Unable to provide		I don't know	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Minor	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Moderate			Moderate								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Oil and Gas Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs		
Sub Area Requirements	All States and Puerto Rico	All States and Puerto Rico		

MCA Description	Response
Mission Critical Activity	Oil and gas exploration and production. Pipeline and route selection. Facility siting to mitigate geologic hazards. Construction planning. Environmental impact assessment and mitigation. Regulatory compliance. FERC issues certificates for gas/oil interstate pipelines. Most are inland, but may be nearshore or offshore
MCA Title	Oil and Gas Resources
MCA ID	60653
Organization Type	Federal Agencies and Commissions
Organization Name	Federal Energy Regulatory Commission (FERC)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	Annually	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Nice to have	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level			Up to triple the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Nice to have		
DEM	Required	Nice to have		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Nice to have		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Nice to have		
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	None		
Cost savings/cost reduction	Minor	None		
Cost avoidance	Minor	None		
Increased revenues	None	None		
Mission-driven performance improvements	Minor	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

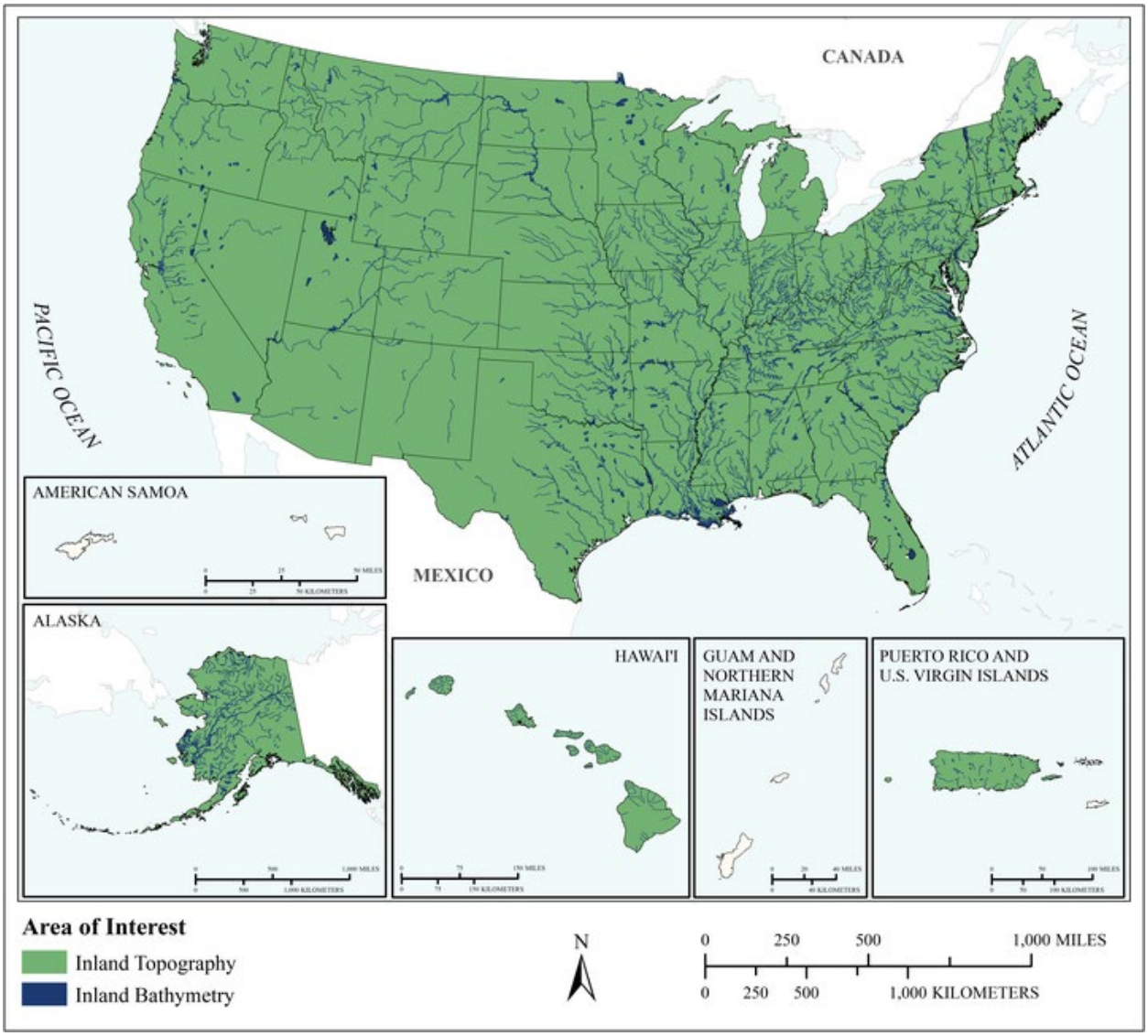
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	None		
Improved customer experience	Minor	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	None		
Environmental	Minor	Minor		
Public safety, including life and property	Minor	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		None								
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Minor	Unable to provide		Moderate	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Moderate								
Public safety, including life and property	Major			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs		
Sub Area Requirements	All States and Puerto Rico	All States and Puerto Rico		

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities. FERC regulatory reviews include details for historic/cultural sites.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60654
Organization Type	Federal Agencies and Commissions
Organization Name	Federal Energy Regulatory Commission (FERC)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Nice to have	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required			Nice to have	
DEM for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Highly desirable		
Ground control/ground truthing	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Nice to have	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Highly desirable		
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Required	Highly desirable		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Moderate	Minor		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Moderate	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

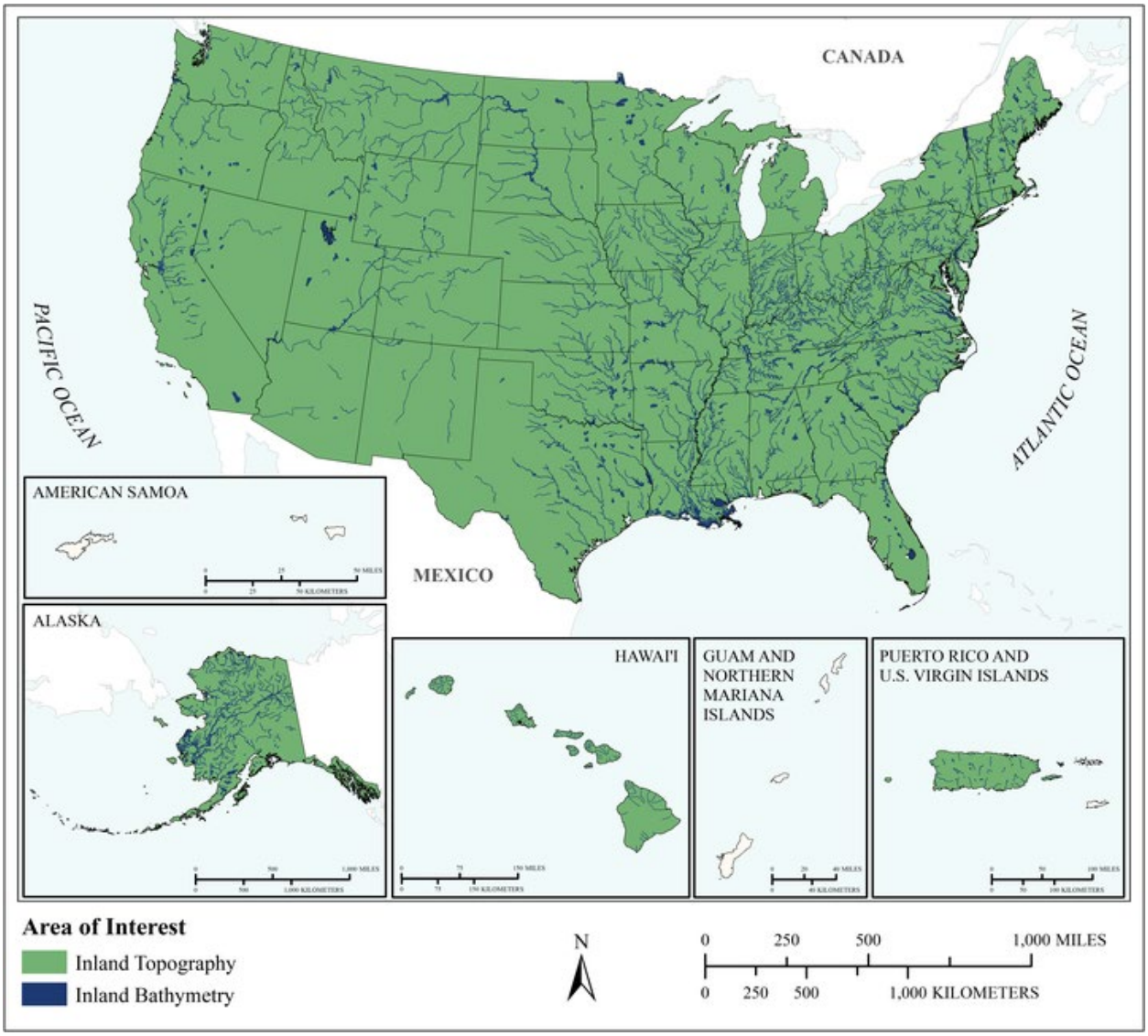
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Major		
Improved customer experience	Moderate	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate		
Environmental	Moderate	Moderate		
Public safety, including life and property	Minor	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide							
Cost savings/cost reduction	Minor	Unable to provide		Minor	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Moderate			Moderate								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs		
Sub Area Requirements	All States and Puerto Rico	All States and Puerto Rico		

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts. FERC requires applicants and dam owners to prepare flood studies and coordinate with Federal and local emergency management officials
MCA Title	Flood Risk Management
MCA ID	60655
Organization Type	Federal Agencies and Commissions
Organization Name	Federal Energy Regulatory Commission (FERC)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Moderate		
Increased revenues	Minor	Minor		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

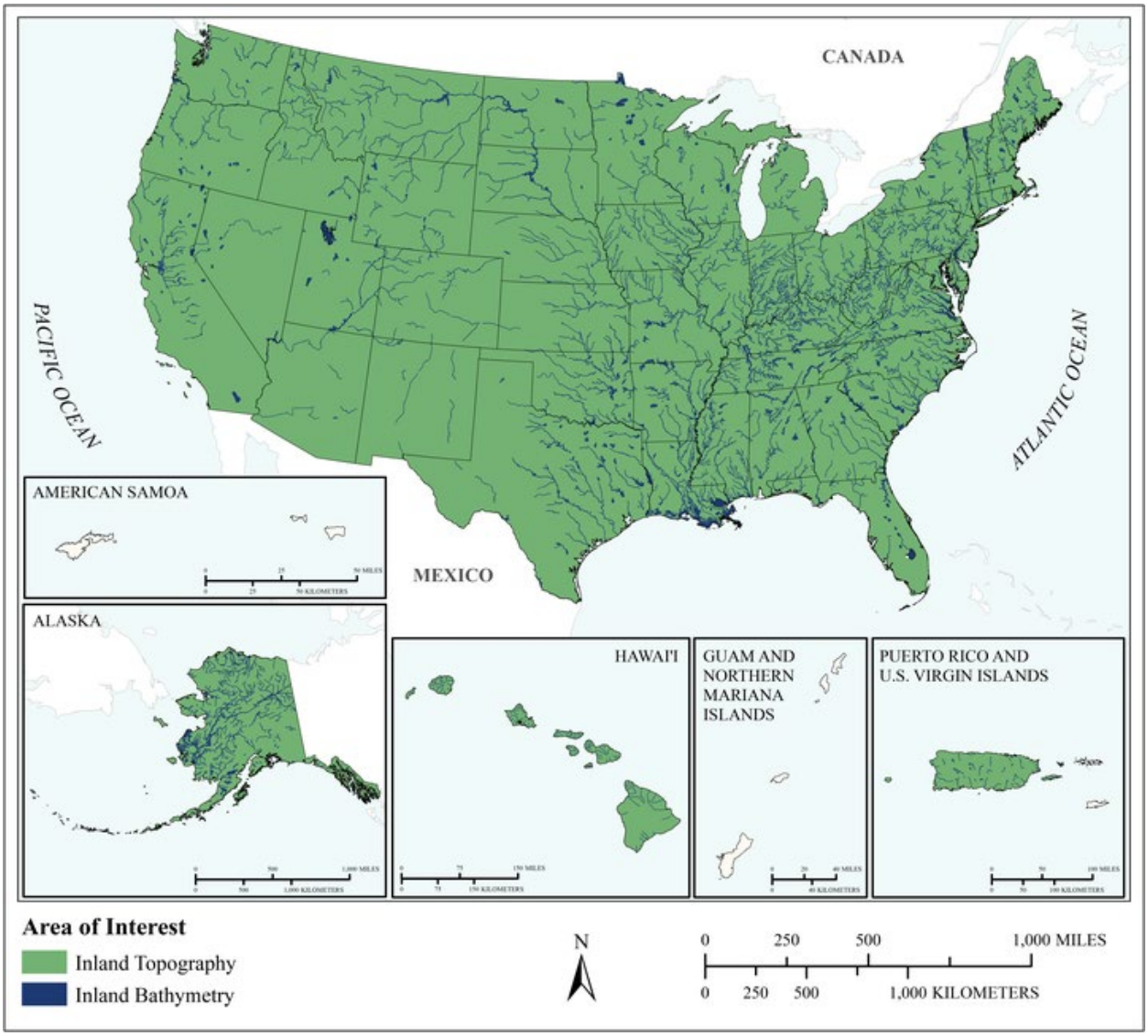
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor		
Environmental	Moderate	Moderate		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Homeland Security, Law Enforcement, Disaster Response, and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs		
Sub Area Requirements	All States and Puerto Rico	All States and Puerto Rico		

MCA Description	Response
Mission Critical Activity	Hydroelectric dam regulation. Infrastructure and border protection. Coastal search and rescue. Population dynamics. Emergency fuel supply and movement. Line of sight analysis in urban areas. Disaster response. Flood risk analysis resulting from acts of terrorism.
MCA Title	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
MCA ID	60656
Organization Type	Federal Agencies and Commissions
Organization Name	Federal Energy Regulatory Commission (FERC)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate		
Cost savings/cost reduction	Major	Moderate		
Cost avoidance	Major	Moderate		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate		

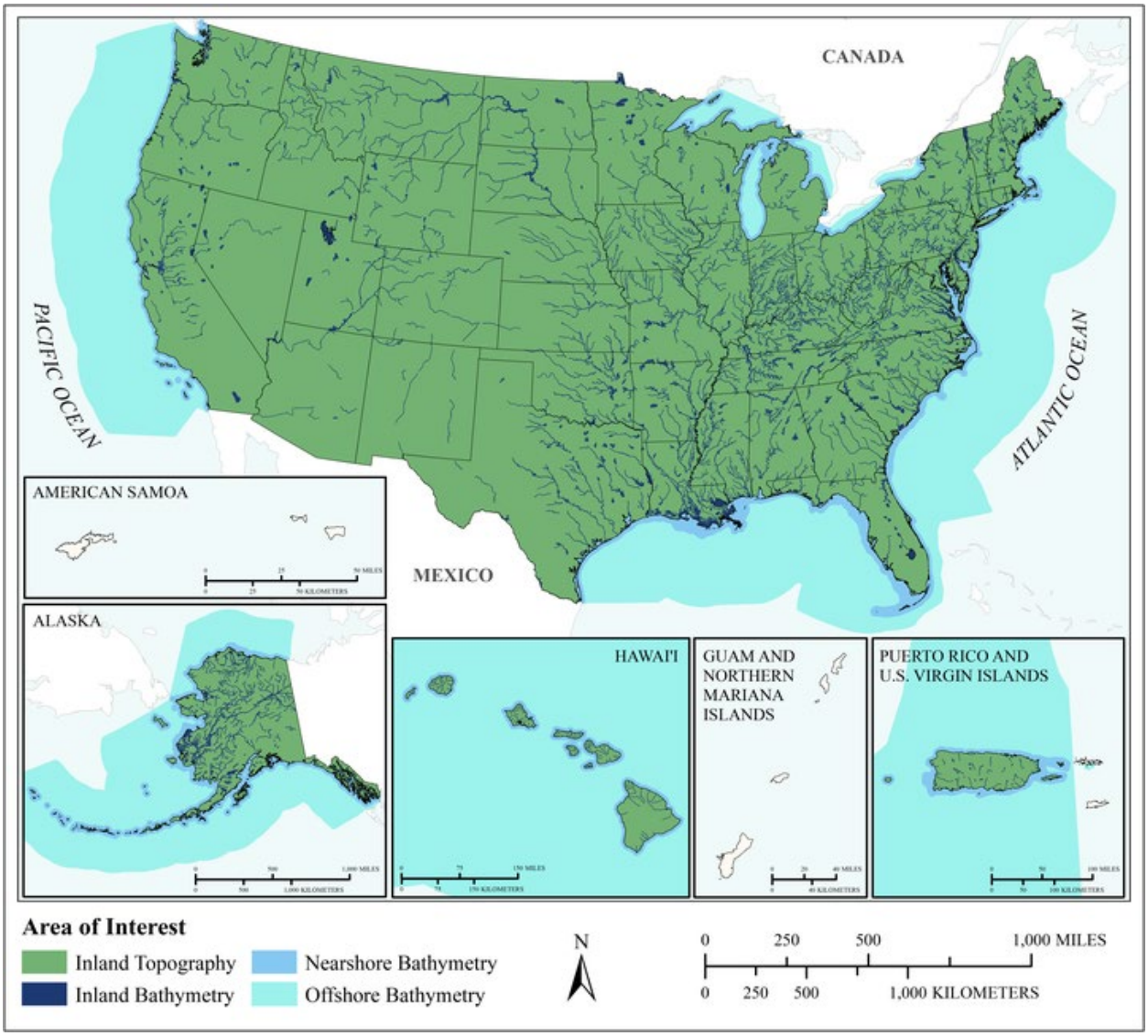
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Moderate		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate		
Environmental	Minor	Moderate		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor								
Environmental	Moderate			Moderate								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness		Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Regulatory Review of Hydroelectric, Pipeline, and Natural Gas Projects



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Nationwide, inland areas	Nationwide, inland areas	Custom description	Custom description
Sub Area Requirements			States and Puerto Rico	States and Puerto Rico out to the EEZ

MCA Description	Response
Mission Critical Activity	The Federal Energy Regulatory Commission, or FERC, is an independent agency that regulates the interstate transmission of electricity, natural gas, and oil. FERC also reviews proposals to build liquefied natural gas (LNG) terminals and interstate natural gas pipelines as well as licensing hydropower projects. FERC generally reviews data submitted by the applicant data, and makes little use of USGS/NOAA data; the applicant would be the primary user of topographic and/or inland bathymetry. Building lowest floor elevation information would also be used for flood reviews. Inland bathy is needed for H&H modeling and stage storage analysis for reservoirs. However, water elevation is more important than bathymetry. Bathymetry would be used for volumetric input into dam breach analysis (volume of water released). It could also be used for underwater pipeline reviews. Note that all needs are project specific.
MCA Title	Regulatory Review of Hydroelectric, Pipeline, and Natural Gas Projects
MCA ID	1292
Organization Type	Federal Agencies and Commissions
Organization Name	Federal Energy Regulatory Commission (FERC)
Sub-Agency or Division	Office of Energy Projects
Organization Mission	Regulate Energy markets
Program Name	Energy Projects
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 12 - Renewable Energy Resources
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Pipelines, hydroelectric dams, transportation network, structures, public infrastructure

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs
Update Frequency	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.
Event type(s)	New application for a project or significant change to an existing project or new downstream development based on an annual inspection.	Event driven only	Event driven only	Event driven only
Quality Level and/or update frequency variability across AOI	Site/project specific			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	Less than 1 meter
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs	Yes	Yes	Yes	Yes
Cross section/transect requirement	Site specific requirements apply. Accuracy is project specific.	Project & site specific	Project & site specific	Project & site specific

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Not required	Not required	Not required	Not required
Entire AOI under same environmental conditions	Nice to have	Not required	Not required	Not required	Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Not required	Not required	Not required	Not required
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	Nice to have
DTM	Highly desirable	Nice to have	Nice to have	Nice to have
DEM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Raw point cloud data	Nice to have	Not required	Not required	Not required
Classified point cloud	Not required	Not required	Not required	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Not required	Not required	Not required	Not required
Ground control/ground truthing	Not required	Not required	Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Nice to have
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Not required	Nice to have
Aerial and/or satellite imagery	Highly desirable	Nice to have	Highly desirable	Nice to have
Underwater videography			Not required	Nice to have
Bottom texture			Not required	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Not required	Nice to have
Geologic and seismic data	Highly desirable	Nice to have	Not required	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Nice to have	Nice to have	
Land use/land cover	Nice to have	Nice to have	Nice to have	Nice to have
Wetlands	Nice to have	Nice to have	Nice to have	Nice to have
Estuaries			Nice to have	Nice to have
Inland surface water features	Highly desirable	Nice to have	Nice to have	
Bridges/culverts	Highly desirable	Nice to have		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Data supplied by applicants, quality required is site specific	Data supplied by applicants, quality required is site specific	Data supplied by applicants, quality required is site specific	Data supplied by applicants, quality required is site specific
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI	Yes			
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	Available state resources	Where available	Where available	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	None	None	None
Cost savings/cost reduction	None	None	None	None

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	None	None	None	None
Increased revenues	None	None	None	None
Mission-driven performance improvements	Minor	None	None	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	None	None	None
Improved response or timeliness	Minor	None	None	None
Improved customer experience	None	None	None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	None	None	None
Environmental	None	None	None	None
Public safety, including life and property	Moderate	None	None	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		None		
Cost savings/cost reduction	None			None			None			None		
Cost avoidance	Minor	Unable to provide		None			None			None		
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Minor	Unable to provide		None			Minor	Unable to provide		None		
Mission-driven performance improvements description	If data are readily available, reviews can be more timely and validation of applicant's data is more efficient.											
Other operational benefits	Minor	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$142,607,338		Annual dollars saved/ realized	$38,921,023		Annual dollars saved/ realized	$2,374,075			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		None			Minor	Unable to provide		None		
Value added to products or services description	Improved data would allow applicant to provide application more cost effectively.											
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Improved customer experience	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$91,421,885		Annual dollars saved/ realized	$2,432,230		Annual dollars saved/ realized	$326,433			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor			None			None		
Environmental	Moderate			Minor			None			None		
Public safety, including life and property	Moderate			Major			None			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	Yes
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	Yes
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	Yes
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Federal Highway Administration (FHWA)

FHWA is an agency within the U.S. Department of Transportation that supports state and local governments in the design, construction, and maintenance of the nation's highway system (Federal Aid Highway Program) and various federally and tribal owned lands (Federal Lands Highway Program). Through financial and technical assistance to state and local governments, the FHWA is responsible for ensuring that America's roads and highways continue to be among the safest and most technologically sound in the world. **The mission of FHWA is to enable and empower the strengthening of a world-class highway system that promotes safety, mobility, and economic growth, while enhancing the quality of life of all Americans.**

The Federal Lands Highway Program provides financial resources and transportation engineering assistance for public roads that service the transportation needs of federal and Indian lands. This includes the design and construction of highway and bridge projects and the original planning, design and construction of roads within our National Parks and National Forests. Elevation data are used for transportation facility design and construction.

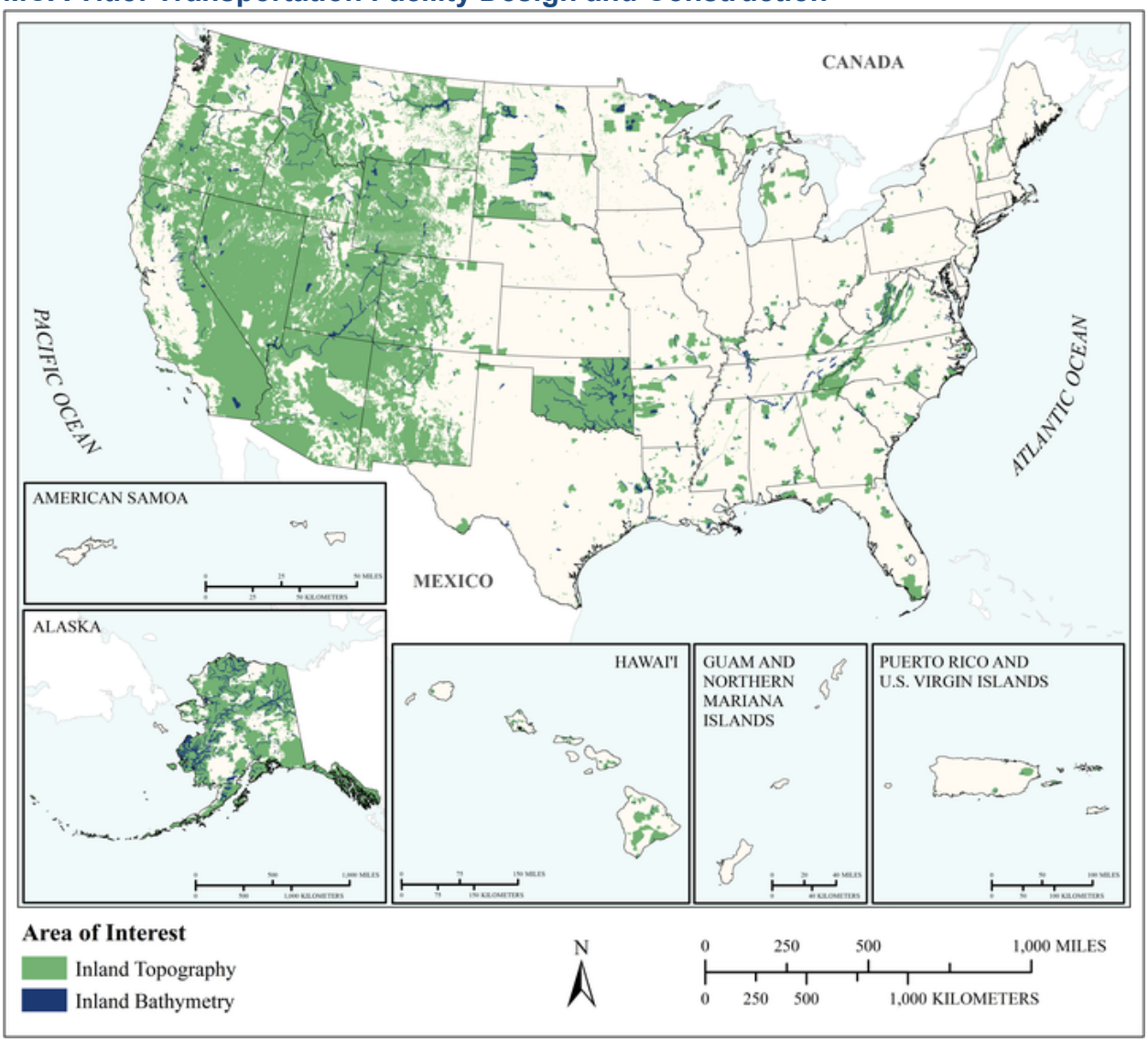
In order to provide these programs, Quality Level 1 (QL1) inland topography is needed on a project-to-project basis and QL0B inland bathymetry is required annually. Benefits of having these data would include major time savings due to faster field visits and reviews, better modeling, more efficient project planning, and increased program effectiveness.

FHWA has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 22 – Infrastructure Management	DOT: Federal Highway Administration (FHWA)	33044	Transportation Facility Design and Construction	Inland Topo	QL1	Event driven	Unable to quantify	Unable to quantify	None	Minor	Major
				Inland Bathy	QL0B	Annually	Unable to quantify	Unable to quantify	None	Minor	Minor

MCA Title: Transportation Facility Design and Construction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies		
Sub Area Requirements	BLM, BOR, DOD, FS, FWS, NPS, TVA, Tribal	BLM, BOR, DOD, FS, FWS, NPS, TVA, Tribal		

MCA Description	Response
Mission Critical Activity	Survey data for transportation facility design and construction. The Federal Lands Highway Program provides financial resources and transportation engineering assistance for public roads that service the transportation needs of Federal and Indian lands. This includes the design and construction of highway and bridge projects and the original planning, design and construction of roads within our National Parks and National Forests. This response is based solely on one perspective within FHWA and may not accurately represent all concerns and issues within FHWA with respect to terrestrial and bathymetric elevation needs. Additionally, any identified needs attributed to FHWA do not necessarily support any funding requests to meet those needs.
MCA Title	Transportation Facility Design and Construction
MCA ID	33044
Organization Type	Federal Agencies and Commissions
Organization Name	DOT: Federal Highway Administration (FHWA)
Sub-Agency or Division	Federal Lands Highway Program
Organization Mission	Our Mission is to improve transportation to and within Federal and Tribal Lands by providing technical services to the highway/transportation community, as well as building accessible and scenic roads that ensure the many national treasures within our Federal Lands can be enjoyed by all.
Program Name	Federal Lands Highway Program
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 19 - Land Navigation and Safety
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	200,000 sq mi - 2 million sq mi (e.g. large state, large multi-state region such as the Great Basin, standard Federal region, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Survey-level features

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	Event driven only – Data need to coincide with a specific event.	Annually		
Event type(s)	New project.			
Quality Level and/or update frequency variability across AOI	Needs vary project to project			
Acceptable Horizontal Error	Less than 20 cm	Up to 1 meter		
Acceptable Vertical Error	Less than 5 cm	Up to 50 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Not required		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Required		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Required	Required		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We use both high density manned aerial LiDAR and data collected with a UAS. For many of our project areas we require survey level accuracies. However, we often use less accurate data for planning purposes, or on the outer limits of our project areas	Best available		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State Repositories	Yes			
State repositories used	All available state repositories			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	None	Minor		
Mission-driven performance improvements	Moderate	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		
Improved response or timeliness	Major	Minor		
Improved customer experience	Minor	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Minor		
Environmental	Minor	Minor		
Public safety, including life and property	Minor	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Minor	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Minor	Unable to provide		Moderate	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide							
Other operational benefits	Major	Unable to provide										
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			None								
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None								
Environmental	Minor			Minor								
Public safety, including life and property	Major			Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Federal Railroad Administration (FRA)

FRA is an agency under the U.S. Department of Transportation that regulates and supports the U.S. railroad system and rail technologies.

FRA's mission is to enable the safe, reliable, and efficient movement of people and goods for a strong America, now and in the future. FRA accomplishes its mission primarily through:

- Issuance, implementation, and enforcement of safety regulations;
- Selective investment in rail corridors across the country; and
- Research and technology development.

FRA regulates more than 760 railroads with over 170,000 miles of tracks. The FY 2021 President's Budget requests $2.0 billion for the FRA, offset by $50.0 million in rail safety user fees. The budget will fund about 900 staff, safety and compliance activities, grant oversight and development, research and technology, and operating, capital, and debt service assistance to the National Railroad Passenger Corporation (Amtrak).

FRA oversees, regulates, and enforces the safety of railroad operations nationwide. In addition, FRA supports the development of intercity passenger rail and freight rail services and new technologies to improve railroad safety and efficiency. FRA applies its resources to identify and address the rail industry's most pressing safety issues, including improving passenger railroad safety; supporting and overseeing to the railroads' implementation of positive train control (PTC); preventing trespassing on railroad property; and increasing safety at highway-rail grade crossings. In collaboration with FRA's Research and Development account, Safety and Operations (S&O) funded programs are innovating to implement new and transformative technologies that enhance safety, develop novel solutions to complex challenges, and better identify, collect, and analyze information necessary to make data-driven decisions that advance FRA's mission.

FRA's oversight, enforcement, and technical assistance improved rail transportation safety by decreasing rail-related accidents and incidents including railroad industry employee fatalities and derailments.

Train-mounted and/or aerial lidar can be used to help achieve FRA's safety goals and regulations:

- Lidar data collected from train-mounted sensors have been used to analyze the risks associated with locations and times of moving hazardous materials to determine the best routes and times for transporting dangerous materials.
- Defective track is one of the most frequent causes of derailments. Identifying track defects and other precursor conditions is the primary focus of FRA's Automated Track Inspection Program (ATIP). FRA deploys its nine ATIP vehicles to collect data on the highest risk routes, including passenger and hazardous materials routes. FRA is installing lidar systems on two vehicles to collect data that will aid in identifying humped crossings and other grade crossing features.
- Track databases require regular management and timely updates to support safe rail operations. Auditing PTC track databases can be a manual, time-consuming process. The Track Database Auditing System (TDAS) establishes standards and best practices for requirements relating to the auditing of PTC critical assets from the perspective of audit process management, data collection, and verification. The TDAS program also aims to support development of the technologies required to automate the auditing process. Development of technology to increase the level of automation enhances the accuracy and efficiency of the track data audit process. Technology

includes lidar for scanning track infrastructure. PTC infrastructure data from lidar can be used to accurately position PTC critical assets for an audit.

- Lidar is also used in Grade Crossing Safety Research to reduce accidents and incidents. In an effort to enhance and verify the accuracy of FRA grade crossing inventory database, this research uses lidar technology to map grade crossing profiles including elevation to identify hump crossings and prevent accidents resulting from low ground clearance vehicles being stuck at crossings.

Any elevation data used by FRA would need to support the accuracy requirements of the North American Rail Network at a scale of 1:48,000. New elevation data collections would be needed for areas around accidents to improve future planning for slope and curvature regulations. Future uses of elevation data may include accident investigation, and safety evaluation and enforcement. For these purposes, Quality Level 3 inland topography is required. Elevation data (slope) in combination with track curvature and train weight could inform speed limits and enforcement. Future benefits are unknown.

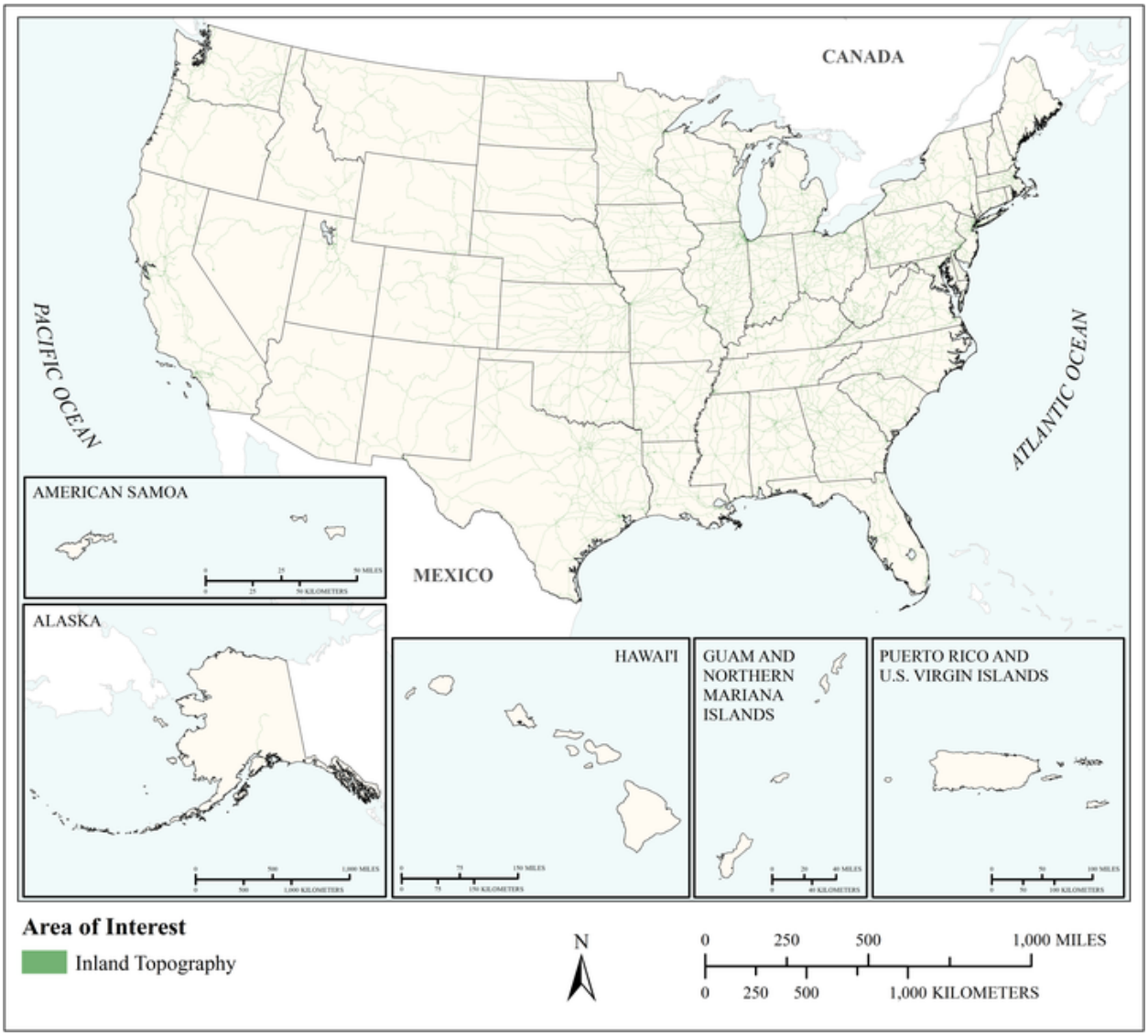
The Office of Research, Development, and Technology would benefit from elevation data to design safer, more efficient, and more reliable rail transportation. For instance, analyzing hump crossings allows trains to better predict their ability to use certain railways based on their weights.

FRA has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 19 – Land Navigation	DOT: Federal Railway Administration (FRA)	21902	National Rail Strategy, Planning, and Policy	Inland Topo	QL3	Event driven	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: National Rail Strategy, Planning, and Policy



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Custom description			
Sub Area Requirements	50 foot buffer around National Rail Network			

MCA Description	Response
Mission Critical Activity	The Federal Railway Administration's Office of Policy & Planning leads development of national rail strategy, policy and planning, including assessment of passenger and freight rail performance, investments and policy issues, and provides support to rail stakeholders planning and developing high-performance rail services. While the FRA does not currently use aerial lidar for many of its initiatives, it makes use of mobile lidar, primarily train mounted, for several activities, including analysis of train weight and hump crossings, for identification of optimal routes and time of day to transport hazardous cargo, and for track inspection. Aerial lidar can be used for accident investigation, and for safety evaluation and enforcement. Elevation data (slope) in combination with track curvature and train weight could inform speed limits and enforcement.
MCA Title	National Rail Strategy, Planning, and Policy
MCA ID	21902
Organization Type	Federal Agencies and Commissions
Organization Name	DOT: Federal Railway Administration (FRA)
Sub-Agency or Division	Office of Railroad Policy & Development
Organization Mission	The Federal Railroad Administration's mission is to enable the safe, reliable, and efficient movement of people and goods for a strong America, now and in the future. The Office of Policy & Planning leads development of national rail strategy, policy and planning, including assessment of passenger and freight rail performance, investments and policy issues, and provides support to rail stakeholders planning and developing high-performance rail services.
Program Name	Office of Railroad Policy & Development
Total Annual Program Budget	$0
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Day-to-day is not needed
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Engineering level data for grade crossings locations.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL3			
Update Frequency	Event driven only – Data need to coincide with a specific event.			
Event type(s)	An accident			
Quality Level and/or update frequency variability across AOI	Only certain portions of the rail network			
Acceptable Horizontal Error	I don't know			
Acceptable Vertical Error	I don't know			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	Only portions of where rail is located.			

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Nice to have			
DEM	Nice to have			
Raw point cloud data	Not required			
Classified point cloud	Not required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Little or no topo currently being used			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	ESRI			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know			
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	I don't know			
Public safety, including life and property	I don't know			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Time savings description	We currently do not use 3D imagery, but I can think of several projects that would be useful. This would be a new way for us to use 3D imagery to improve rail safety. Our regulations require our inspectors to physically be onsite.											
Cost savings/cost reduction	I don't know	Unable to provide										
Cost savings/cost reduction description	We currently do not use 3D imagery, but I can think of several projects that would be useful. This would be a new way for us to use 3D imagery to improve rail safety.											
Cost avoidance	I don't know	Unable to provide										
Cost avoidance description	We currently do not use 3D imagery, but I can think of several projects that would be useful. This would be a new way for us to use 3D imagery to improve rail safety.											
Increased revenues	I don't know	Unable to provide										
Increased revenues description	We currently do not use 3D imagery, but I can think of several projects that would be useful. This would be a new way for us to use 3D imagery to improve rail safety.											
Mission-driven performance improvements	I don't know	Unable to provide										
Mission-driven performance improvements description	We currently do not use 3D imagery, but I can think of several projects that would be useful. This would be a new way for us to use 3D imagery to improve rail safety.											
Other operational benefits	I don't know	Unable to provide										
Other operational benefits description	We currently do not use 3D imagery, but I can think of several projects that would be useful. This would be a new way for us to use 3D imagery to improve rail safety.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved response or timeliness description	USDOT is trying to consolidate our response to Natural Hazards and events at a Department level. USDOT also has a CMC that would be working with immediate response.											
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Education or outreach description	We currently do not use 3D imagery, but I can think of several projects that would be useful. This would be a new way for us to use 3D imagery to improve rail safety.											
Environmental	I don't know											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental description	We currently do not use 3D imagery, but I can think of several projects that would be useful. This would be a new way for us to use 3D imagery to improve rail safety.			
Public safety, including life and property	I don't know			
Public safety, including life and property description	We currently do not use 3D imagery, but I can think of several projects that would be useful. This would be a new way for us to use 3D imagery to improve rail safety.			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

Farm Service Agency (FSA)

The FSA is equitably serving all farmers, ranchers, and agricultural partners through the delivery of effective, efficient agricultural programs for all Americans to achieve an abundant, safe, and affordable food and fiber supply while sustaining quality agricultural communities.

In pursuit of its mission, the FSA is involved with digital elevation data and programs. These programs work to address a large number of farming- and ranching-related issues, including:

- Production and inspection of orthorectified aerial photography.
- Flood zones and disaster planning and mitigation.
- Slope data for conservation programs.
- Research and analysis using elevation data within GIS and image processing programs.
- Elevation data made available in aerial photography contracts/programs.

FSA accomplishes its goals and program responsibilities through a variety of products and services that directly or indirectly use or rely on elevation data. This can include such things as: orthorectified aerial photography and satellite imagery, flood plains, disaster programs, and slope (soil loss, erosion, aspect, volume, etc.).

FSA and prior versions of the agency have been responsible for aerial photography collection and usage. The agency has also used aerial photography from other agencies or organizations as well. As satellite imagery has become available over the past few decades, the agency has also used this resource, particularly for locations where using aircraft to acquire imagery is not possible or practical. The aerial and satellite imagery make possible the identification and area measurements for agricultural lands. This in turn supports the disaster, environmental, and other commodity programs delivered by the agency. Elevation data are used to orthorectify the aerial and satellite imagery. Orthorectification allows for making accurate area and volume measurements and using the imagery with other georeferenced data such as roads, soil boundaries, and the agency Common Land Unit (CLU) data.

FSA and other agencies have large amounts of historical aerial photography, acquired as far back as the 1930s. This photography can be digitally scanned and orthorectified using elevation data as is done with current imagery programs. This work is done by FSA as well as contracted to be done by commercial organizations. Historical imagery makes possible the determination of land cover/land change which is useful for environmental, historical, planning, and other purposes for FSA and many other agencies.

Elevation data and aerial photography have a symbiotic relationship. Not only can orthorectification of photography be done using elevation data but elevation data can be created using aerial photography and structure from motion.

Agency responsibilities also include programs involved with flooding. Flood plains, flood zones, riparian areas, 100 year or other estimates, and so forth rely heavily on elevation data. Flood zones are a required protected resource for environmental compliance within FSA. Being able to calculate where flooding could occur or visualizing where it has occurred makes possible: area measurements, determine crop or other losses, value/cost estimates, notifications, program eligibility determinations, property owner identification, and so forth. The Conservation Reserve Program (CRP) and Conservation Reserve Enhancement Program (CREP) are other programs that can benefit from elevation data.

Other current or potential uses of elevation data by the agency are: slope determinization, potential for erosion, irrigation suitability, landslides, crop or natural vegetation suitability, disaster prediction, etc.

While FSA is more often identified with responsibilities and usage of aerial photography, its work would be impossible or much more difficult without accurate, authoritative elevation data and products.

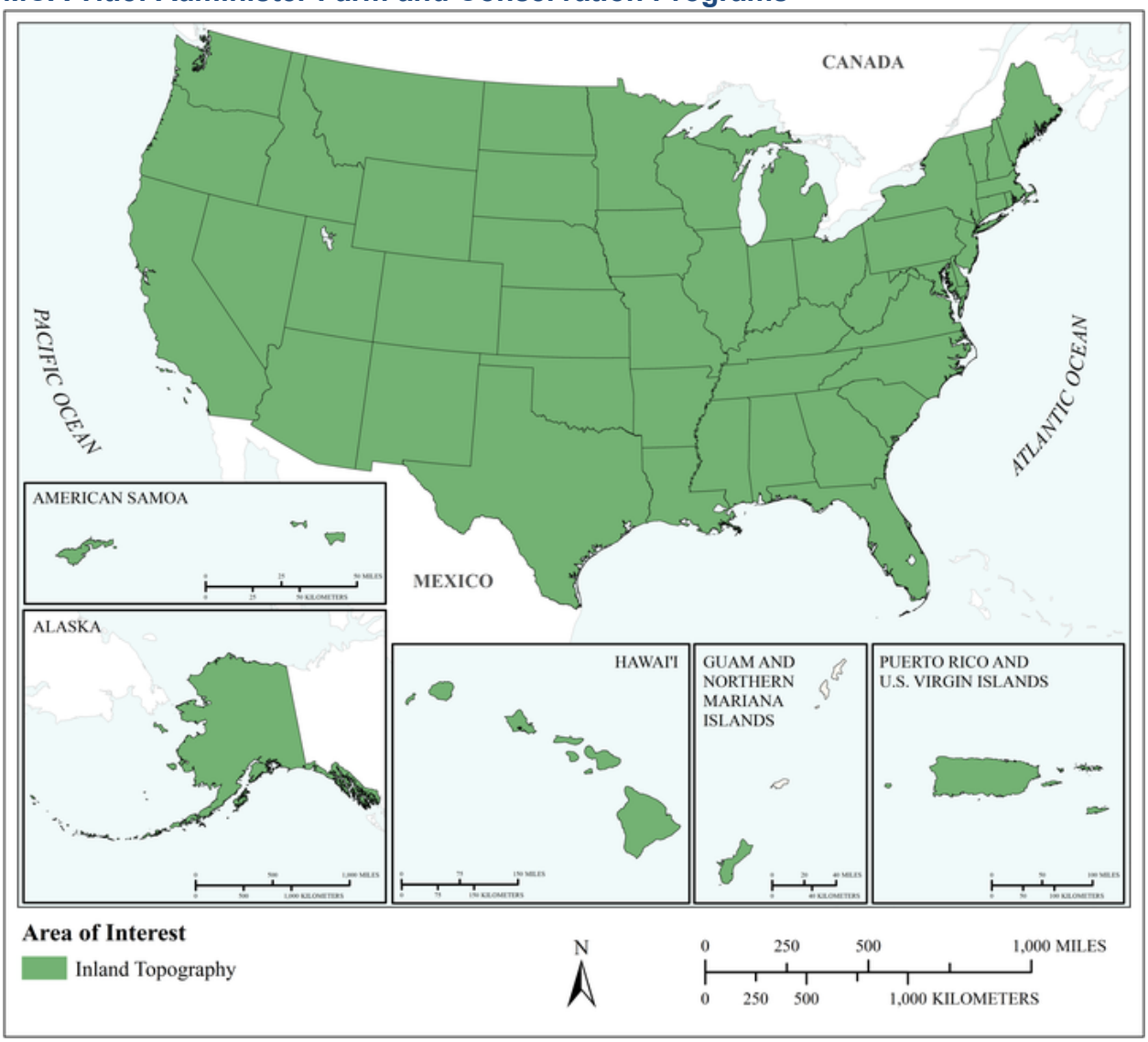
FSA generally requires nationwide Quality Level 2 inland topography updated every 2-3 years to administer their programs. Future benefits from having improved elevation data include significant time savings, mission-driven performance improvements, and improved responses.

FSA has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 06 – Natural Resource Management	USDA: Farm Service Agency (FSA)	21669	Administer Farm and Conservation Programs	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 08 – Agriculture	USDA: Farm Service Agency (FSA)	1193	NAIP Imagery for Agricultural Programs	Inland Topo	(a) QL5 (b) QL3	2-3 years	Unable to quantify	Unable to quantify	I don't know	Moderate	Moderate
BU 15 – Flood Risk Management	USDA: Farm Service Agency (FSA)	1313	Disaster Recovery	Inland Topo	QL2	>10 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Administer Farm and Conservation Programs



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Nationwide, inland areas			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Administer Farm and Conservation Programs. GIS is used extensively to support farm, conservation, and disaster programs. FSA utilizes a multitude of GIS base data. Specific to elevation data, FSA uses FEMA DFIRM data which is dependent on elevation data to support Conservation Reserve Program (CRP) activities. The 1 percent chance annual flood (100-year) zone is required for certain CRP practices. The easy availability of the data is very beneficial.
MCA Title	Administer Farm and Conservation Programs
MCA ID	21669
Organization Type	Federal Agencies and Commissions
Organization Name	USDA: Farm Service Agency (FSA)
Sub-Agency or Division	Conservation/Compliance/GIS
Organization Mission	To administer Farm Programs and Farm Loan Programs. Our mission is to deliver timely, effective programs and services to America's farmers and ranchers to support them in sustaining our Nation's vibrant agricultural economy, as well as provide first-rate support for domestic and international food aid efforts.
Program Name	Conservation Reserve Program (CRP)
Total Annual Program Budget	$1,000,000
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 08 - Agriculture and Precision Farming
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	While USDA, FSA has no direct need for 3D data, some programs utilize 3D derivatives, like FEMA DFIRM data, that have LIDAR as a component.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	2-3 years and certain events.			
Event type(s)	Flood or land forming (by USACE or farmers)			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 5 meters			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Not required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Not required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Not required			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	For disaster purposes, use vector elevation data of elevation isolines (contours)			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Mississippi Automated Resource Information System (MARIS), and many others			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	I don't know			

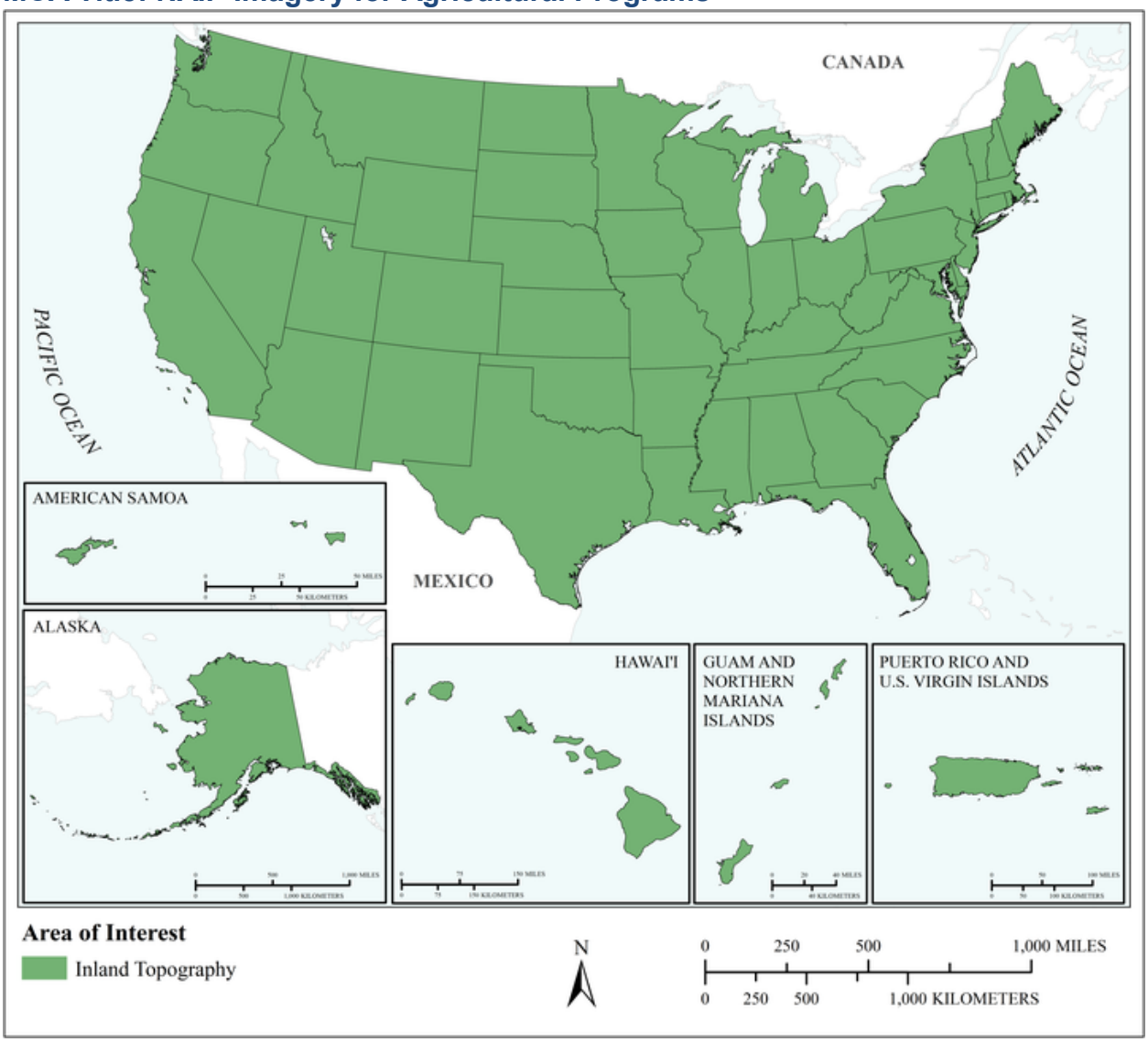
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	I don't know			
Increased revenues	I don't know			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Major			
Public safety, including life and property	I don't know			
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major			
Other description	Some CRP practices require offer area is within a 1 percent chance annual (100-year) flood zone			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Time savings description	Digital data versus analog, paper data. Prior to the availability of DFIRM data, users referenced paper maps.											
Cost savings/cost reduction	Moderate	Unable to provide										
Cost savings/cost reduction description	The DFIRM data acquired through the State GIS Clearinghouse is available at no cost to USDA, FSA.											
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	CRP offers requiring DFIRM data are more likely to be accurate with good digital data being available.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved response or timeliness description	Flood zones are a required protected resource for environmental compliance within FSA. More current DFIRM data is very helpful.											
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: NAIP Imagery for Agricultural Programs



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Area split by varying quality level or update frequency			
Sub Area Requirements	All U.S. States & Territories, Palau, and Micronesia			

MCA Description	Response
Mission Critical Activity	Delineate and identify crops and other areas involved with agency programs.
MCA Title	NAIP Imagery for Agricultural Programs
MCA ID	1193
Organization Type	Federal Agencies and Commissions
Organization Name	USDA: Farm Service Agency (FSA)
Sub-Agency or Division	Aerial Photography Field Office
Organization Mission	Farm Service Agency is equitably serving all farmers, ranchers, and agricultural partners through the delivery of effective, efficient agricultural programs for all Americans.
Program Name	National Agriculture Imagery Program
Total Annual Program Budget	$16,300,000
Primary Business Use	BU 08 - Agriculture and Precision Farming
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Sufficient detail to support creation of sub-meter orthophotography

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL5 (b) QL3			
Update Frequency	2-3 years			
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	CONUS would have stricter requirements than AK.Non-agricultural areas may also require less accuracy than agricultural and/or areas involved with FSA programs. QL5 in Alaska, QL3 for all other U.S. States & territories, Palau, and Micronesia			
Acceptable Horizontal Error	Up to 2 meters			
Acceptable Vertical Error	Greater than 1 meter			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required					
DEM for entire AOI needs to be seamless	Not required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness						

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Not required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Required			
Other	Required			
Other description	Note: Elevation data is an optional deliverable with the agency imagery program. The required items are only required if the optional elevation data is selected.			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Not required			
Wetlands	Not required			
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			
Other	Required			
Other description	If point cloud data is ordered as part of the agency imagery program it would need to integrate with the imagery.			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	The imagery contract requirement states: Digital Elevation Model. The Contractor may use any Digital Elevation Model (DEM) for terrain-correcting the imagery required to meet horizontal accuracy specifications in paragraph d. The Contractor shall document the elevation dataset used during the orthoimagery production process including, but not limited to corrections made to an existing dataset, in the process description field of the metadata. The description should be at the project item level and not tailored to individual tiles unless unique conditions necessitate the additional detail. The horizontal accuracy required in the imagery contract is: Horizontal Accuracy. All well-defined points tested on image tile shall fall within 4.0 meters of true ground at a 95% confidence level (see FGDC-STD-007.3-1998, page 3-10).			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Derived from stereo aerial photography.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	I don't know			
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	I don't know			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know			
Environmental	I don't know			
Public safety, including life and property	I don't know			

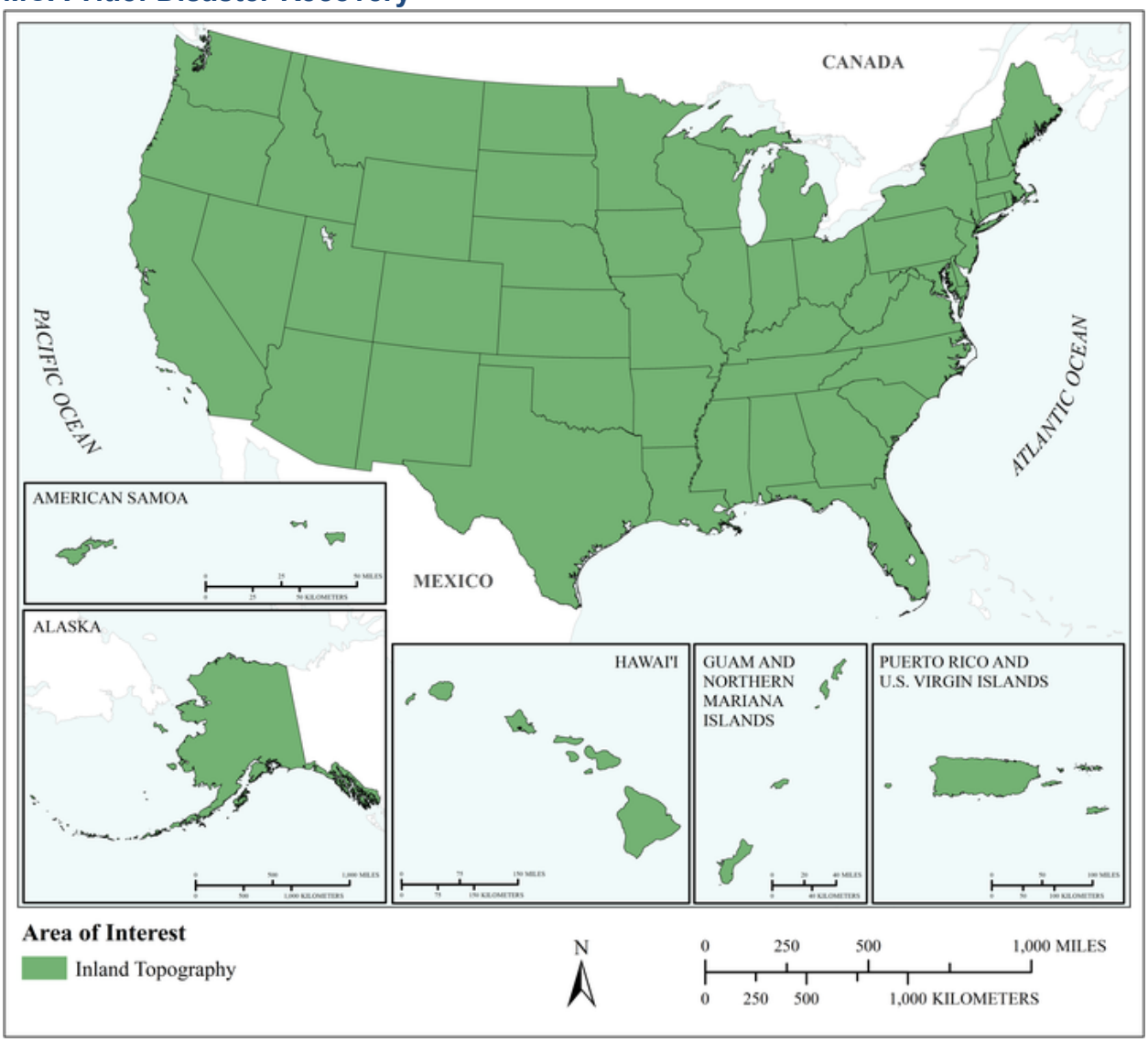
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Time savings description	Identification of potential flood zones, erosion, volume of soil loss, and other slope, aspect, disaster, and volume considerations. Determine or identify areas for potential program participation by farmers/producers.											
Cost savings/cost reduction	Moderate	Unable to provide										
Cost savings/cost reduction description	Perhaps avoid site visit by determining slope, volume or other information.											
Cost avoidance	Moderate	Unable to provide										
Cost avoidance description	Identification of potential flood zones, erosion, volume of soil loss, and other slope, aspect, disaster, and volume considerations.											
Increased revenues	Moderate	Unable to provide										
Increased revenues description	Identification of areas suitable for agriculture or potential flood zones, erosion, volume of soil loss, and other slope, aspect, disaster, and volume considerations. Identification of areas suitable for participation in agency programs.											
Mission-driven performance improvements	Moderate	Unable to provide										
Mission-driven performance improvements description	Identification of areas suitable for agriculture or potential flood zones, erosion, volume of soil loss, and other slope, aspect, disaster, and volume considerations. Identify areas suitable for agriculture or participation in agency programs. Determine areas of possible erosion, flooding, etc.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Value added to products or services description	Delineation of potential flood or wildfire, actual or potential erosion, participation in agency programs. Precision agriculture, potential flooding or other disasters, areas suitable for participation in agency programs.											
Improved response or timeliness	Moderate	Unable to provide										
Improved response or timeliness description	Predetermine potential areas for disasters as well as best access routes or options. Any decisions that require elevation related data that is traditional done with site visits.											
Improved customer experience	Moderate	Unable to provide										

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved customer experience description	New or integrated tools that can utilize elevation data and related calculations. More accurate estimates, predetermine potential issues, potential participation in agency programs. Include elevation related data with other existing agency data.			
Societal Benefits	**Benefits**	**Benefits**	**Benefits**	**Benefits**
Education or outreach	I don't know			
Environmental	Moderate			
Environmental description	Predetermine potential areas for disasters as well as best access routes or options.			
Public safety, including life and property	Moderate			
Public safety, including life and property description	Predetermine potential areas for disasters as well as best access routes or options.			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Disaster Recovery



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	States and/or Territories			
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau			

MCA Description	Response
Mission Critical Activity	Disaster recovery
MCA Title	Disaster Recovery
MCA ID	1313
Organization Type	Federal Agencies and Commissions
Organization Name	USDA: Farm Service Agency (FSA)
Sub-Agency or Division	Deputy Administrator for Farm Programs (DAFP), Production, Emergencies, and Compliance Division (PECD)
Organization Mission	Delivery of agricultural programs for farmers, ranchers and agricultural partners
Program Name	Emergency Farm Loan Programs
Total Annual Program Budget	$83,000,000
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Buildings on agricultural lands, orchard trees

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	>10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	I don't know			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Not required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Nice to have			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	National Elevation Dataset			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor			
Cost savings/cost reduction	None			
Cost avoidance	None			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Unable to provide										
Cost savings/cost reduction	None											
Cost avoidance	I don't know	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Moderate	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Minor	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

U.S. Fish and Wildlife Service (USFWS)

The mission of the USFWS is working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people. USFWS relies heavily on objective science used in the decision-making process. One of the most critical inputs of objective science is accurate, timely, and reliable data.

Habitats are comprised of the biological, chemical, and physical features over space and time. Elevation data of subsurface bottoms of lakes, rivers and oceans, earth or terrain surface features and vegetation structure and surface canopies are all critical data components to achieving the USFWS mission and supporting the greater conservation community. Service programs such as the National Wildlife Refuge System and Ecological Services utilize elevation data (and derived products) to better understand landscape features and underlying ecological processes, among other things. Technologies that provide highly accurate elevation data improve our scientific knowledge and foster improved decision-making on lands managed by USFWS, as well as help the Service address all its Mission Critical Activities. However, the acquisition of source data is not funded in a systematic way.

The USFWS needs high quality elevation data (Quality Level 2 (QL2)) nationwide to meet its mandates for managing species (especially Threatened and Endangered), their habitats (terrestrial, aquatic, and nearshore), and water across all lands. Even higher quality/resolution data (QL0/QL1) are needed to manage the hundreds of specific refuges the USFWS manages across all 50 states and many territories. Elevation data are also needed for the USFWS Fire Program and many others. Bathymetric data is vital to the habitat planning, conservation, and restoration USFWS does. Data requirements for inland topography vary depending on location and analysis type. QL0 may be required for coastal plains, highly vegetated, and densely forested areas. QL1 lidar for is ideal for refuges in the lower 48 states, Hawaii, Guam, American Samoa, Northern Mariana Islands, and Puerto Rico. QL2 lidar is needed for Alaska Refuges in the Yukon Delta and Wetland Management Districts in the lower 48 states. QL2 lidar is also appropriate for generalized landscape analysis nationwide. QL5 IFSAR is needed for other Alaska Refuges. The USFWS generally requires QL0B inland bathymetry, QL0B nearshore bathymetry, and Order 2 offshore bathymetry. Data updates are required every 4-5 years or in the event of a significant flood event or storm. Major future benefits from improved elevation data include significant cost savings and avoidance; increased program effectiveness; and time saved through faster field inspections, more efficient modeling, reduced data manipulation, faster response to events, improved projections, and faster reviews.

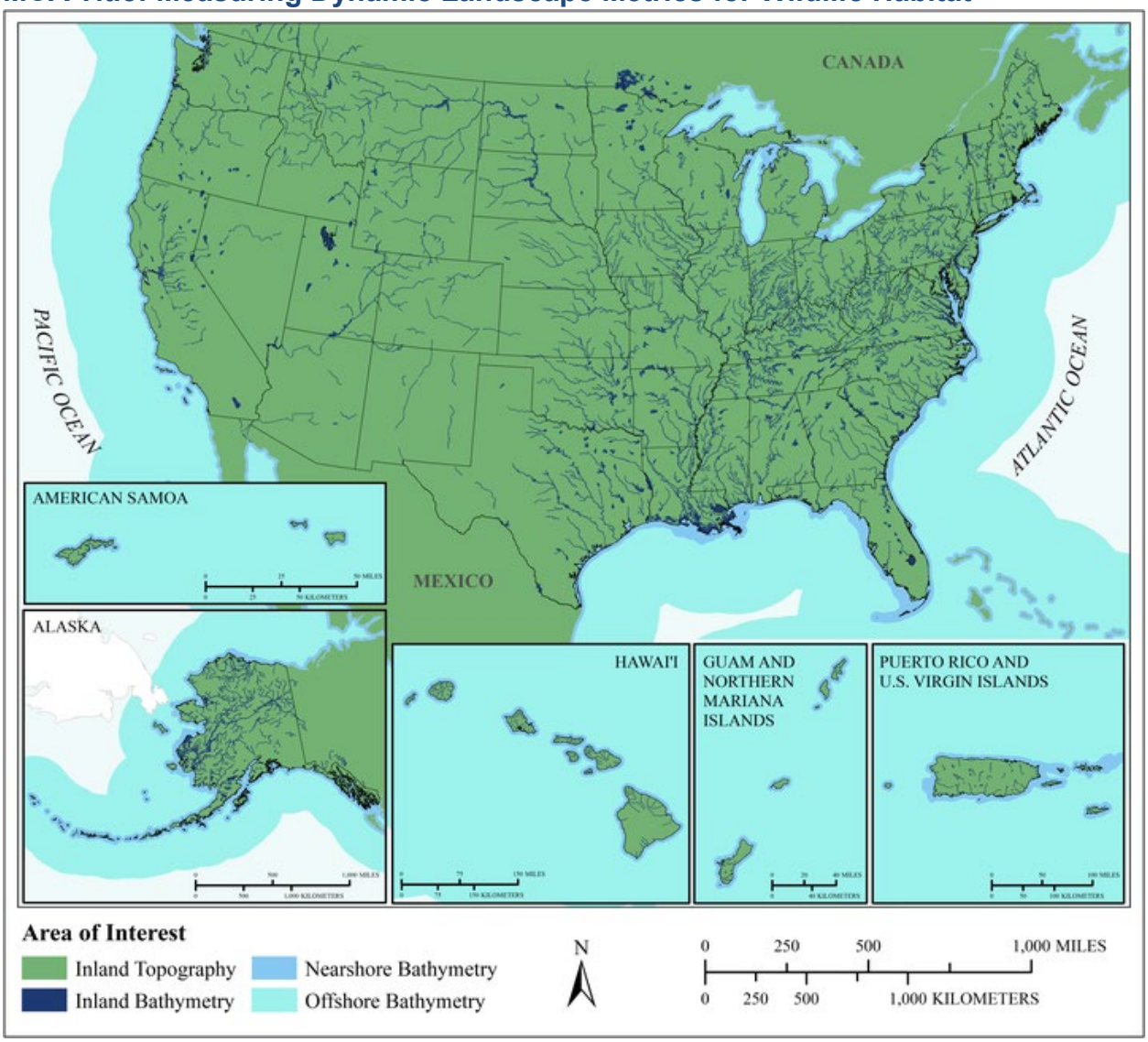
Having the ability to coordinate with the 3D Elevation Program (3DEP) Working group has been of benefit for lidar collects in the USFWS. Lidar data collects over strategic areas may provide a catalyst for fund matching. However much more needs to be done. Current funding for lidar in the USFWS comes from local office, project, or regional levels. National level support for lidar collections has never been a reality in the USFWS.

The USFWS has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 07 – Wildlife and Habitat Management	DoI: U.S. Fish and Wildlife Service (USFWS)	1124	Measuring Dynamic Landscape Metrics for Wildlife Habitat	Inland Topo	(a) QL0 (b) QL2	4-5 years for lidar baseline. Fill in with optical for frequent canopy change collection and radar for movement throughout the growing season to measure and map canopy heights	Unable to quantify	Unable to quantify	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Nearshore Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Offshore Bathy	Order 2	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 07 – Wildlife and Habitat Management	DoI: U.S. Fish and Wildlife Service (USFWS)	1186	Conservation Planning for National Wildlife Refuges	Inland Topo	(a) QL1 (b) QL2 (c) QL5	4-5 years	$467,830	$229,140	Minor	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$167,585	$27,135	Minor	I don't know	Minor
				Nearshore Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor

MCA Title: Measuring Dynamic Landscape Metrics for Wildlife Habitat



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Area split by varying quality level or update frequency	Custom description	Custom description	Custom description
Sub Area Requirements	North America, Antilles, and all Pacific Islands	North America, Antilles, and all Pacific Islands	North America, Antilles, and all Pacific Islands	North America, Antilles, and all Pacific Islands to the EEZ

MCA Description	Response
Mission Critical Activity	Using biological, chemical and physical features of the water and landscape over space and time to measure habitats geospatially over the entire planet. Elevation data are needed to evaluate land and canopy changes that affect migratory birds which do not respect political boundaries. Elevation data are also used to model wetlands that exist or can be restored. Canopy height can be used to see the existence of invasive and other species. Additionally, elevation data can be used to estimate water depths the water fowl and other shore birds prefer in impoundments. Elevation data are also needed to analyze vegetation structure (canopy height and relative vegetation density) on a landscape basis, for basal area calculation, and to improve the accuracy of vegetation structure metrics. Elevation data enable activities that just would not be done in the field from a cost perspective. The power of widespread elevation data collection is the ability to perform fine grained landscape scale analysis of vegetative and topographic data. Additional Business Uses include BU 01 - Water Supply and Quality; BU 02 – Riverine Ecosystem Management: BU 08 – Agriculture and Precision Farming; BU 15 - Flood Risk Management; BU 17 - Wildfire Management, Planning, and Response; BU 16 - Sea Level Rise and Subsidence; and BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management. These are all Business Uses that elevation data can and will be used for in USFWS nationwide.
MCA Title	Measuring Dynamic Landscape Metrics for Wildlife Habitat
MCA ID	1124
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Fish and Wildlife Service (USFWS)
Sub-Agency or Division	Ecological Services
Organization Mission	The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect, and enhance fish, wildlife, plants, and their habitats for the continuing benefit of the American people.
Program Name	Ecological Services
Total Annual Program Budget	$247,825,000
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 09 - Fisheries Management and Aquaculture

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	A variety of native and invasive plants (on land and underwater). Individual trees.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL0 (b) QL2	QL0B	QL1B	Order 2
Update Frequency	4-5 years for lidar baseline. Fill in with optical for frequent canopy change collection and radar for movement throughout the growing season to measure and map canopy heights	4-5 years and certain events.	4-5 years and certain events.	6-10 years and certain events.
Event type(s)		Floods, dam failures, new water sources, etc.	Major events (hurricanes)	Special events

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	For generalized Landscape analysis, QL2 may suffice. For certain areas of low relief where highly detailed data is desired, QL0 may be needed. QL0 for coastal plains, highly vegetated, and densely forested areas, QL2 for uplands.		Areas for generalized habitat can be coarser. Areas on the refuge and immediately adjacent would need to be of higher resolution.	6-10 years across the bulk of the offshore areas with updates at a higher resolution and frequency around inlets.
Acceptable Horizontal Error	Up to 50 cm	Up to 5 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Up to 20 cm	Up to 5 meters
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Required	Nice to have	Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Other	Required		Required			
Other description	Other AOI can be collected using stereo optical submeter satellites photogrammetrically		Tidal conditions add complexity			
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Required	Nice to have	Nice to have	
Edited/cube XYZ		Highly desirable	Nice to have	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Full waveform	Nice to have	Highly desirable	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required
Other	Required			
Other description	Other DIGITAL SURFACE VEGETATION ELEVATION SURFACE MODELS USING SUBMETER STEREO OPTICAL SATELLITES			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Required
Bottom type			Required	Required
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Required	Required
Water column properties - Chemical			Required	Required
Water column properties - Biological			Required	Required
Currents			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Required	Required
Habitat distribution and classification			Required	Required
Boundaries			Nice to have	Required
Routes			Nice to have	Required
Offshore cadastral			Highly desirable	Required
Lease areas			Highly desirable	Required
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	Required
Wetlands	Required	Required	Required	Required
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			
Other	Required			
Other description	INSAR of Water Change in Wetlands			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Stereo submeter optical satellite imagery creating 3D Vegetation Surface Models. Also using any existing DEMS mostly derived from LIDAR but a few from stereo aerial imagery. QL2 to QL4 LiDAR data.	JABLTX for the Great Lakes. Relic contours of Lake bottoms before filling as indicated on USGS 7.5 minute quad sheets.	JABLTX	NOAA Charts. Whatever is available.

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI	Yes	Yes	Yes	Yes
Open Topography	Yes			
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS			Yes	Yes
State Repositories	Yes			
State repositories used	MN, IA, WI, MI for terrestrial lidar. Also North Carolina Department of Public Safety. NOAA's Digital Coast for bathy lidar.			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Moderate
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Major	Major	Major
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Major	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	Moderate
Improved response or timeliness	Major	Major	Moderate	Moderate
Improved customer experience	Moderate	Major	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	Minor
Environmental	Major	Major	Major	Major
Public safety, including life and property	Moderate	Major	Major	Major

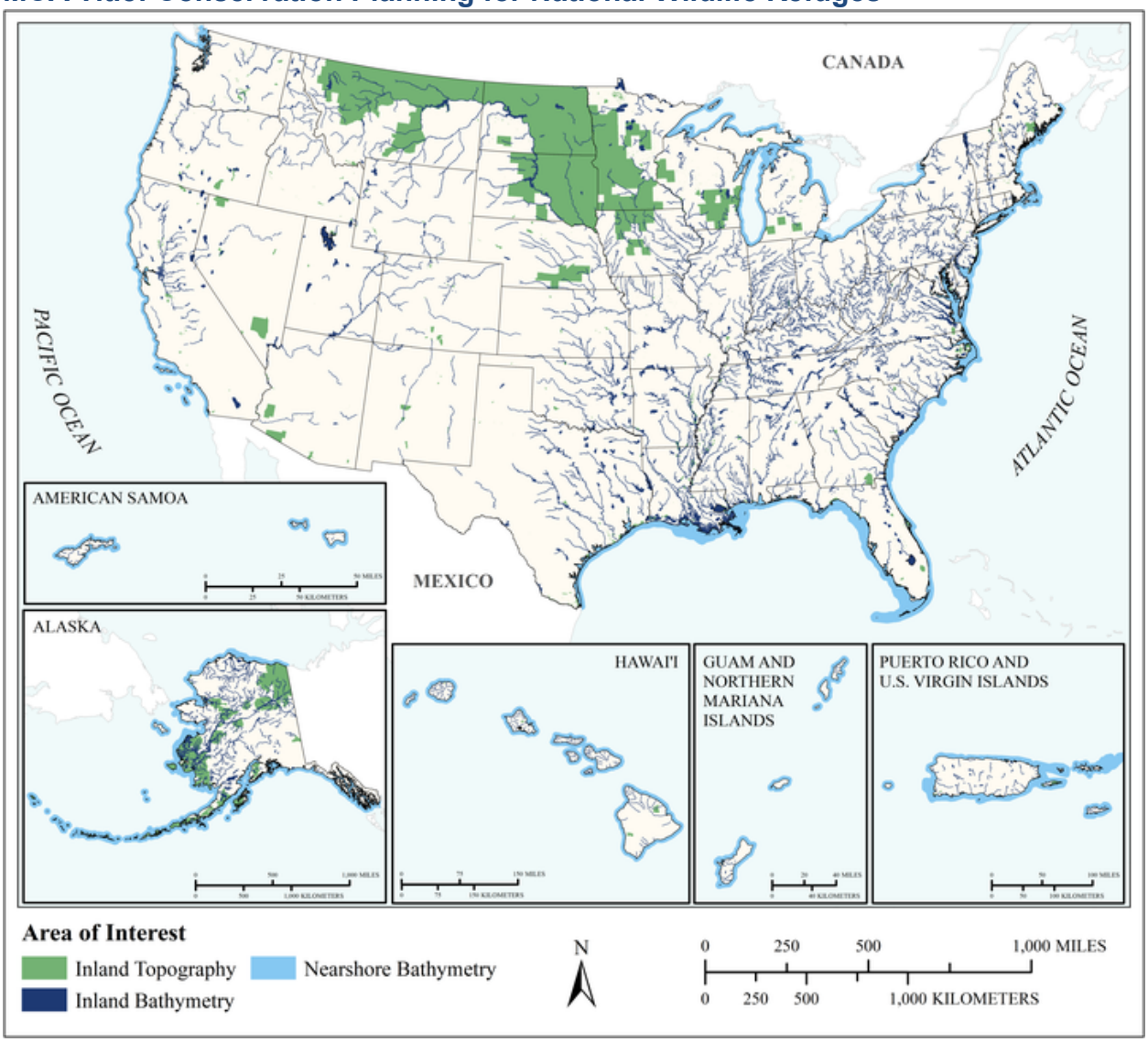
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Time savings description	Wetland mapping accuracy increased at finer resolutions as shown in MN using new high resolution DEMs. More accurate wetland maps automatically derived (and proven).			Manually digitizing and interpolation of lake and large river bathymetry data from Quad sheet contours is time is of questionable accuracy. Allows for the modeling of fish spawning areas and juvenile foraging areas with more precision. Manually digitizing and interpolation of lake and large river bathymetry data from Quad sheet contours is time consuming and of questionable accuracy.						Better modeling of fish habitat analysis for productivity.		
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction description	Accurate maps result in project implementation savings. Accurate terrain maps should reflect in more accurate estimations of the volume of earth to be moved.											
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost avoidance description	Knowing the surface and subsurface terrain will result in fewer off airport aviation and seaplane accidents. More accurate readings at a finer scale should help minimize data errors. Accurate flood mapping is the best example.						Avoided seaplane accidents, boat accidents etc.					
Increased revenues	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues description	More accurate 3D descriptions of our natural habitats will result in more efficient fish harvests, hunting opportunities, and resource management.						May be able to remove invasive carp more effectively.					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements description				Allows for the modeling of fish spawning areas and juvenile foraging areas with more precision. Allows for the modeling of fish spawning areas and juvenile foraging areas faster and with more precision.								
Other operational benefits	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other operational benefits description	In MN and the Great Lakes Basin, we have already proven the value of 3D DEMs from lidar for better wetland identification as well as using 3D surface vegetation models for seasonal wetland type identification. Semi-automated wetland mapping with 3D.			For the most part, NWI has not had access to accurate bathymetry data for the subsurface wetland types. This is a game changer.			Improved coastal management.			Given how old and coarse the current data is, anything would be better than what we have today.		
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Value added to products or services description				Fewer grounded boats. The seaplane pilots really need this now because they are guessing when they land on lakes and rivers.			Improved hunting and fishing maps.					
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description				Better visualization!								
Improved customer experience	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience description	Using NOAA's Digital Coast to bulk download data by project via wget without requiring a login is a tremendous time saver.									Requiring a login to access the data (Earthexplorer.usgs.gov) decreases accessibility and usability. The NOAA Digital Coast option of direct bulk wget downloads per project is much easier to use.		
Other customer service benefits	Moderate	Unable to provide		Moderate	Unable to provide					Major	Unable to provide	
Other customer service benefits description	More accurate maps.			Better subsurface mapping which may relate to invasive species prevention.						Deep water visualization.		
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Moderate			Major		
Education or outreach description	Predicting and tracking urbanization, mapping habitat in a way that can be more quantitatively and effectively described to the public											
Environmental	Major			Major			Major			Major		
Environmental description	More precisely describe species-specific habitats across a landscape											
Public safety, including life and property	Major			Major			Major			Major		
Public safety, including life and property description	Hazard evacuation planning on refuges, construction siting on public lands											
Other	Increased economic efficiencies						Better hunting and fishing					
Other benefits	Moderate						Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps	Yes	Yes	Yes	Yes
Cross sections	Yes			
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes		Yes	
Other (please specify)	Yes			
Other description	SURFACE VEGETATION CANOPY DEMS			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Conservation Planning for National Wildlife Refuges



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Custom description	States and/or Territories	All study waters	
Sub Area Requirements	Federal Wildlife Service Wetland Management Districts & Refuges	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		

MCA Description	Response
Mission Critical Activity	Conservation planning for national wildlife refuges, including long-term (e.g., Comprehensive Conservation Plans - 15 years) and short-term (e.g., annual habitat work plans) planning activities. Includes vegetation mapping, hydrological modeling, volumetric mapping of impoundments, and development of communication and outreach materials.
MCA Title	Conservation Planning for National Wildlife Refuges
MCA ID	1186
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Fish and Wildlife Service (USFWS)
Sub-Agency or Division	National Wildlife Refuge System
Organization Mission	The Mission of the National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.
Program Name	National Wildlife Refuge System
Total Annual Program Budget	$486,506,000
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual shrubs and trees (less than 1 meter tall) is important. Identifying water control structures and other refuge infrastructure would be important.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL1 (b) QL2 (c) QL5	QL0B	QL0B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	Areas that are expected to change frequently, the frequency of data update should be lower. There may be areas within the Refuge System that require greater than QL2 data to meet specific questions. However, QL2 specifications likely meet many common applications. QL1 LiDAR for Refuges in the lower 48 states, Hawaii, Guam, American Samoa, Northern Mariana Islands, and Puerto Rico. QL2 LiDAR for Alaska Refuges in the Yukon Delta and Wetland Management Districts in the lower 48 states. QL5 IFSAR for other Alaska Refuges.			
Acceptable Horizontal Error	Up to 80 cm	Up to 5 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm	Up to 20 cm	
How far onshore needed			To cover the beach slope	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		Certain projects may be better served using cross section/transects. However, at this time I can not identify a specific location (or refuge) where this would be the case. The larger point is that full bottom coverage is not needed for every inland water boundary in refuge system lands. Spacing unknown, likely project specific.		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Nice to have		Not required	Nice to have
Entire AOI under same environmental conditions	Not required	Not required	Nice to have		Not required	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Nice to have		Not required	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Not required	Nice to have		Not required	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to triple the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	
DTM	Highly desirable	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Highly desirable	Required	Highly desirable	
Underwater videography			Highly desirable	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Highly desirable	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Not required	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Nice to have	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Lidar data is used (mostly QL3 and some QL2 and 1) when available. Where no lidar exists, we use 10m NED and USGS topographic maps for general topographic needs.	A variety of sonar type units are used across the Refuge System, in addition to areas where green laser lidar have been used. Given the AOI is the entire Refuge System, I do not know all of the specifics about QL and dates acquired.	Post Matthew data flown by USACE, NOAA and USACE data	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI	Yes	Yes		
Open Topography	Yes			
NOAA nautical charts		Yes		
USACE navigation charts		Yes		
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	We use all states that have available lidar. Having a search option like Earth Explorer in one place is helpful. What is not known is what information is not included in EE. That would be helpful.	I am not aware of each individual state however there are users throughout the country. One national site that could be drawn upon as the definitive site for lidar data would be very beneficial.		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available	I don't know	
Cost savings/cost reduction	Moderate	Inland bathy data not available	I don't know	
Cost avoidance	Moderate	Inland bathy data not available	I don't know	
Increased revenues	I don't know	Inland bathy data not available	I don't know	
Mission-driven performance improvements	Moderate	Inland bathy data not available	I don't know	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know	I don't know	
Improved response or timeliness	Moderate	I don't know	I don't know	
Improved customer experience	Moderate	I don't know	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	I don't know	I don't know	
Environmental	Moderate	I don't know	I don't know	
Public safety, including life and property	Moderate	I don't know	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$367,830	Moderate	Annual dollars saved/realized	$117,585	Moderate	Unable to provide				
Time savings description	20 advanced users saving 50 hours per year in processing, data and manipulation, developing mapping products, etc. 20 users saving 10 hours per year in fixing data errors. 20 advanced users saving 50 hours per year in processing, model development, data storage, data manipulation. 50 users saving 10 hours per year in field visits by increased efficiency and reduced trips. 200 users saving 20 hours per year in project planning, reduction time in the field, etc.			50 users saving 10 hours per year in avoided or less intensive field surveys. 40 users saving 10 hrs per year on data errors. 50 advanced users saving 20 hours per year through reduced data manipulation and cloud storage capabilities. 20 advanced users saving 100 hours per year in improved modeling, data manipulation, mapping, etc.								
Cost savings/cost reduction	Minor	Annual dollars saved/realized	$100,000	I don't know	Annual dollars saved/realized	$50,000	Minor	Unable to provide				
Cost savings/cost reduction description	If cost could be shared across multiple local, regional, and federal levels, reduced agency cost would result. 100k is estimated cost for two relatively small (<20k ac) collections.			5 field visits (3-4 tech/leader) cancelled in which sonar would have been used to obtain bathy data.								
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Increased revenues	None			I don't know	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Annual dollars saved/realized	$90,450	Minor	Unable to provide		Minor	Unable to provide				
Value added to products or services description	100 users saving 10 hours per year by being more effective with the visiting public. 200 users saving 10 hours per year by more effectively explaining to the public elevation derived products and maps; reducing the time explaining why decisions were made, etc.											
Improved response or timeliness	Moderate	Annual dollars saved/realized	$105,525	Minor	Annual dollars saved/realized	$12,060	Moderate	Unable to provide				
Improved response or timeliness description	50 users saving 10 hours per year engaging with more effective communication with the public. 100 users saving 10 hours per year by being more effective with the visiting public during an emergency. 200 users saving 10 hours per year responding to an emergency and getting public facilities back open.			40 users saving 10 hrs per year assisting customers with better data and map products.								
Improved customer experience	Moderate	Annual dollars saved/realized	$33,165	Minor	Annual dollars saved/realized	$15,075	Minor	Unable to provide				
Improved customer experience description	50 users saving 10 hours per year engaging with more effective communication with the public. # of hours spent annually saved by being able to download data faster and address issues that arise in the public. 40 users saving 10 hours per year helping the public understand elevation data and derived products, risk evaluations, etc.			40 users saving 10 hrs per year in increased efficiencies with interested public. 25 users saving 4 hrs per year responding to inquiries by the public about data availability.								
Other customer service benefits				Minor	Unable to provide		Minor	Unable to provide				

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other customer service benefits description		Better data = better decisions. Builds public confidence. Better understanding of features that we managed within the Refuge System.		
Societal Benefits	**Benefits**	**Benefits**	**Benefits**	**Benefits**
Education or outreach	Minor	Minor	Minor	
Education or outreach description	Detailed maps with lidar products help communicate to the public about conservation mission of the refuge system and the lands managed from the American public.	Good visualization tools build public interest and support for the Refuge System.	Better data will yield better decisions and improved communication to the public.	
Environmental	Moderate	I don't know	Minor	
Environmental description	High quality information will lead to better decisions.		Better data will improve decision making in a timely way.	
Public safety, including life and property	Moderate	Minor	Minor	
Public safety, including life and property description	Up to date DEMs would assist in decision making when dealing with natural disasters which will help save lives.	Same as above. Visualization tools help with public safety either before, during or after an emergency.	Improved communication through high quality data will improve public safety, including recovery from a natural disaster.	

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

International Boundary and Water Commission (IBWC)

The mission of the IBWC is to apply the rights and obligations which the Governments of the United States and Mexico assume under the numerous boundary and water treaties and related agreements, and to do so in a way that benefits the social and economic welfare of the peoples on the two sides of the boundary and improves relations between the two countries.

Established in 1889, the IBWC has responsibility for applying the boundary and water treaties between the United States and Mexico and settling differences that may arise in their application. The IBWC is an international body composed of the United States Section and the Mexican Section, each headed by an Engineer-Commissioner appointed by his/her respective president. Each Section is administered independently of the other. The United States Section of the IBWC is a federal government agency and is headquartered in El Paso, Texas. The IBWC operates under the foreign policy guidance of the Department of State. The Mexican Section is under the administrative supervision of the Mexican Ministry of Foreign Affairs and is headquartered in Ciudad Juarez, Chihuahua, Mexico.

As provided for in the treaties and agreements, those rights and obligations include: distribution between the two countries of the waters of the Rio Grande and of the Colorado River; regulation and conservation of the waters of the Rio Grande for their use by the two countries by joint construction, operation and maintenance of international storage dams and reservoirs and plants for generating hydroelectric energy at the dams; regulation of the Colorado River waters allocated to Mexico; protection of lands along the river from floods by levee and floodway projects; solution of border sanitation and other border water quality problems; preservation of the Rio Grande and Colorado River as the international boundary; and demarcation of the land boundary.

The IBWC currently uses elevation data from a 2011 lidar collection. The data are accessed from the National Map, NOAA, USACE, USGS, NGA, as well as internal sources and state repositories.

In general, the IBWC requires Quality Level 0 (QL0) inland topography, QL0B inland bathymetry, and QL1B nearshore bathymetry. All data types should be updated every 4-5 years. The IBWC's area of interest is comprised of the HUC8s along the United States and Mexican border.

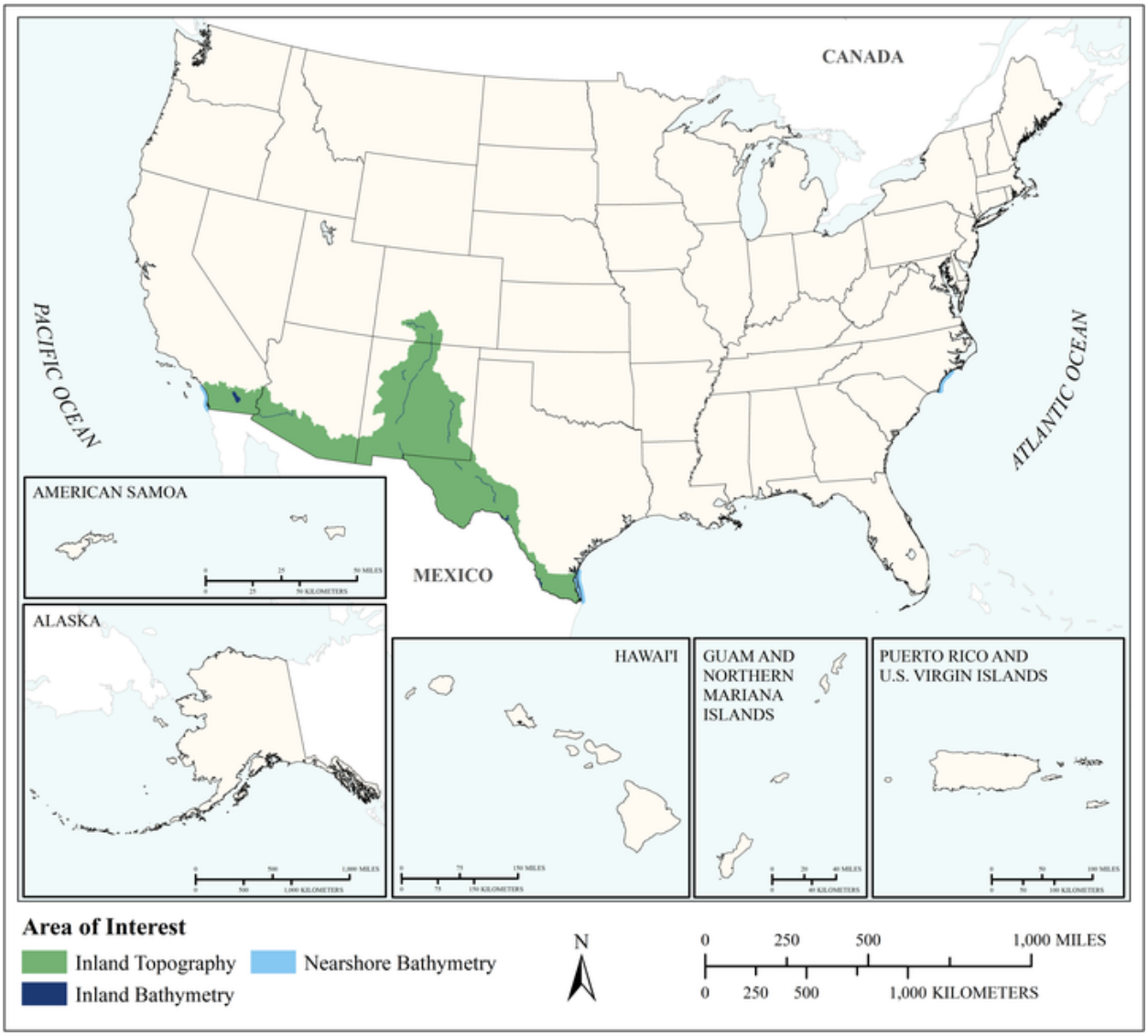
Access to more accurate topographic data for boundary preservation and water quality and management would provide major future annual benefits. Future annual benefits to the IBWC from enhanced elevation data include significant time savings for field visits, modeling efficiencies, quicker determination of boundaries, and reduced data errors. There would be a major reduction of costs due to less data processing and avoided data errors. Enhanced topographic and inland bathymetry data would also allow faster post-event response and recovery by way of identifying impacted areas, as well as improving projections of at-risk locations and providing faster flood warnings.

The IBWC has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	U.S. International Boundary and Water Commission (IBWC)	60692	Water Supply and Quality	Inland Topo	QL2	4-5 years	$923,575	$105,996	Moderate	Major	Moderate
				Inland Bathy	QL1B	6-10 years	$3,579,543	$207,817	Moderate	Major	Moderate
				Nearshore Bathy	QL1B	4-5 years	$40,401	$33,278	Moderate	Moderate	Moderate
BU 15 – Flood Risk Management	U.S. International Boundary and Water Commission (IBWC)	60693	Flood Risk Management	Inland Topo	QL2	4-5 years	$22,479,160	$1,861,890	Major	Moderate	Major
				Inland Bathy	QL1B	4-5 years	$1,439,439	$801,478	Moderate	Moderate	Major
				Nearshore Bathy	QL2B	4-5 years	$140,194	$70,604	Major	Moderate	Major
BU 22 – Infrastructure Management	U.S. International Boundary and Water Commission (IBWC)	60694	Infrastructure and Construction Management	Inland Topo	QL0	4-5 years	$7,236,148	$4,638,908	Minor	Moderate	Major
				Inland Bathy	QL0B	4-5 years	$1,973,486	$123,326	Minor	Minor	Moderate
				Nearshore Bathy	QL1B	4-5 years	$25,598	$3,519	Minor	Moderate	Moderate
BU 30 – Maritime and Land Boundary Management	U.S. International Boundary and Water Commission (IBWC)	21609	Boundary Preservation, Water Conveyance, and Water Quality Management Along the U.S. Mexico Border	Inland Topo	QL0 HD	2-3 years	$1,513,136	$163,654	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$247,294	$86,831	Major	Major	Major

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	
Sub Area Requirements	IBWC Area of Operations	IBWC Area of Operations	Nearshore waters off IBWC Area of Operations	

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60692
Organization Type	Federal Agencies and Commissions
Organization Name	U.S. International Boundary and Water Commission (IBWC)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	
Update Frequency	4-5 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Nice to have		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Nice to have	
DTM	Required	Highly desirable	Nice to have	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	
Cost savings/cost reduction	Major	Minor	Moderate	
Cost avoidance	Major	Minor	Moderate	
Increased revenues	Minor	None	Minor	
Mission-driven performance improvements	Major	Moderate	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Moderate	

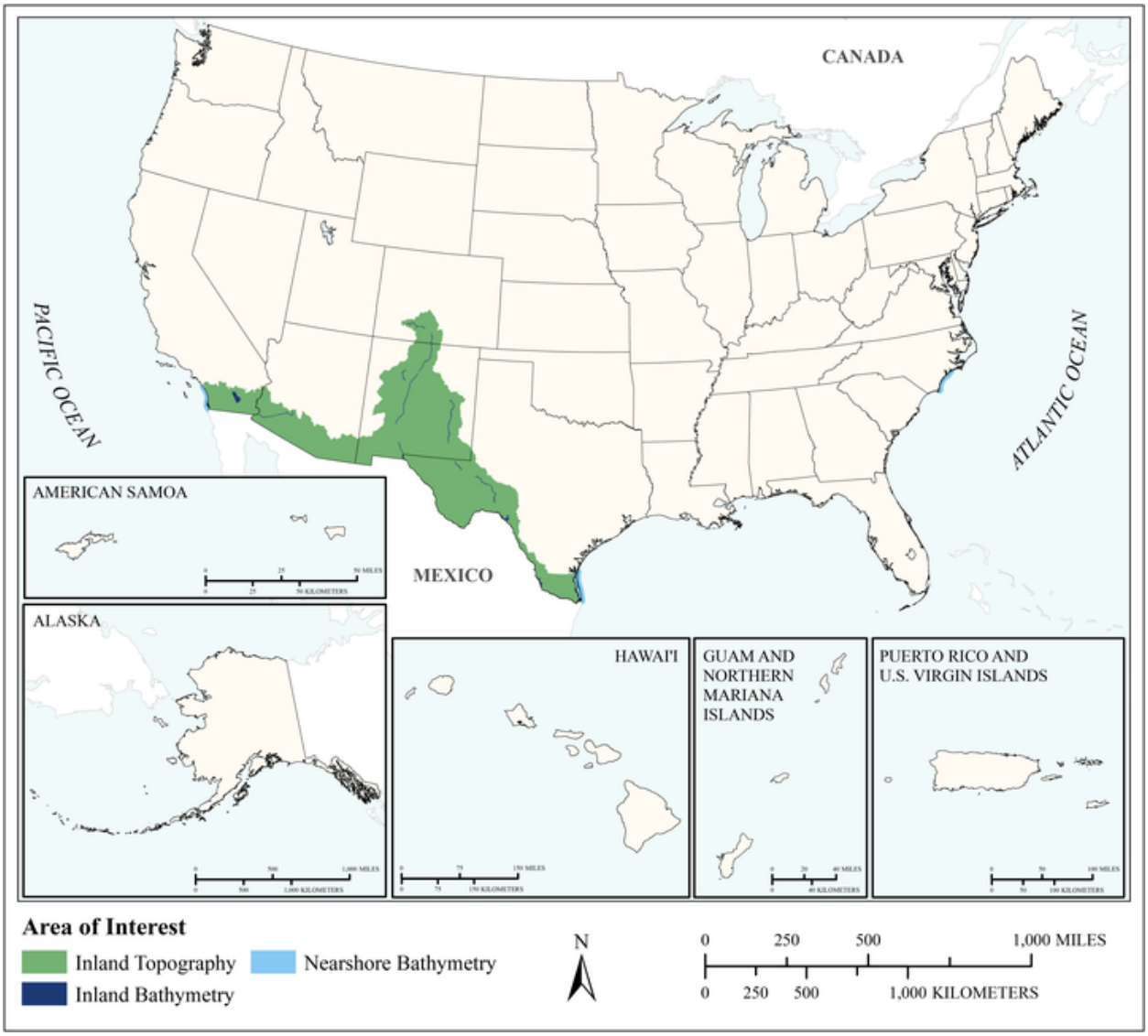
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Minor	Moderate	
Improved customer experience	Major	Minor	Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Moderate	
Environmental	Major	Moderate	Moderate	
Public safety, including life and property	Major	Minor	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$923,575		Annual dollars saved/ realized	$3,579,543		Annual dollars saved/ realized	$40,401			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$105,996		Annual dollars saved/ realized	$207,817		Annual dollars saved/ realized	$33,278			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate					
Environmental	Major			Major			Moderate					
Public safety, including life and property	Moderate			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes		Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Flood Risk Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	
Sub Area Requirements	IBWC Area of Operations	IBWC Area of Operations	Nearshore waters off IBWC Area of Operations	

MCA Description	Response
Mission Critical Activity	Flood risk modeling and mapping of riverine and coastal areas. Dam/dike/levee safety analysis. Emergency management. Flood forecasts.
MCA Title	Flood Risk Management
MCA ID	60693
Organization Type	Federal Agencies and Commissions
Organization Name	U.S. International Boundary and Water Commission (IBWC)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL2B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Nice to have	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	Minor	Minor	None	
Mission-driven performance improvements	Major	Moderate	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	

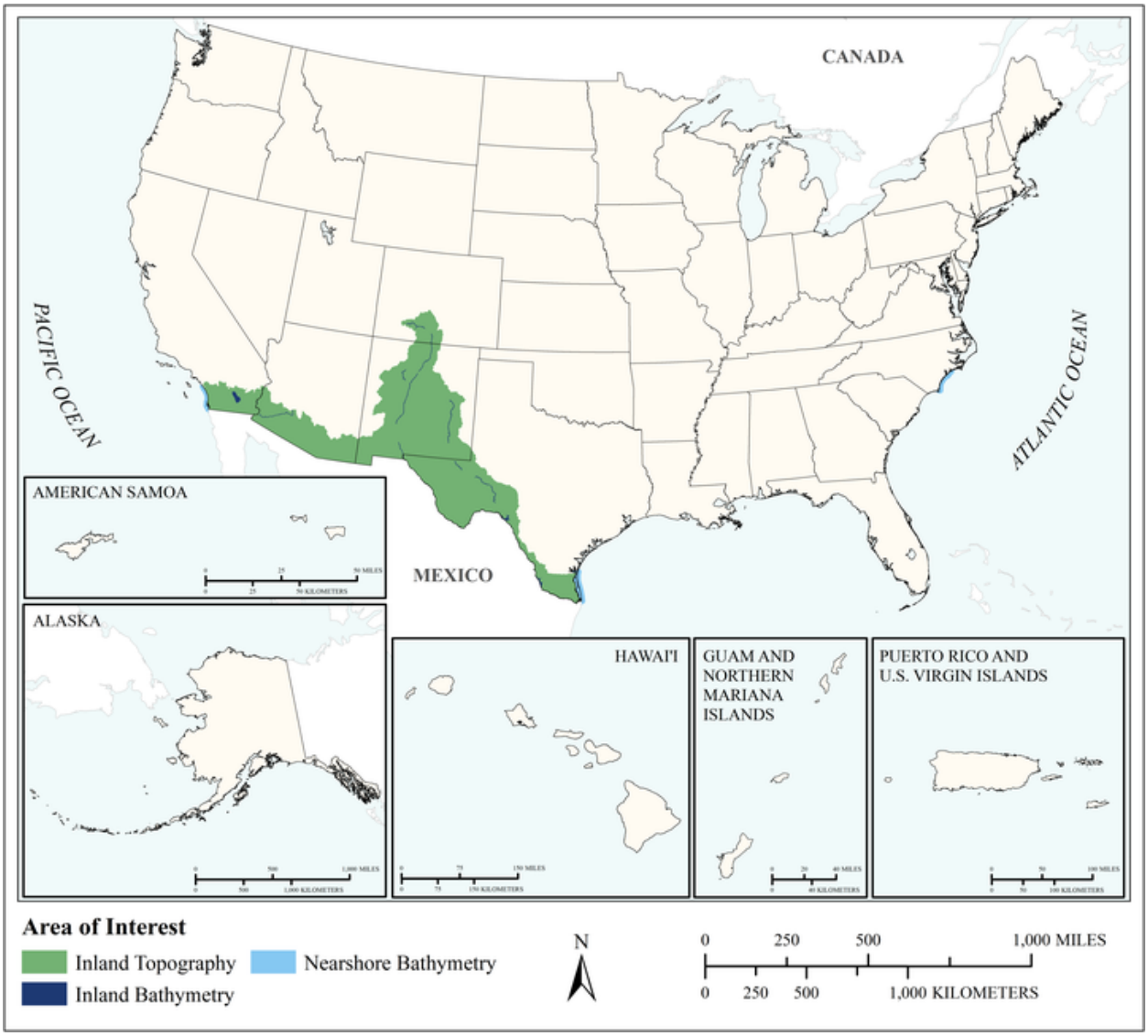
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Minor	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Minor	
Environmental	Moderate	Moderate	Moderate	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		None			Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$22,479,160		Annual dollars saved/ realized	$1,439,439		Annual dollars saved/ realized	$140,194			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,861,890		Annual dollars saved/ realized	$801,478		Annual dollars saved/ realized	$70,604			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes	Yes	
Height-Above-Ground maps			Yes	
Viewshed maps				
Hydrologic Flow Direction Grids	Yes		Yes	
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	
Sub Area Requirements	IBWC Area of Operations	IBWC Area of Operations	Nearshore waters off IBWC Area of Operations	

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60694
Organization Type	Federal Agencies and Commissions
Organization Name	U.S. International Boundary and Water Commission (IBWC)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL1B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Major	Moderate	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Moderate	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	

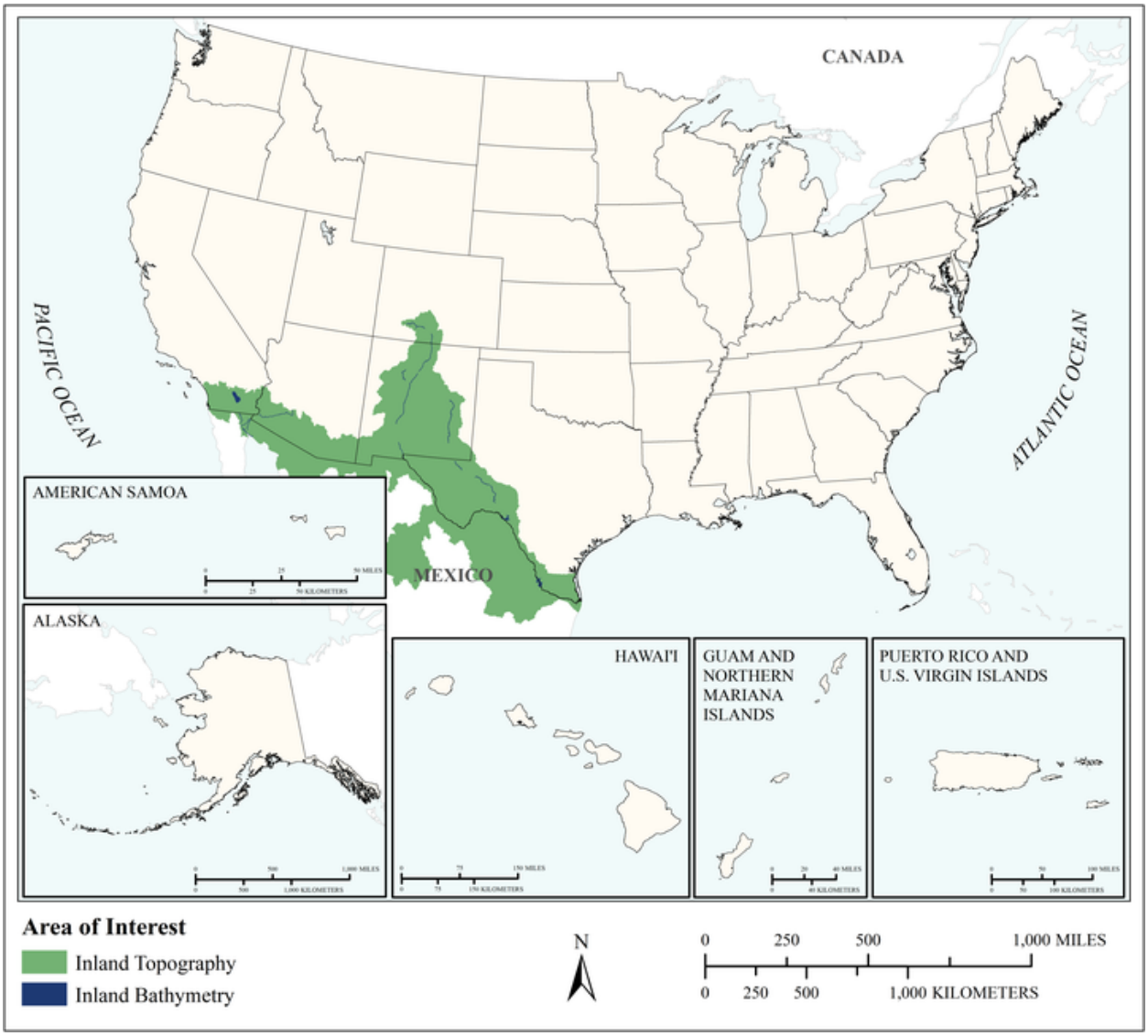
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Moderate	Minor	
Improved customer experience	Moderate	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	
Environmental	Moderate	Minor	Minor	
Public safety, including life and property	Moderate	Moderate	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$7,236,148		Annual dollars saved/ realized	$1,973,486		Annual dollars saved/ realized	$25,598			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$4,638,908		Annual dollars saved/ realized	$123,326		Annual dollars saved/ realized	$3,519			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor					
Environmental	Moderate			Minor			Moderate					
Public safety, including life and property	Major			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Boundary Preservation, Water Conveyance, and Water Quality Management Along the U.S. Mexico Border



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase		
Sub Area Requirements	IBWC Area of Operations	IBWC Area of Operations		

MCA Description	Response
Mission Critical Activity	The mission of the IBWC is to apply the rights and obligations that the Governments of the United States and Mexico assume under boundary and water treaties, and to do so in way that benefits the social and economic welfare of people on both sides of the boundary and improves relations between the two countries. Elevation data are needed for habitat restoration and monitoring, archaeological documentation and mapping, flood control and hydrology modeling, and water quality issues. IBWC provides flood protection to U.S. residents and ensures the efficient conveyance, utilization, and accurate accounting of boundary and transboundary river waters through the operation and maintenance of flood control structures, dams, reservoirs, power plants, and gaging stations in accordance with domestic law and international agreements. The Transboundary Aquifer Program manages groundwater along the U.S. Mexico border. Elevation data are needed for H&H modeling for dam and levee safety, flood risk analysis, flow volumes, and project planning and preliminary design of new facilities. Bathymetry is needed for reservoir silt determinations.
MCA Title	Boundary Preservation, Water Conveyance, and Water Quality Management Along the U.S. Mexico Border
MCA ID	21609
Organization Type	Federal Agencies and Commissions
Organization Name	U.S. International Boundary and Water Commission (IBWC)
Sub-Agency or Division	U.S. International Boundary and Water Commission
Organization Mission	International Boundary and Water Commission (IBWC) has responsibility for applying the boundary and water treaties between the United States and Mexico and settling differences that may arise in their application.
Program Name	Operations
Total Annual Program Budget	$18,000,000
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 22 - Infrastructure and Construction Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.

General Geographic Area and Size	
Description of smallest 3D features	Property line stakes. Posts wood, metal. approximately 1'-2' height; individual tree, shrub that provided resistance to flow; Boundary markers

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL0B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm		
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		
Cross section/transect requirement	Cross section about 100 feet apart; Vertical accuracy, <5cm, with longitudinal sampling density of greater than 8 points per sq. meter	1 meter DEM; cross sections about 100 feet apart		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required			Required	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Required		
Full waveform	Required	Required		
Bathymetric Attributed Grid (BAG)		Required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Required		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Required	Required		
Cultural resources	Required	Required		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2011 Lidar Collection.	Sedimentation Surveys of reservoirs in an ArcGIS framework; We use our own bathymetry data on reservoirs taken every 10 years; Contract specific.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes	Yes		
Open Topography				
NOAA nautical charts				
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories		Yes		
State repositories used		Texas (Texas Natural Resource Information System)		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes	Yes		
Other description	Contracted Collections; internal lidar, Surveys, NGA	Internal		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	None	Major		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Major		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$159,192	Major	Annual dollars saved/realized	$67,295						
Time savings description	Authoritative data baseline. Authoritative data prepared with industry standards less likely to produce errors. Improved ability to analyze dam and levee safety using H&H models. Time per field visit. Authoritative data baseline; improved products sent for permitting.			Again, hard to estimate once the new data is available. Once enacted - direct surveys will not be required for many of our sites.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$125,000	Major	Annual dollars saved/realized	$60,000						
Cost savings/cost reduction description	Authoritative data readily downloadable.											
Cost avoidance	Major	Annual dollars saved/realized	$1,200,000	Major	Annual dollars saved/realized	$120,000						
Cost avoidance description	Authoritative data prepared with industry standards less likely to produce errors. Can be used to mitigate risk and hazards; estimated if catastrophic failure occurs.											
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	Major	Annual percent improvement	50%	Major	Annual percent improvement	22%						
Mission-driven performance improvements description	Spend more time on solving problems that buried in technical matters.											
Other operational benefits	Moderate	Annual dollars saved/realized	$28,944									
Other operational benefits description	More accurate information for assessment.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$31,959	Major	Annual dollars saved/realized	$8,683						
Value added to products or services description	Many hours dedicated to flood operations and flood mitigation. Less cost for levee rehabilitation (design, modeling, construction) by stakeholders. Improved facility maintenance.			Improved modeling and facility maintenance.								
Improved response or timeliness	Major	Annual dollars saved/realized	$50,652	Major	Annual dollars saved/realized	$52,099						
Improved response or timeliness description	Provide stakeholder vetted baseline data and information. Spend more time on solving problems that buried in technical matters. Flood hazard mapping. Flood warnings and Flood operations. Quicker determination of boundaries. Identification of Damaged / Impacted areas.											
Improved customer experience	Major	Annual dollars saved/realized	$81,043	Major	Annual dollars saved/realized	$26,050						
Improved customer experience description	Timely, Responsive, and Precise products and services. Improved understanding by communities of flood risks and the safety of IBWC projects. Baseline of vetted products to create custom services and features. Centralized location.											

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Other customer service benefits				Moderate	Unable to provide							
Other customer service benefits description				Reservoir storage and flood control operations especially. Public access to records.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Education or outreach description	Ability to spotlight current issues or areas of concern. Improved understanding by communities of flood risks and the safety of IBWC projects.											
Environmental	Major			Major								
Environmental description	Ability to spotlight current issues or areas of concern; Better assessment and mapping capabilities.											
Public safety, including life and property	Major			Major								
Public safety, including life and property description	Apples to Apples comparison. Critical to make timely and informed decisions; Improved maps and information (modeling). Better understanding of risks and lower potential future loss of life or economic impacts.											
Other												
Other benefits				Moderate								
Other description				Increased trust								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

International Joint Commission (IJC)

The IJC prevents and resolves disputes between the United States of America and Canada under the 1909 Boundary Waters Treaty and pursues the common good of both countries as an independent and objective advisor to the two governments. In particular, the IJC rules upon applications for approval of projects affecting boundary or transboundary waters and may regulate the operation of these projects; it assists the two countries in the protection of the transboundary environment, including the implementation of the Great Lakes Water Quality Agreement and the improvement of transboundary air quality; and it alerts the governments to emerging issues along the boundary that may give rise to bilateral disputes.

Canada and the U.S. created the IJC because they recognized that each country is affected by the other's actions in lake and river systems along the border. The two countries cooperate to manage these waters and to protect them for the benefit of today's citizens and future generations.

The IJC is guided by the Boundary Waters Treaty, signed by Canada and the U.S. in 1909. The treaty provides general principles, rather than detailed prescriptions, for preventing and resolving disputes over waters shared between the two countries and for settling other transboundary issues. The specific application of these principles is decided on a case-by-case basis.

The IJC has two main responsibilities: approving projects that affect water levels and flows across the boundary and investigating transboundary issues and recommending solutions. The IJC's recommendations and decisions take into account the needs of a wide range of water uses including drinking water, commercial shipping, hydroelectric power generation, agriculture, ecosystem health, industry, fishing, recreational boating, and shoreline property.

Elevation data are used for cooperation and data harmonization between the U.S. and Canada to protect shared waters. Elevation data are needed for the International Watersheds Initiative, which is working on integrating and standardizing hydrographic data along the 5,000-mile U.S.-Canada border.

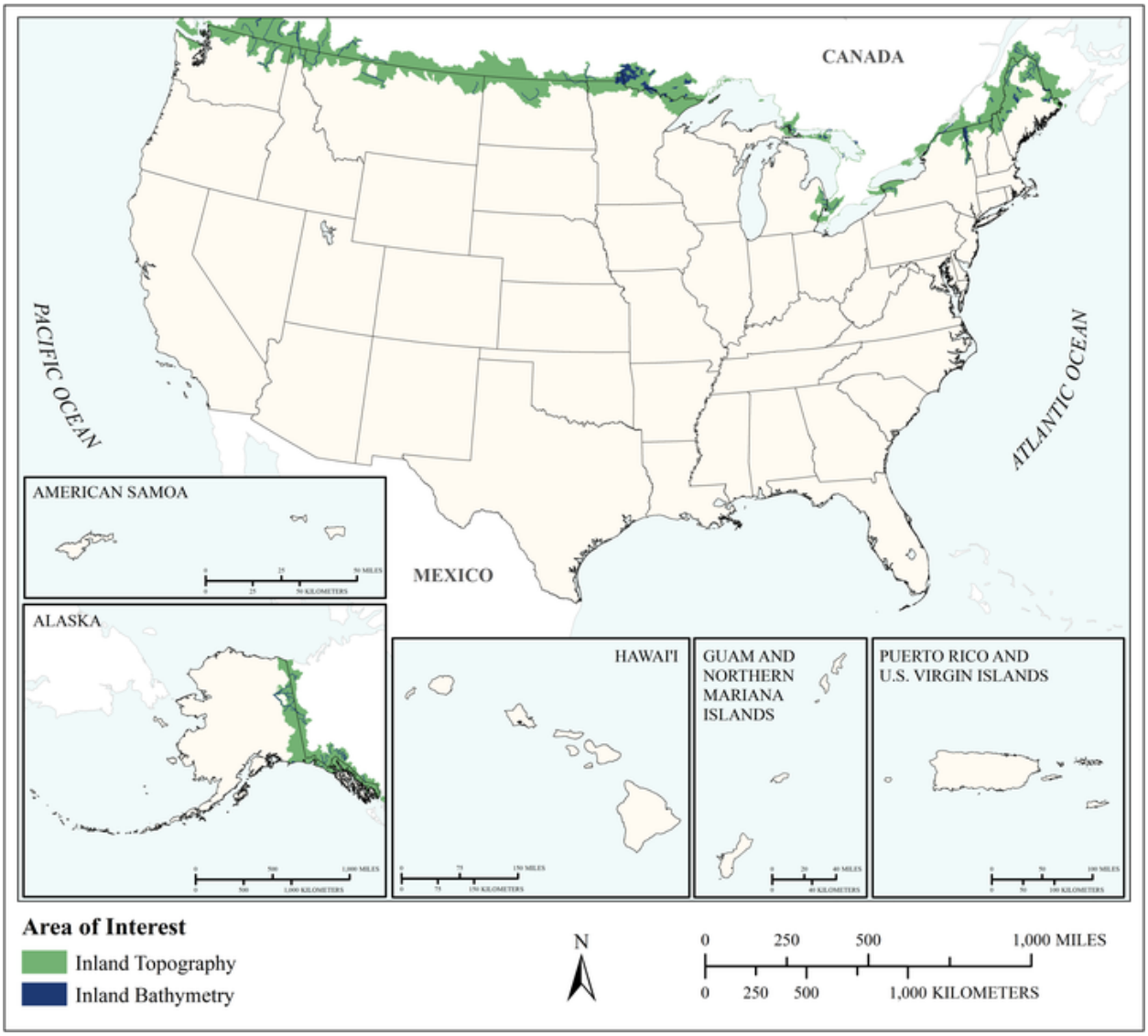
Elevation data requirements are Quality Level 2 (QL2) inland topography and QL1B inland bathymetry updated every 2-3 years. Benefits that would come from improved elevation data include more efficient modeling, reviews, reporting, data dissemination, mapping, or other procedures; data processing avoided, increased program effectiveness and improved decision making; and improved projections of at-risk locations and faster recovery after an event. Seamless data across the U.S. boundary with Canada would allow harmonization and data sharing with Canada.

IJC has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	International Joint Commission (IJC)	1244	Bi-National Cooperation	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major

MCA Title: Bi-National Cooperation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Custom description	Custom description		
Sub Area Requirements	HUC8s along the entire U.S.-Canada boundary	HUC8s along the entire U.S.-Canada boundary		

MCA Description	Response
Mission Critical Activity	Bi-national cooperation and data harmonization between the U.S. and Canada to protect shared waters. Elevation data are needed for the International Watersheds Initiative, which is working on integrating and standardizing hydrographic data along the 5,000-mile U.S.-Canada border. An additional Business Use for this MCA is BU 08 - Agriculture and Precision Farming.
MCA Title	Bi-National Cooperation
MCA ID	1244
Organization Type	International Treaty Organization
Organization Name	International Joint Commission (IJC)
Sub-Agency or Division	
Organization Mission	Prevent and resolve issues dealing with the quantity and quality of waters shared by Canada and the U.S.
Program Name	The International Watersheds Initiative: Canada and the U.S.
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 02 - Riverine Ecosystem Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	The Canadian US Boundary
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual homes

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Less than 50 cm		
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	Up to 10 cm - Rainy River, Lake of the Woods, Lake Ontario, Lake Superior, Lake Champlain, Lake Memphremagog, Lake Osoyoos, Kootenay, St Lawrence River, Maumee River			

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Nice to have			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Highly desirable	Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Required		
Land use/land cover	Highly desirable	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	What is currently available from the 3 DEP	NOAA		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast		Yes		
NCEI		Yes		
Open Topography				
NOAA nautical charts		Yes		
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major		
Cost savings/cost reduction	Major	Moderate		
Cost avoidance	Moderate	Moderate		
Increased revenues	None	Minor		
Mission-driven performance improvements	Major	Major		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Moderate	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Major		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Other operational benefits				Major	Unable to provide							
Other operational benefits description				Seamless data across the U.S. Boundary with Canada. Harmonization with Canada.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Minor	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Other customer service benefits				Major	Unable to provide							
Other customer service benefits description				Data Sharing with Canada.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections		Yes		
Height-Above-Ground maps		Yes		
Viewshed maps		Yes		
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness		Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Maritime Administration (MARAD)

MARAD is one of the 11 administrations under the Department of Transportation. **The mission of MARAD is to foster, promote and develop the maritime industry of the United States to meet the nation's economic and security needs.**

Under its mission, MARAD promotes the development and maintenance of an adequate, well-balanced, United States merchant marine, sufficient to carry the nation's domestic waterborne commerce and a portion of its waterborne foreign commerce, and capable of serving as a naval and military auxiliary in time of war or national emergency. MARAD also seeks to ensure that the United States enjoys adequate shipbuilding and repair service, efficient ports, effective intermodal water and land transportation systems, and reserve shipping capacity in time of national emergency.

Importance of elevation data to MARAD

MARAD currently uses publicly available topographic lidar and bathymetry and does not acquire elevation data on its own. The majority of MARAD's geographic data is of port, dock, and waterway locations and is provided by other federal agencies or private vendors. MARAD also heavily relies on automatic identification system (AIS) data from both U.S. and foreign-flag vessels to better understand the trading routes of vessels servicing U.S. ports. MARAD uses port data to analyze the economic impacts of current port usage and how policy affects that, and elevation data makes up a small percentage of what data are used. Management and maintenance of navigation channels is handled by the U.S. Army Corps of Engineers and the U.S. Coast Guard oversees marine safety.

High-level summary of elevation data requirements

MARAD needs the latest, most accurate data available for the entire United States and out to the Exclusive Economic Zone. Inland topography and bathymetry requirements vary depending on Mission Critical Activity. MARAD requires Quality Level 0B nearshore bathymetry and Order 1a offshore bathymetry updated every 2-3 years.

High-level summary of benefits that would come from higher resolution elevation data

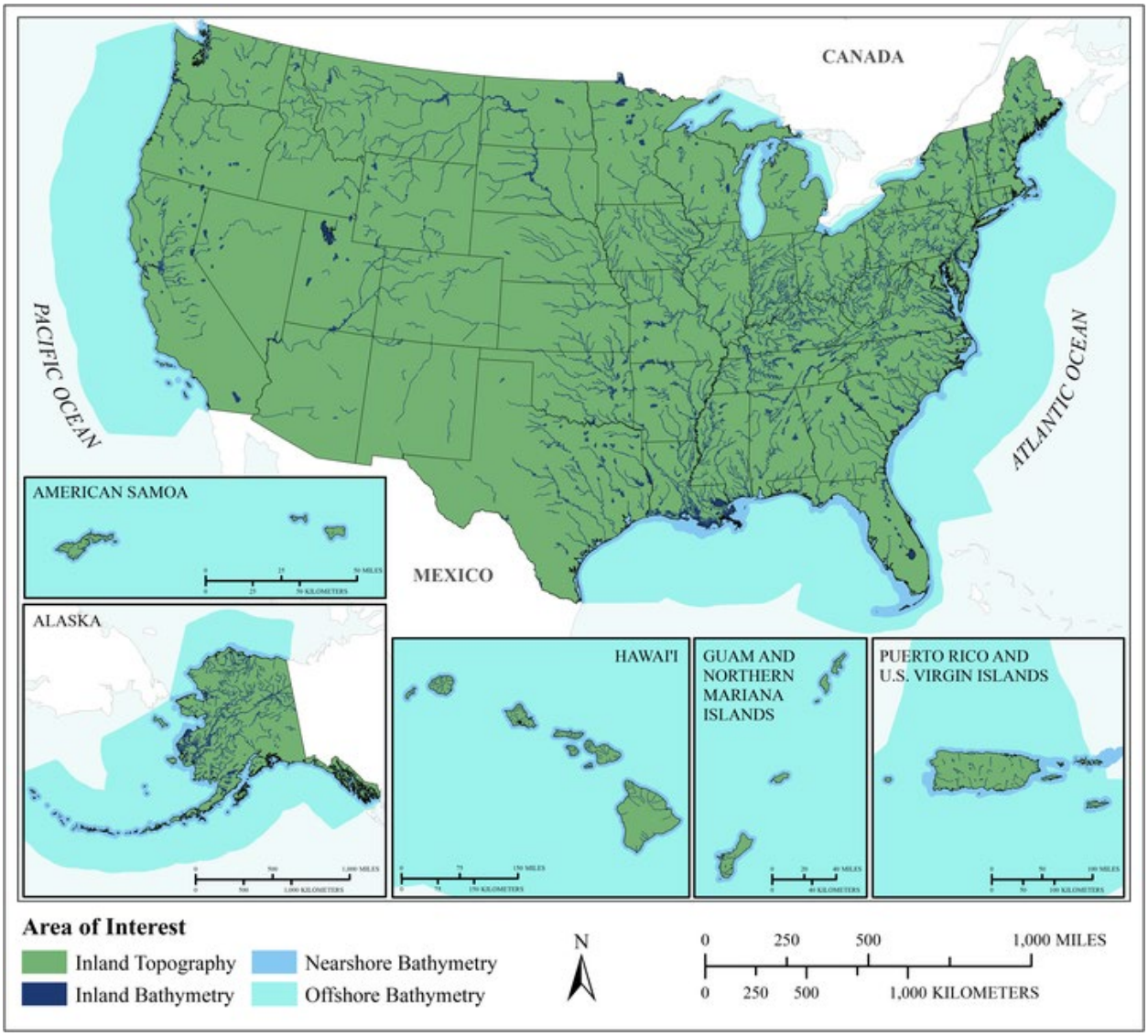
MARAD reports major benefits that would come from higher resolution elevation data due to time and cost savings, cost avoidance, increased revenues, mission-driven performance improvements, value added to products or services, improved timeliness, improved customer service experience, environmental benefits, and public safety benefits.

MARAD has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 20 – Marine and Riverine Navigation	DoT: Maritime Administration (MARAD)	22364	Data Collection and Analysis of Maritime Geospatial Data	Inland Topo	QL2	6-10 years	$137,750,984	Unable to quantify	Moderate	Major	Major
				Inland Bathy	Cross sections and/or transects meet needs	6-10 years	$32,843,495	$4,319,054	Moderate	Major	Major
				Nearshore Bathy	Cross sections and/or transects meet needs	6-10 years	$60,104,205	$592,365	Moderate	Major	Major
				Offshore Bathy	Cross sections and/or transects meet needs	6-10 years	$8,322,080	Unable to quantify	Moderate	Major	Major
BU 29 – Military	DoT: Maritime Administration (MARAD)	60657	Military	Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
				Offshore Bathy	Order 1a	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
BU 30 – Maritime and Land Boundary Management	DoT: Maritime Administration (MARAD)	60658	Maritime and Land Boundary Management	Inland Topo	QL1	4-5 years	$5,161,313	$5,437,701	Major	Minor	Minor
				Inland Bathy	QL0B	4-5 years	$2,123,651	$212,214	Major	Major	Moderate
				Nearshore Bathy	QL0B	2-3 years	$26,214,097	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	Order 1a	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate

MCA Title: Data Collection and Analysis of Maritime Geospatial Data



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Nice to have	Required	Required	Required
Geographic Area Requirements	States and/or Territories	States and/or Territories	All study waters	All study waters
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		

MCA Description	Response
Mission Critical Activity	Marine and Riverine Navigation and Safety. MARAD deals with all maritime issues within the Department of Transportation, including shipping and all ports, both coastal and on inland waterways. Topographic and bathymetric data are used in conjunction with other datasets that are specific to vessel traffic, such as the Automatic Identification Systems (AIS) data transmitted by vessels about where and when they are traveling on the water. MARAD is one of nine agencies that participates in the National Port Readiness Network (NPRN); a cooperative designed to ensure the readiness of commercial ports to support U.S. military movements. In addition, MARAD plays a key role in the realm of strategic sealift and is a maintainer of a fleet of government-owned vessels. Due to these responsibilities, access to accurate nautical charts, including reliable information regarding port/channel depths is important for assessing port readiness and ensuring that our agency can carry out its strategic sealift responsibilities. Port infrastructure development is a topic of great interest to MARAD. Elevation data could play a role in helping us to better understand infrastructure needs at U.S. ports especially as they relate to storm surges and sea level rise. Monitoring sea level rise is not a major function in the organization, but elevation information is critical to the management of risk related to port and infrastructure investment supported by DOT/MARAD's discretionary grant programs. BU 12 – Renewable Energy Resources, BU 13 – Oil and Gas Resources, BU 15 – Flood Risk Management, and BU 18 – Homeland Security, Law Enforcement, Disaster Response, and Emergency Management are additional Business Uses for this activity. MARAD monitors vessel activity near oil and gas platforms in U.S. waters. As water depths can dictate what types of offshore supply vessels are used to carry out certain activities near a platform, we have had to rely on depth information to better understand which vessels can best fulfill certain roles with respect to offshore oil production. As offshore wind development increases, MARAD will need to monitor activity in these areas in much the same way the agency currently does for the oil and gas industry. MARAD does not have a lead role in flood risk management, but elevation information is critical to the management of risk related to port and infrastructure investment supported by DOT/MARAD's discretionary grant programs. Homeland Security and Disaster Response could be considered a tertiary use of elevation data within MARAD. Although we actively monitor port conditions during emergency events, including hurricanes, we have not utilized elevation data during our monitoring/analysis of past events. However, incorporating elevation data into future disaster response activities at MARAD could be beneficial.
MCA Title	Data Collection and Analysis of Maritime Geospatial Data

MCA ID	22364
Organization Type	Federal Agencies and Commissions
Organization Name	DoT: Maritime Administration (MARAD)
Sub-Agency or Division	Office of Policy and Plans
Organization Mission	Special short-term analyses and evaluations, briefings, and policy papers on current and projected future marine transportation issues are often prepared to help inform policy level officials of the Maritime Administration, the Department of Transportation, the Office of Management and Budget, and other agencies.
Program Name	Maritime Security Program (MSP), National Defense Reserve Fleet (NDRF), Ready Reserve Fleet (RRF)
Total Annual Program Budget	$3,000,000,000
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	**Response**
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Supporting U.S. maritime, we need national and international data.

Inland Bathy Feature Size Requirements	**Response**
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Not required
101 - 500 ft	Not required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs
Update Frequency	6-10 years	6-10 years	6-10 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	Need to know when updates are made to data so we can find best available data		Need to know when updates are made to data so we can find best available data	Need to know when updates are made to data so we can find best available data
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Less than 50 cm	Less than 50 cm
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	Less than 1 meter
How far onshore needed			To MHW	
How far down the beach profile needed	To MLLW		To MHHW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs		Yes	Yes	Yes
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Required	Required	Required	Nice to have	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable
DEM for entire AOI needs to be seamless	Nice to have	Required	Highly desirable	Required	Nice to have	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Highly desirable	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Nice to have	Highly desirable	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Required	Required	Required
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Required
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Required
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Required
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery	Nice to have	Required	Nice to have	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Highly desirable	Required
Geologic and seismic data	Highly desirable	Required	Highly desirable	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Highly desirable	Required
Routes			Highly desirable	Required
Offshore cadastral			Highly desirable	Required
Lease areas			Highly desirable	Nice to have
Fixed obstructions			Highly desirable	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Highly desirable	Required
Wetlands	Required	Required	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Required
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Required	Required	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Whatever is the best data we can find	Whatever is the best data we can find	Whatever is the best data we can find	Whatever is the best data we can find
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes	Yes	Yes	Yes
Open Topography	Yes			
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS			Yes	Yes
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Moderate	Moderate	Major
Increased revenues	Moderate	Moderate	Moderate	None
Mission-driven performance improvements	Moderate	Major	Moderate	Major

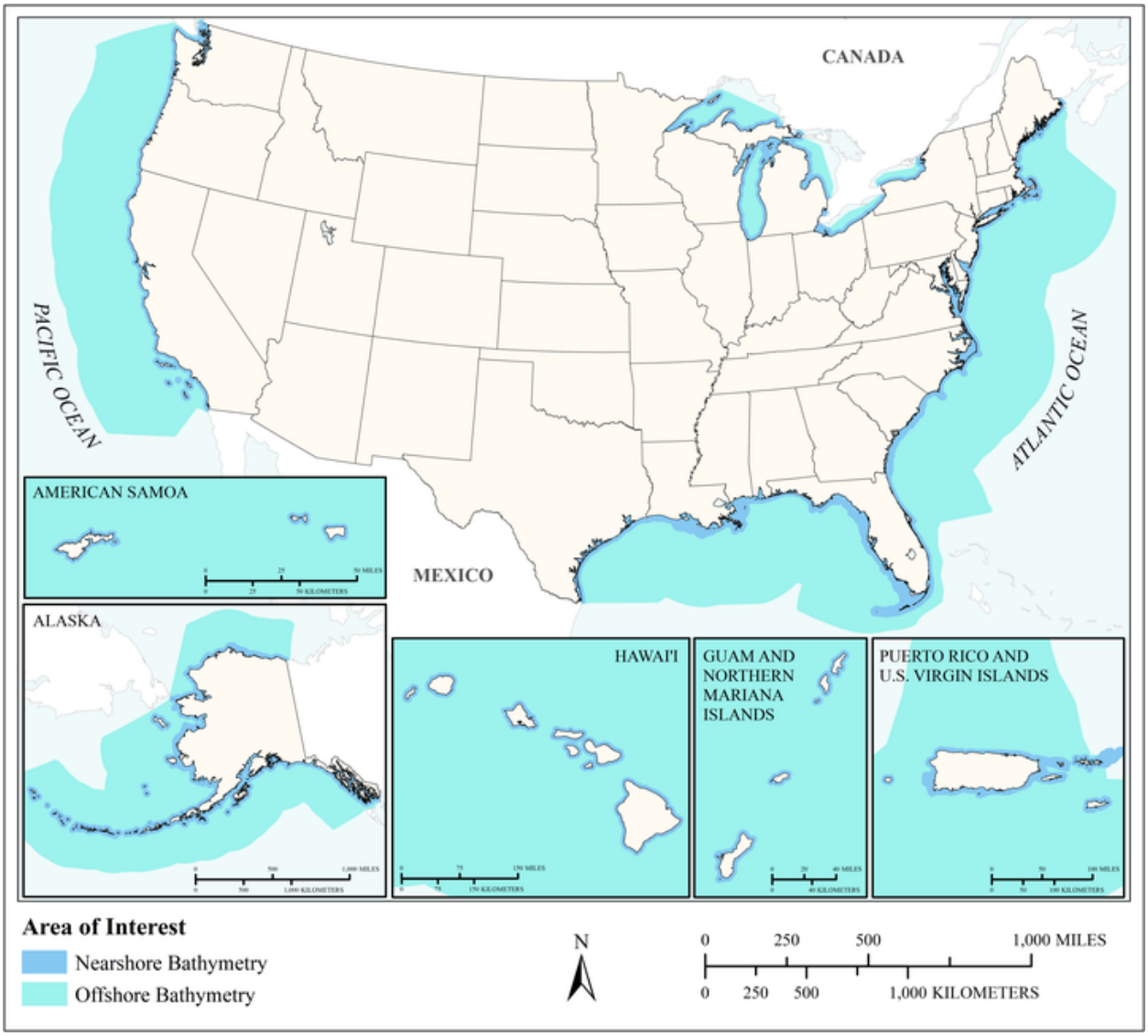
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Major	Major	Major
Improved response or timeliness	Major	Major	Moderate	Major
Improved customer experience	Moderate	Moderate	Moderate	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Moderate	Moderate
Environmental	Major	Moderate	Major	Major
Public safety, including life and property	Major	Major	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	None			None			Major	Unable to provide		Major	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other operational benefits				Major	Unable to provide					Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$137,750,984		Annual dollars saved/ realized	$32,843,495		Annual dollars saved/ realized	$60,104,205		Annual dollars saved/ realized	$8,322,080
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other customer service benefits				Major	Unable to provide					Major	Unable to provide	
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$4,319,054		Annual dollars saved/ realized	$592,365			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Major			Major			Major			Major		
Other												
Other benefits				Moderate			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps	Yes	Yes	Yes	Yes
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes	Yes	Yes	Yes
Viewshed maps	Yes	Yes	Yes	Yes
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Military



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Federal Review AOIs	Federal Review AOIs
Sub Area Requirements			All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Strategic sealift is a key component of MARAD's mission. MARAD maintains a fleet of government-owned vessels that wait in reserve, in U.S. ports, to provide logistics support for the military. In addition, MARAD administers programs to ensure the availability of privately-owned, commercial vessels to support national defense needs. Having accurate navigational and depth information for U.S. military installations is useful to ensuring that vessels under our purview (or privately-owned vessels that participate in our programs) can safely and effectively access military installations during a time of need. Elevation information could also be useful to the U.S. Merchant Marine Academy or the State Maritime Academies supported in part by MARAD
MCA Title	Military
MCA ID	60657
Organization Type	Federal Agencies and Commissions
Organization Name	DoT: Maritime Administration (MARAD)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 29 - Military
Secondary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL0B	Order 1a
Update Frequency			2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error			Up to 2 meters	Up to 5 meters
Acceptable Vertical Error			Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Highly desirable	Highly desirable		Highly desirable
Entire AOI under same environmental conditions			Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Highly desirable	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless			Highly desirable	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level		Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Required	Required
DTM			Required	Required
DEM			Required	Required
Raw point cloud data			Highly desirable	Required
Classified point cloud			Highly desirable	
Edited/cube XYZ			Highly desirable	Highly desirable
Full waveform			Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)			Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Highly desirable
Tide Predictions			Required	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Required	Highly desirable
Intensity imagery/sidescan imagery			Required	Highly desirable
Ground control/ground truthing			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery			Required	Required
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Required	Required
Geologic and seismic data			Highly desirable	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Required	Required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Required	Required
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates			Required	
Land use/land cover			Required	Required
Wetlands			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features			Required	
Bridges/culverts				
Landmark features			Required	
Cultural resources			Required	
Coastal and riverine structures			Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	Yes
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts			Yes	Yes
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Major	Major
Cost savings/cost reduction			Major	Major
Cost avoidance			Major	Major
Increased revenues			None	None
Mission-driven performance improvements			Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Moderate	Major

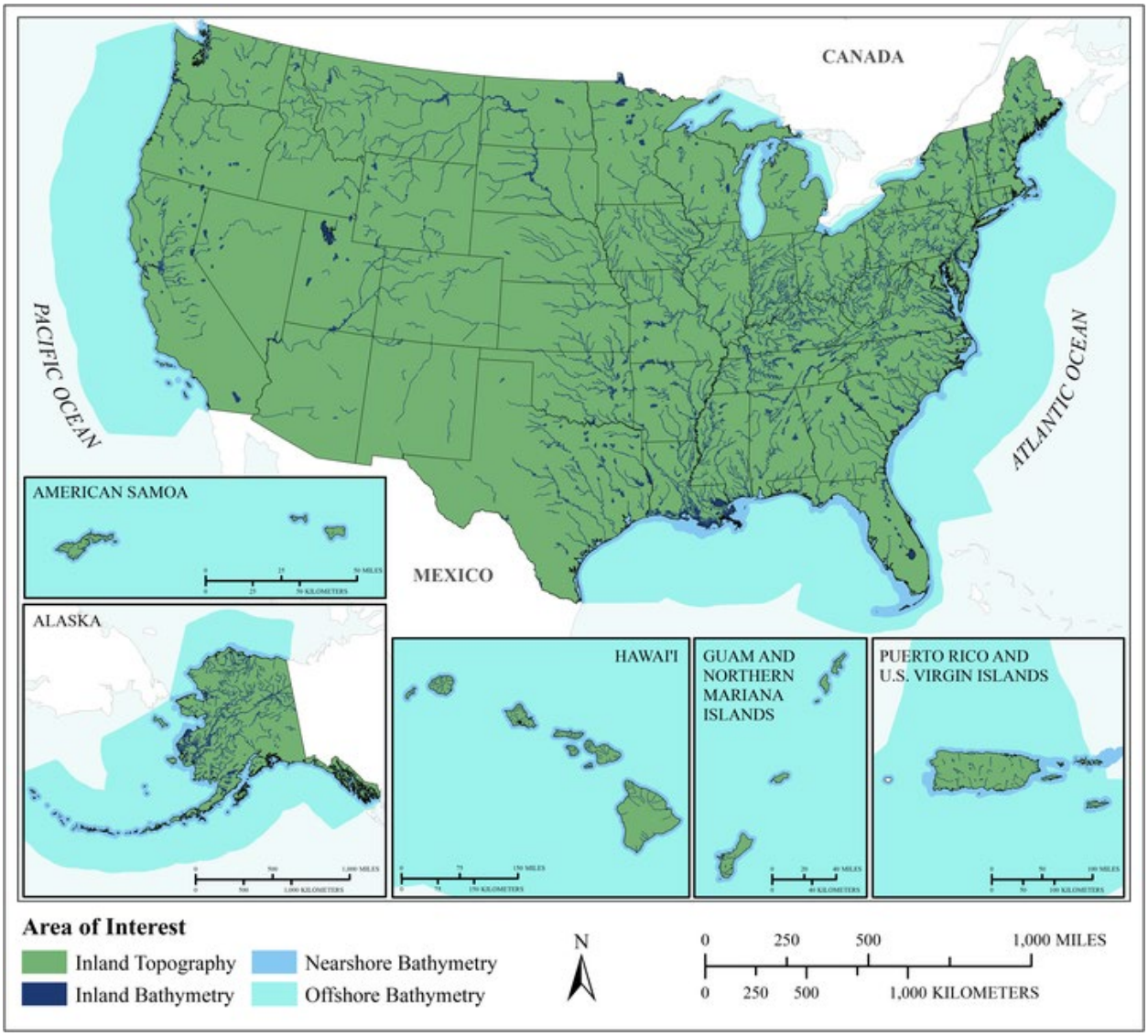
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness			Moderate	Major
Improved customer experience			Moderate	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Moderate	Moderate
Environmental			Moderate	Moderate
Public safety, including life and property			Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction							Major	Unable to provide		Major	Unable to provide	
Cost avoidance							Major	Unable to provide		Major	Unable to provide	
Increased revenues							Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements							Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness							Major	Unable to provide		Major	Unable to provide	
Improved customer experience							Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Moderate			Moderate		
Environmental							Moderate			Moderate		
Public safety, including life and property							Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours			Yes	Yes
Hillshades			Yes	Yes
Slope maps			Yes	Yes
Aspect maps			Yes	Yes
Curvature maps			Yes	Yes
Cross sections			Yes	Yes
Height-Above-Ground maps			Yes	Yes
Viewshed maps			Yes	Yes
Hydrologic Flow Direction Grids			Yes	Yes
Hydrologic Flow Accumulation Grids			Yes	Yes
Hydrologic networks (e.g. streams, lakes)			Yes	Yes
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)			Yes	Yes
Building footprints			Yes	Yes
Breaklines for road edge-of-pavement			Yes	Yes
Rugosity/Surface Roughness			Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL). Understanding all aspects of port boundaries is of great interest to MARAD and access to comprehensive elevation information could help us to better understand maritime/land boundaries as they pertain to ports.
MCA Title	Maritime and Land Boundary Management
MCA ID	60658
Organization Type	Federal Agencies and Commissions
Organization Name	DoT: Maritime Administration (MARAD)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	Order 1a
Update Frequency	4-5 years	4-5 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Highly desirable	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Required	Required
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Nice to have
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	Not required
Ground control/ground truthing	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Nice to have
Routes			Nice to have	Highly desirable
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate	None	I don't know
Cost savings/cost reduction	Major	Minor	Minor	Moderate
Cost avoidance	Moderate	Minor	Minor	Moderate
Increased revenues	None	Moderate	None	I don't know
Mission-driven performance improvements	Major	Minor	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	I don't know

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Minor	Minor	Moderate
Improved customer experience	Major	Minor	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	Moderate
Environmental	Major	Moderate	Minor	Moderate
Public safety, including life and property	Minor	Minor	Minor	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	None			None			None			I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,161,313		Annual dollars saved/ realized	$2,123,651		Annual dollars saved/ realized	$26,214,097			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$5,437,701		Annual dollars saved/ realized	$212,214						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			Moderate		
Environmental	Minor			Major			Major			Major		
Public safety, including life and property	Minor			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

National Aeronautics and Space Administration (NASA)

NASA's mission is to drive advances in science, technology, aeronautics, and space exploration to enhance knowledge, education, innovation, economic vitality and stewardship of Earth. NASA's Earth science activities utilize observations from space to advance the scientific understanding of the Earth in service to the United States and the world. The unique vantage point of space provides a broad and integrated set of uniformly high-quality data covering all parts of the planet. NASA shares this unique knowledge and data continuity with the global community including members of the science, government, industry, education, and policy-maker communities. The NASA Earth Science Division delivers the technology, expertise, and global observations that help advance scientific knowledge by mapping the myriad connections between Earth's vital processes and the effects of ongoing natural and human-caused changes.

Through NASA's partnerships with other agencies that maintain forecast and decision support systems, such as the National Oceanic and Atmospheric Administration (NOAA), U.S. Geological Survey (USGS), and Environmental Protection Agency (EPA), NASA improves national capabilities to predict climate, weather, and natural hazards, to manage resources, and to inform environmental policy.

Current status of elevation data for NASA

Elevation data -- topographic and bathymetric -- are acquired by NASA with airborne or satellite instruments at a regional to global scale. NASA and the research partners it funds primarily have, or will be using, elevation data acquired by NASA beginning in the 1990s. This includes data collected by airborne NASA instruments such as the Airborne Topographic Mapper (ATM); Scanning Lidar Imager of Canopies by Echo Recovery (SLICER); Land, Vegetation, and Ice Sensor (LVIS); Slope Imaging Multi-polarization Photon-counting Lidar (SIMPL); Multiple Altimeter Beam Experimental Lidar (MABEL); and Uninhabited Aerial Vehicle Synthetic Aperture Radar (UAVSAR). Data are also collected by airborne commercial instruments operated by NASA as part of multi-instrument systems such as Goddard's LiDAR, Hyperspectral & Thermal Imager (G-LiHT) and Airborne Snow Observatory (ASO). Past spaceflights include the Shuttle Laser Altimeter (SLA), Ice Cloud and land Elevation Satellite (ICESat), Shuttle Radar Topography Mission (SRTM), and Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER); and ICESat-2 and Global Ecosystem Dynamics Investigation (GEDI) launched in 2018. Future missions in development, such as Surface Water and Ocean Topography (SWOT) and NASA-ISRO Synthetic Aperture Radar (NISAR), will allow for measurements of surface water elevations in lakes, reservoirs, and large rivers, and detection of surface structure and dynamics by identifying subtle changes in surface elevation, respectively. In some cases NASA funds the procurement of elevation data by commercial vendors where these resources can augment NASA data. On a limited basis, NASA uses topographic data acquired by 3DEP and nearshore bathymetry acquired by NOAA for cal/val of NASA satellite elevation data and to augment scientific studies in local areas.

Importance of elevation data to NASA

Elevation data are primarily used to map the topography of the land surface; determine the height and 3D structure of vegetation; and measure the height of snow, ice, and water, including those of ice sheets, ice caps, and glaciers. The anthropogenic and natural change in these attributes is often a fundamental component of NASA's objectives. The uses of these data are diverse, with the following as prominent, but not complete, examples:

- Earth Surface and Interior: Characterization and modeling of tectonics, deposition, erosion, and/or climate coupled processes. This includes data used for earthquake, volcano, landslide, tsunami, storm and coastal hazard assessment, response, mitigation, and modeling.

- Carbon Cycle and Ecosystems: Biomass inventory, dynamics and monitoring, biodiversity, habitat quality and its response to disturbance, wild-fire fuel, and forest services management.
- Terrestrial Hydrology: Lake and reservoir heights, snow depth and melt timing impact on water resources, stream and river routing, flooding and inundation modeling, wetland monitoring and management, and shallow lake, river and nearshore bathymetry.
- Cryosphere: Ice sheet, ice cap and glacier elevation change and sea level impact, sea ice cover and thickness change and effect on ocean circulation, and constraints for modeling ice flow and dynamics.

Although not an operational organization, a part of NASA's mandate is to transfer technologic, observational, analytic and modeling capabilities it develops to national and international organizations whose responsibilities benefit from incorporation of these capabilities.

High-level summary of elevation data requirements

NASA's objectives are driven by understanding the Earth system at a synoptic scale enabled by space-based observations, so very fine Quality Level data of limited geographic extent are less applicable to the NASA mission than coarser regional to global datasets. NASA expressed the need for nationwide Quality Level 2 (QL2) inland topography and QL2B inland bathymetry updated every 4-5 years for hydrologic analyses; QL2 inland topography updated annually for vegetation structure studies; QL1 inland topography and QL1B inland bathymetry of Greenland, Antarctica, and areas of mountain glaciers updated seasonally; and QL2 inland topography and QL2B nearshore bathymetry, both updated every 4-5 years for geohazards research.

High-level summary of benefits that would come from higher resolution elevation data

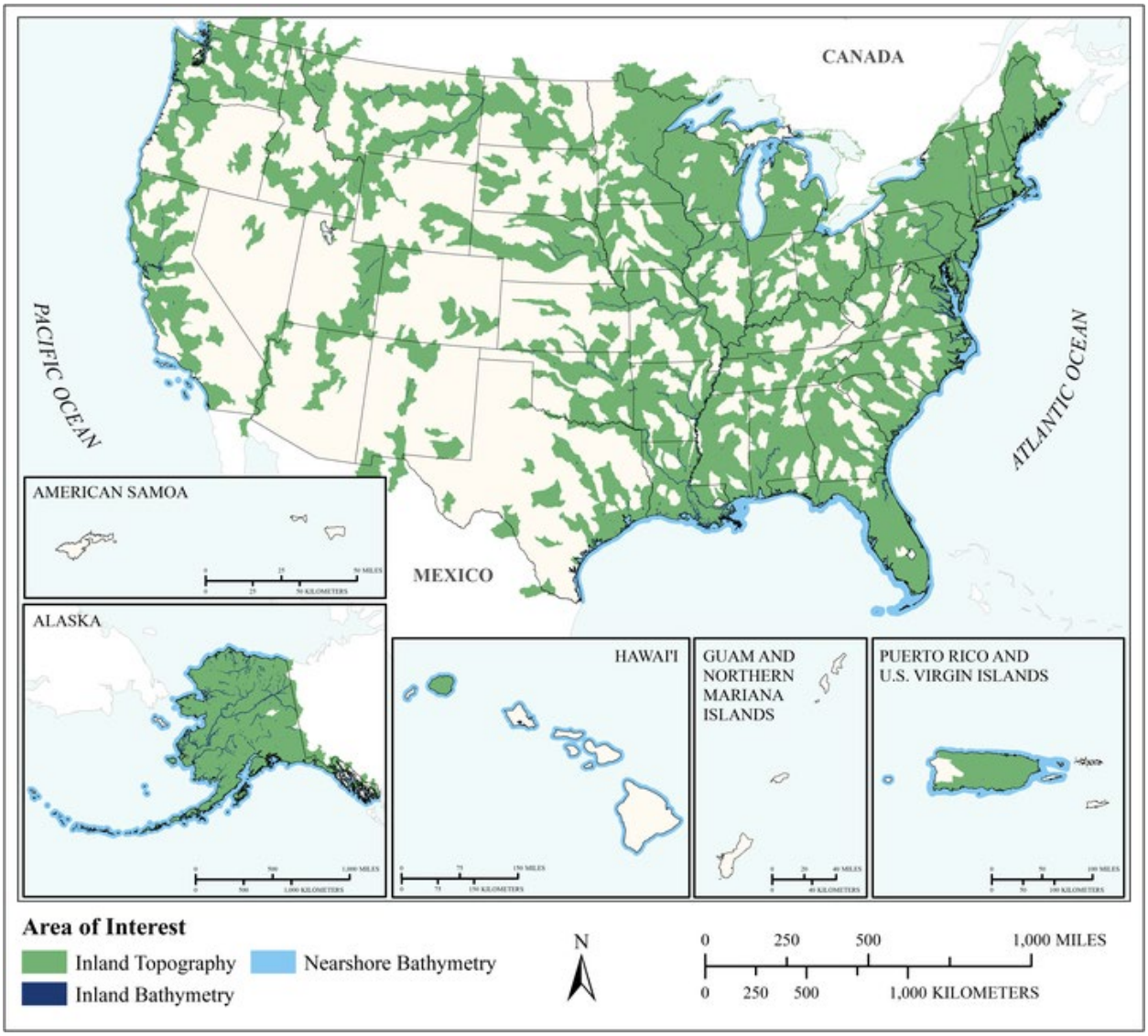
Future benefits include time savings due to more efficient modeling and reduced data manipulation, avoided data errors, and improved decision making from better data and modeling.

NASA has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	National Aeronautics and Space Administration (NASA)	22539	Remote Sensing and Modeling of the Global Terrestrial Hydrologic Cycle	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Inland Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 04 – Forest Resource Management	National Aeronautics and Space Administration (NASA)	22036	Assess Interactions of Global Biogeochemical Cycles and Ecosystems with Global Environmental Change, Scientific Research, and Data Collection to Understand Changes in the Earth's Surface	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	Major	Major	Major
BU 10 – Geologic Assessment	National Aeronautics and Space Administration (NASA)	60659	Geologic Assessment and Hazard Mitigation	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
BU 16 – Sea Level Rise and Subsidence	National Aeronautics and Space Administration (NASA)	1158	Map Ice Sheets and Glaciers and their Interactions with Sea Level Rise	Inland Topo	QL1	Seasonally	Unable to quantify	Unable to quantify	I don't know	I don't know	Major
				Inland Bathy	QL1B	Seasonally	Unable to quantify	Unable to quantify	I don't know	I don't know	Major

MCA Title: Remote Sensing and Modeling of the Global Terrestrial Hydrologic Cycle



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Highly desirable	
Geographic Area Requirements	Custom description	Custom description	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	HUC8s containing rivers with a width greater than about 100 meters	Rivers with a width greater than about 100 meters		

MCA Description	Response
Mission Critical Activity	Remote sensing and modeling of the global terrestrial hydrologic cycle. NASA's data in conjunction with lidar, sonar derived bathymetry, field collected data, etc. would improve water resources applications throughout the user community of water resources engineers. Data management, accuracy, and efficiency could all be improved.
MCA Title	Remote Sensing and Modeling of the Global Terrestrial Hydrologic Cycle
MCA ID	22539
Organization Type	Federal Agencies and Commissions
Organization Name	National Aeronautics and Space Administration (NASA)
Sub-Agency or Division	
Organization Mission	Remote sensing and modeling of the terrestrial hydrologic water and energy cycle at local, regional and global scales.
Program Name	Terrestrial Hydrology, Earth Science
Total Annual Program Budget	$5,000,000
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Dams, Jetties, Weirs, Seawalls, Levees.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 5 meters	Up to 5 meters	Up to 5 meters	
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	
How far onshore needed				
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial	Partial	
Cross section/transect requirement	5 cm accuracy per 100m resolution. Across lake, reservoirs and rivers	5 cm per 100m	5 cm accuracy per 100m resolution.	

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Not required		Highly desirable	Not required
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Not required		Required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Not required	
Full waveform	Highly desirable	Highly desirable	Highly desirable	
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Not required	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Highly desirable	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Not required	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Highly desirable	
Habitat distribution and classification			Highly desirable	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Required	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Not required	
Wetlands	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Not required	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have	Not required	
Cultural resources	Nice to have	Not required	Not required	
Coastal and riverine structures	Highly desirable	Nice to have	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Lidar altimetry and Landsat-based bathymetry	Lidar altimetry and Landsat-based bathymetry	Lidar altimetry and Landsat-based bathymetry	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes		
NCEI	Yes	Yes		
Open Topography	Yes			
NOAA nautical charts		Yes	Yes	
USACE navigation charts				
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	I don't know	
Cost savings/cost reduction	Major	Major	I don't know	
Cost avoidance	None	Major	I don't know	
Increased revenues	None	Minor	I don't know	
Mission-driven performance improvements	Major	Moderate	I don't know	

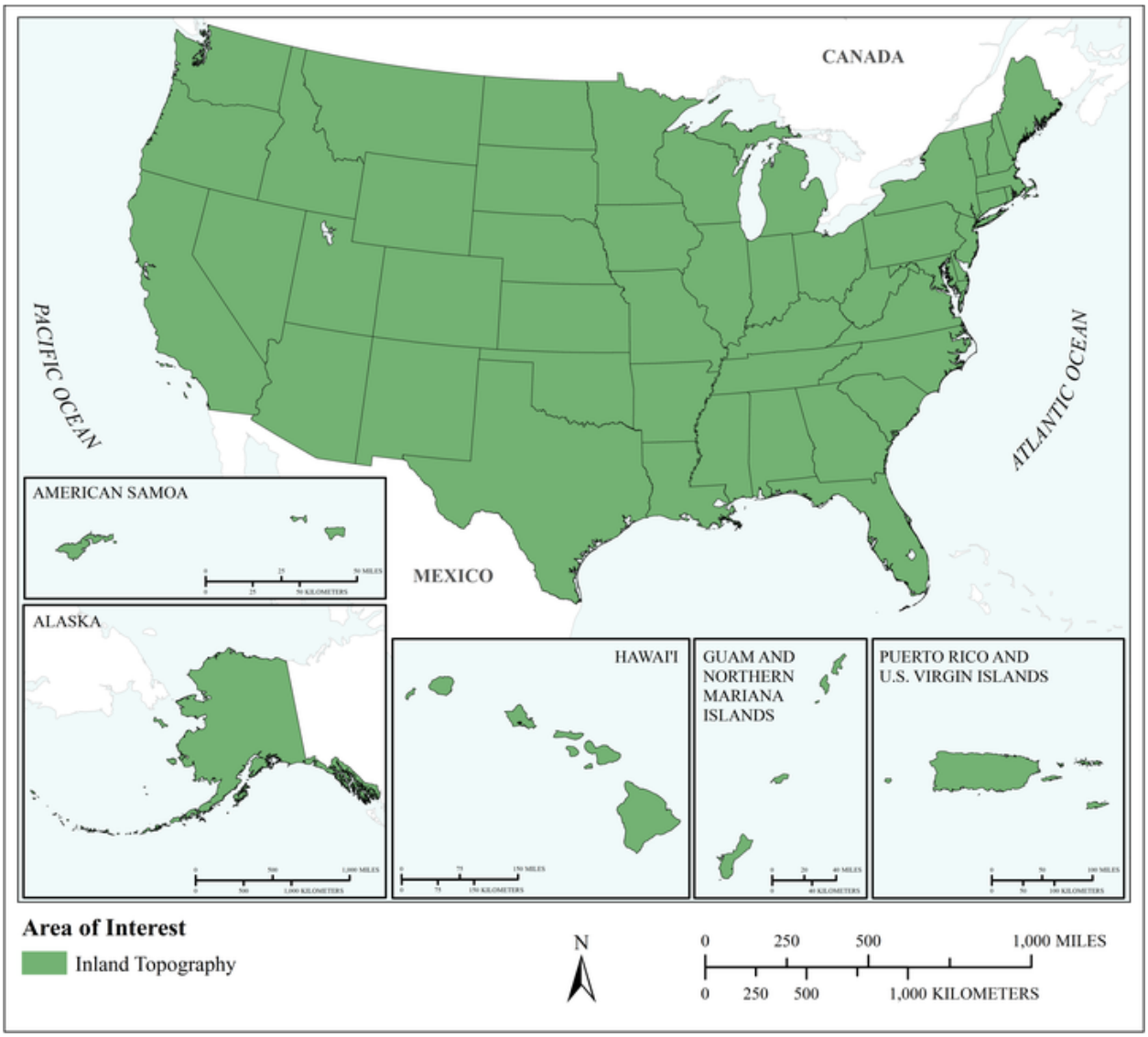
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	I don't know	
Improved response or timeliness	Moderate	Moderate	I don't know	
Improved customer experience	Moderate	None	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	I don't know	
Environmental	Major	Minor	I don't know	
Public safety, including life and property	Moderate	Minor	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Time savings description	NASA's data in combination with existing topo, field collection data, lidar, acoustic, etc. could improve Water Resources applications.											
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Increased revenues	None			I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements description	Benefits would be for user community of water resources engineers that manage water across the U.S. Bathy would improve their management – accuracy and efficiency.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major					
Environmental	Major			Major			Major					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours				
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes	Yes	Yes	
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Assess Interactions of Global Biogeochemical Cycles and Ecosystems with Global Environmental Change, Scientific Research, and Data Collection to Understand Changes in the Earth's Surface



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	States and/or Territories			
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau			

MCA Description	Response
Mission Critical Activity	Assess Interactions of Global Biogeochemical Cycles and Ecosystems with Global Environmental Change NASA's technology investments, data collection and dissemination, scientific research and applications related to elevation data extend across many Earth science disciplines. The primary information is topography of the land surface, the height and 3D structure of vegetation and the height of snow, ice and water, including those of ice sheets, ice caps and glaciers. The anthropogenic and natural change in these attributes is often a fundamental component of NASA's objectives. The uses of these data are diverse, with these as prominent, but not complete, examples. Topography: Characterization and modeling of tectonics/deposition/erosion/climate coupled processes. Earthquake, volcano, landslide and coastal hazard assessment, response, mitigation and modeling. Planetary analog studies. Biosphere: Biomass inventory, dynamics and monitoring. Habitat quality and its response to disturbance. Land use and land cover. Biodiversity and forest services management. Wild-fire fuel, slope stability and storm/tsunami surge resistance. Hydrosphere: Lake and reservoir heights. Snow depth and melt timing impact on water resources. Stream and river routing. Flooding and inundation modeling. Wetland monitoring and management. Cryosphere: Ice sheet, ice cap and glacier elevation change and sea level impact. Sea ice cover and thickness change and effect on ocean circulation. Constraints for modeling ice flow and dynamics. Although not an operational organization, a part of NASA's mandate is to transfer technologic, observational, analytic and modeling capabilities it develops to national and international organizations whose responsibilities benefit from incorporation of these capabilities. BU 6 – Natural Resources Conservation, BU 16 – Sea Level Rise and Subsidence, BU 07 – Wildlife and Habitat Management, BU 24 – Health and Human Services, and BU 26 – Education K12 and Beyond, Basic Research are additional Business Uses.Response to Question 5a. Given the broad scope of NASA scientific and applications objectives, identification of one or a few business uses that require elevation data is not applicable. Of the 30 Business Uses these are the ones that do not directly pertain to NASA objectives: 11, 12, 13, 19, 20, 21, 22, 25, 27, 28, 29, 30
MCA Title	Assess Interactions of Global Biogeochemical Cycles and Ecosystems with Global Environmental Change, Scientific Research and Data Collection to Understand Changes in the Earth's Surface
MCA ID	22036
Organization Type	Federal Agencies and Commissions
Organization Name	National Aeronautics and Space Administration (NASA)
Sub-Agency or Division	Agency-wide

Organization Mission	NASA conducts, sponsors and manages research to advance scientific understanding of Earth as a system, collecting and disseminating new observations, developing new technologies and computational models, and building the capacity to develop innovative applications of Earth science observations and research results. NASA and the Agency's research partners pioneer the use of both spaceborne and aircraft measurements to characterize, understand, and predict variability and trends in Earth's system for both research and applications. It is motivated by four over-arching science questions: How is the global Earth system changing? What causes these changes in the Earth system? How will the Earth system change in the future? How can Earth system science provide societal benefit?
Program Name	NASA's Earth Science Division is responsible for conducting, sponsoring and managing the Mission Critical Activities described in Question 4. Its activities are organized around four programmatic areas: flight, research, applied sciences, and technology. Only a small portion of these activities are related to MCAs involving the acquisition, dissemination and utilization of elevation data. Breaking out the portion of the overall program budget related to these MCAs is beyond the scope of the information that I can provide.
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 17 - Wildfire Management, Planning, and Response

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Global data is used for production of geometrically and radiometrically corrected satellite images (e.g. Landsat)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Smallest scale: features such as the shape of individual shrubs and trees and sub-meter scale topographic slopes and glacier crevasses are sometimes of interest. Objectives usually do not need these small-scale observations. More typically the smallest scale is at the level of 5 to 100 meters.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			
Update Frequency	Annually			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Event type(s)				
Quality Level and/or update frequency variability across AOI	Depends on the use. E.G. forest biomass annually, glacier elevation change seasonally, natural hazard pre- and post-event.			
Acceptable Horizontal Error	Up to 2 meters			
Acceptable Vertical Error	Up to 30 cm			
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	This depends on the use of the data. For example, to monitor glacier elevation change a longitudinal sampling density of 1km and 20cm vertical accuracy is required. For quantifying global forest biomass change, canopy height with a density of 500m and accuracy of 50cm is required. Comment on Question 15c. In most cases NASA and its funded partners do not need any of the QLs listed. Coarser 3D topographic data satisfies most of the needs.			

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Amount of acceptable vertical manipulation to achieve spatial seamlessness	In its collection of elevation data NASA typically does not apply vertical manipulations to enforce consistency. It applies calibrations to the sensor model, incorporation of geophysical parameters (e.g. solid Earth tides, coastal ocean tide loading) and outlier rejection to ensure all data meets the required vertical accuracy. For non-NASA elevation data used by NASA and its research partners Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level is desired.					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Highly desirable			
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	NASA and the research partners it funds primarily have, or will be using, elevation data acquired by NASA beginning in the 1990s. That include Airborne NASA instruments: ATM, SLICER, LVIS, SIMPL, MABEL, UAVSAR Airborne commercial instruments operated by NASA as part of multi-instrument systems: G-LiHT, ASO Past spaceflight: SLA, ICESat, SRTM, ASTER Launching in 2018: ICESat-2, GEDI In some cases NASA funds the procurement of elevation data by commercial vendors, such as in Brazil where operation of NASA instruments is not permitted. In those cases, and for G-LiHT and ASO, QL1 or QL2 is typically needed. For the other instruments data coarser than the QL specifications are acquired.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			

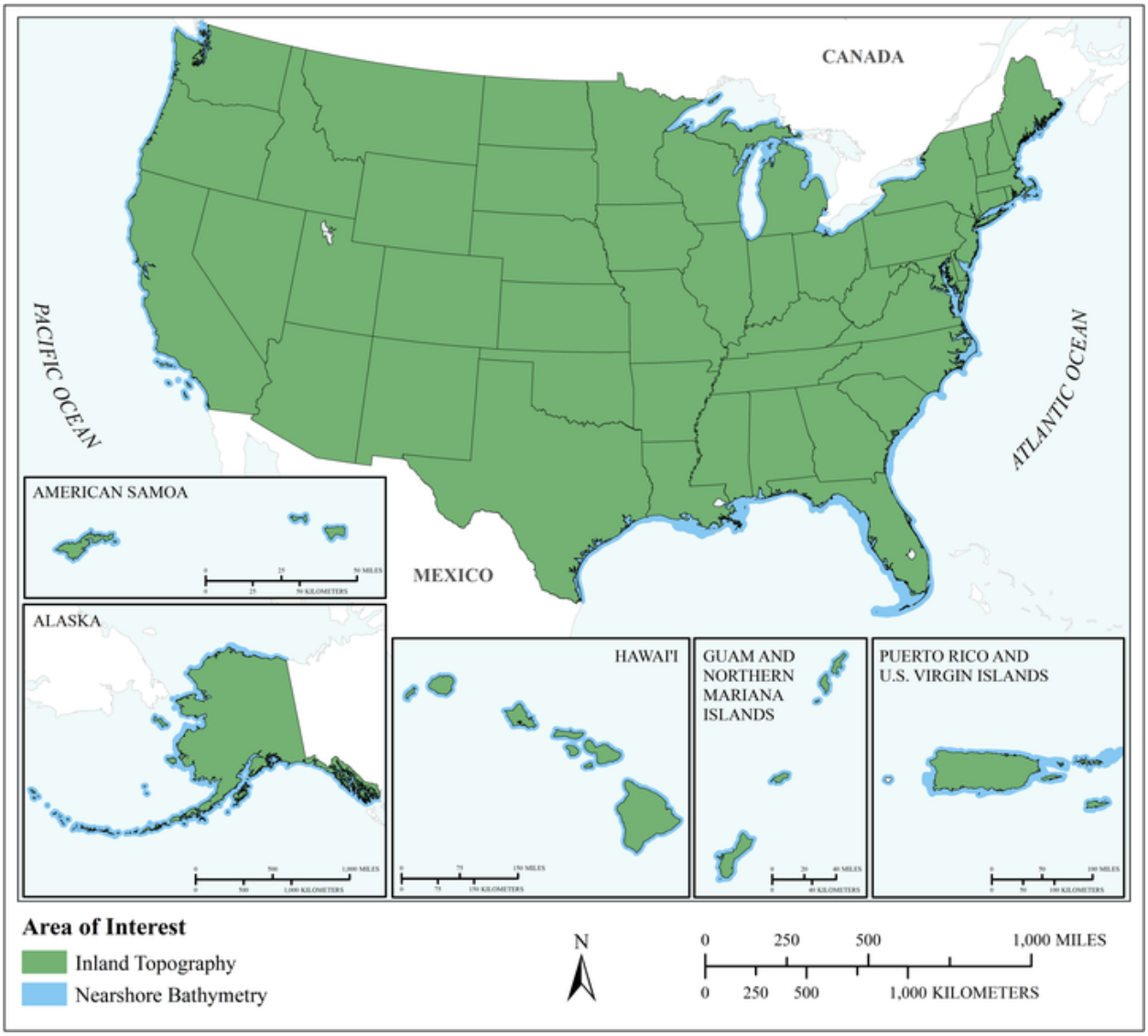
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Elevation data used by NASA and its funded partners is typically accessed through NASA distribution sites. Data not acquired by NASA would typically be acquired from the National Map or Open Topography.			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	None			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Time savings description	NASA does not have operational mandates of the sort applicable to this survey.											
Cost savings/cost reduction	I don't know	Unable to provide										
Cost savings/cost reduction description	NASA does not have operational mandates of the sort applicable to this survey.											
Cost avoidance	I don't know	Unable to provide										
Cost avoidance description	NASA does not have operational mandates of the sort applicable to this survey.											
Increased revenues	I don't know	Unable to provide										
Increased revenues description	NASA does not have operational mandates of the sort applicable to this survey.											
Mission-driven performance improvements	I don't know	Unable to provide										
Mission-driven performance improvements description	NASA does not have operational mandates of the sort applicable to this survey.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Value added to products or services description	NASA does not have customer service mandates of the sort applicable to this survey.											
Improved response or timeliness	I don't know	Unable to provide										
Improved response or timeliness description	NASA does not have customer service mandates of the sort applicable to this survey.											
Improved customer experience	I don't know	Unable to provide										
Improved customer experience description	NASA does not have customer service mandates of the sort applicable to this survey.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours				
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Assessment and Hazard Mitigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	Federal Review AOIs		Federal Review AOIs	
Sub Area Requirements	All study land areas		All nearshore study waters	

MCA Description	Response
Mission Critical Activity	Geologic mapping and analysis. Sinkhole and steephead mapping, monitoring, and analysis. Identification of geomorphologic units. Landslide hazard mapping and assessment. Karst mapping, including springs and caves. Aquifer recharge.
MCA Title	Geologic Assessment and Hazard Mitigation
MCA ID	60659
Organization Type	Federal Agencies and Commissions
Organization Name	National Aeronautics and Space Administration (NASA)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL2B	
Update Frequency	4-5 years		4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 5 meters	
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Highly desirable			Nice to have
Entire AOI under same environmental conditions	Required		Highly desirable			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required			Highly desirable
DEM for entire AOI needs to be seamless	Required		Required			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Required		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Highly desirable		Nice to have	
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Nice to have	
Full waveform	Nice to have		Nice to have	
Bathymetric Attributed Grid (BAG)			Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	
Ground control/ground truthing	Required		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required		Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Required		Required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable		Required	
Land use/land cover	Highly desirable		Highly desirable	
Wetlands	Highly desirable		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required		Highly desirable	
Bridges/culverts	Nice to have			
Landmark features	Nice to have		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Highly desirable		Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Moderate	
Cost savings/cost reduction	Major		Minor	
Cost avoidance	Major		Minor	
Increased revenues	None		None	
Mission-driven performance improvements	Major		Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	

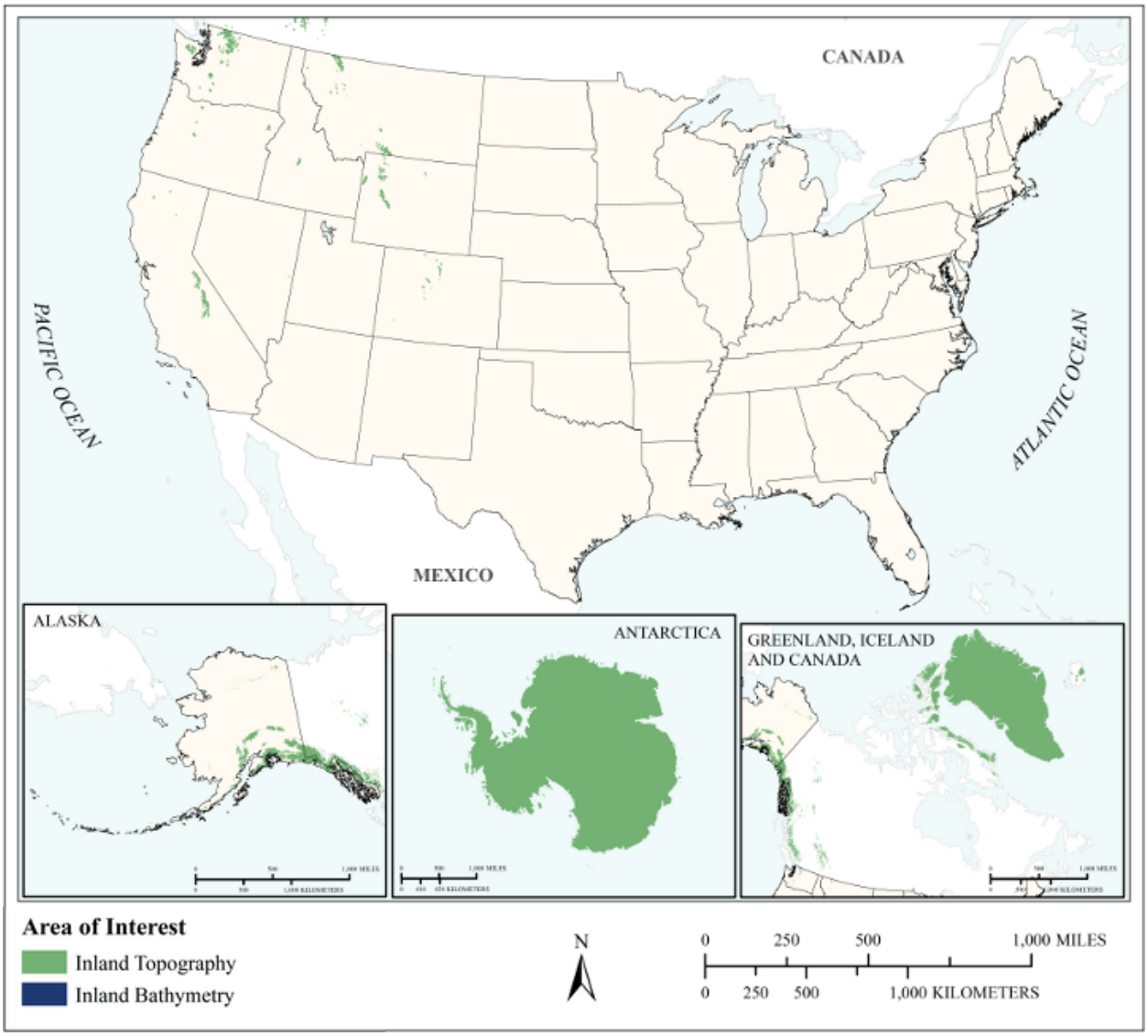
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major		Moderate	
Improved customer experience	Major		Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Moderate	
Environmental	Major		Minor	
Public safety, including life and property	Major		Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide					Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide					None					
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					Moderate	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major						Moderate					
Environmental	Major						Moderate					
Public safety, including life and property	Major						Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours	Yes		Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps			Yes	
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes		Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Map Ice Sheets and Glaciers and their Interactions with Sea Level Rise



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Custom description	Custom description		
Sub Area Requirements	Greenland, Antarctica, and mountain glaciers globally	Greenland, Antarctica, and mountain glaciers globally		

MCA Description	Response
Mission Critical Activity	Map ice sheets and glaciers and their interactions with sea level rise
MCA Title	Map Ice Sheets and Glaciers and their Interactions with Sea Level Rise
MCA ID	1158
Organization Type	Federal Agencies and Commissions
Organization Name	National Aeronautics and Space Administration (NASA)
Sub-Agency or Division	
Organization Mission	https://www.nasa.gov/sites/default/files/atoms/files/nasa_2018_strategic_plan.pdf
Program Name	Science Mission Directorate at NASA Headquarters
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 26 - Education K12 and Beyond, Basic Research

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required
Other	Required
Other description	Top of ice

General Geographic Area and Size	
Average geographic extent of day-to-day area	Greenland Ice Sheet, Antarctic Ice Sheet
Smallest 3D features needed	Continental scale
Description of smallest 3D features	Melt ponds over sea ice, supraglacial lakes on the Greenland Ice Sheet.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Not required
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	Seasonally	Seasonally		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Less than 50 cm		
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		
Cross section/transect requirement	Vertical accuracy < 5 cm. Require profile along flowlines of outlet glaciers in Greenland and Antarctica 6km spacing between lines	Cross section over sea ice meltponds and supgraglacial lakes in Greenland better than 5 cm accuracy		

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Required			Required	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Not required	Nice to have			Nice to have	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Nice to have		
DTM	Not required	Highly desirable		
DEM	Highly desirable	Highly desirable		
Raw point cloud data	Required	Highly desirable		
Classified point cloud	Nice to have	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Highly desirable	Highly desirable		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Not required	Not required		
Wetlands	Not required	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required	Nice to have		
Bridges/culverts	Not required	Not required		
Landmark features	Not required	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Airborne laser altimetry data collected over the Greenland and Antarctic Ice Sheets, and sea ice.	Experimental depth estimates of supraglacial lakes on the Greenland Ice Sheet from airborne laser altimetry		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	National Snow and Ice Data Center (NSIDC)			
Data that meet my needs are not available		Yes		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	Inland bathy data not available		
Cost savings/cost reduction	I don't know	Inland bathy data not available		
Cost avoidance	I don't know	Inland bathy data not available		
Increased revenues	I don't know	Inland bathy data not available		
Mission-driven performance improvements	I don't know	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	Inland bathy data not available		
Improved response or timeliness	I don't know	Inland bathy data not available		
Improved customer experience	I don't know	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Inland bathy data not available		
Environmental	I don't know	Inland bathy data not available		
Public safety, including life and property	I don't know	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide							
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide							
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know								
Environmental	I don't know			I don't know								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

U.S. Navy

The mission of the Navy is to maintain, train and equip combat-ready naval forces capable of winning wars, deterring aggression and maintaining freedom of the seas. The Navy and Marine Corps provide the Nation with a continuous, adaptable, and active instrument of security policy with which to promote stability and project maritime power. Forward-deployed, combat-credible expeditionary naval forces are important to shaping the global security environment; helping assure access to regions of vital interest; and permitting timely and frequently the initial crisis response from the sea. The ability to reassure friends and allies, deter potential adversaries, and, when called upon, engage in combat at all levels of intensity makes the Navy-Marine Corps Team especially useful to the Nation in peace, crisis, and war.

The Navy uses standard elevation products from National Geospatial-Intelligence Agency and NOAA. This includes Digital Nautical Chart, Electronic Navigation Chart, Electronic Navigation Charts, and Digital Terrain Elevation Data (DTED)/ Shuttle Radar Topography Mission (SRTM).

The Navy requires elevation data at various Quality Levels and update frequencies across the nation depending on the Mission Critical Activity. For Navy facility engineering including bridge construction, Quality Level 1 (QL1) inland topography updated every 4-5 years, QL1B inland and nearshore bathymetry, and Special Order for shallow waters and Order 2 at greater depths offshore bathymetry is needed. Navigation safety, training, and research requires QL0HD inland topography, QL1B inland bathymetry, Order 1a offshore bathymetry, and an unknown Quality Level for nearshore bathymetry all with event-driven update frequencies.

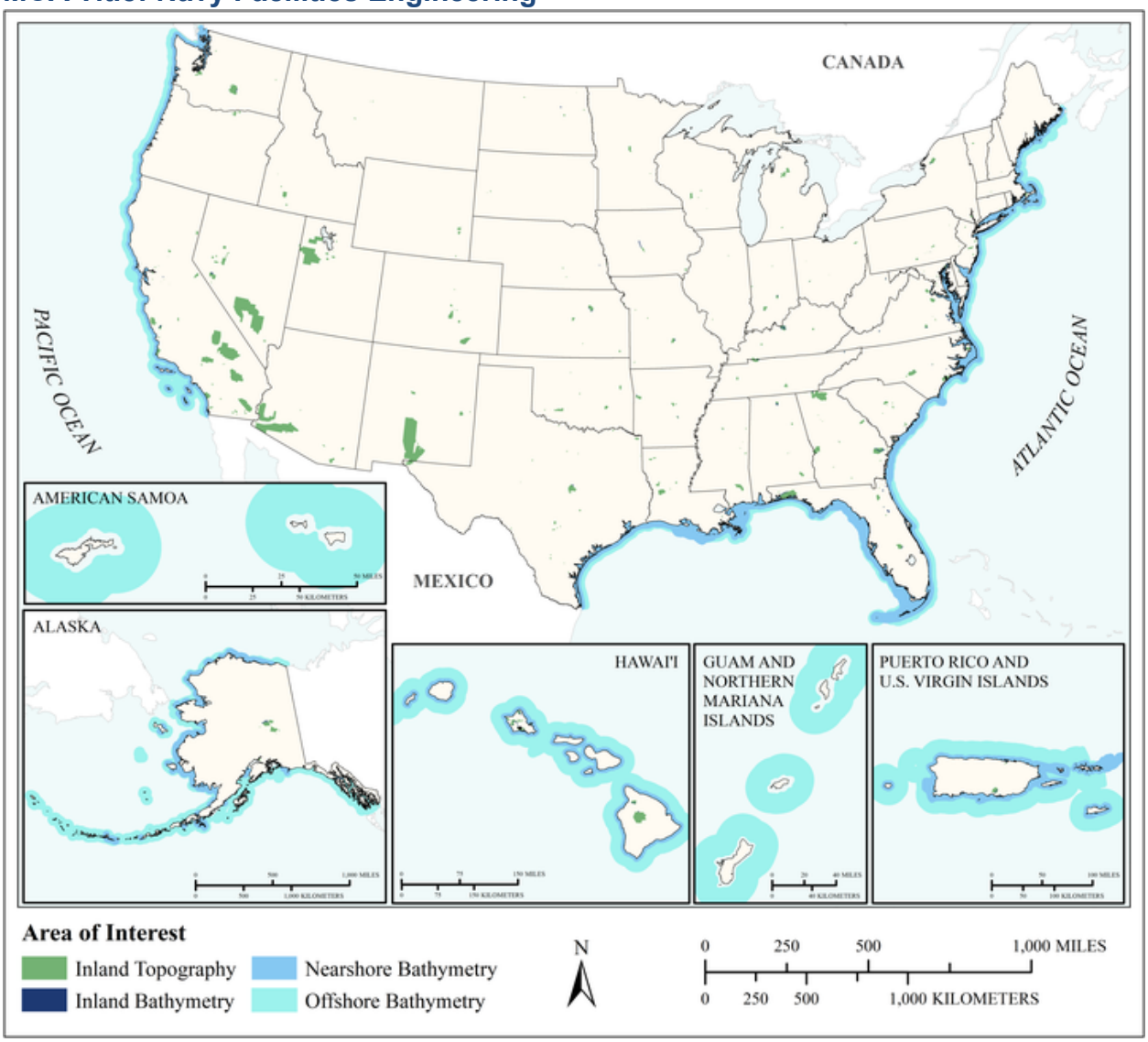
Major benefits that would come from improved elevation data include time saved from reduced or avoided data errors and from more streamlined operations, avoided accidents caused by human error due to lack of information, overall increased program effectiveness, improved decision making due to better data., value added to products or services, faster response to and recovery after an event, improved projections of at-risk locations and/or faster warning to the public of impending natural or man-made hazards, and improved military training.

The Navy has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 22 – Infrastructure Management	DoD: Department of the Navy	22004	Navy Facilities Engineering	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL1B	Event driven	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL1B	Event driven	Unable to quantify	Unable to quantify	Moderate	I don't know	Minor
				Offshore Bathy	(a) Special Order (b) Order 1a (c) Order 2	Event driven	Unable to quantify	Unable to quantify	Moderate	I don't know	Minor
BU 29 – Military	DoD: Department of the Navy	1294	Navy Geospatial Information and Services	Inland Topo	(a) QL0 HD (b) QL2	Event driven	Unable to quantify	Unable to quantify	Major	Major	Major
				Inland Bathy	QL0B	Event driven	Unable to quantify	Unable to quantify	Minor	Minor	Major
				Nearshore Bathy	I don't know	Event driven	Unable to quantify	Unable to quantify	I don't know	Moderate	Major
				Offshore Bathy	(a) Order 1a (b) Order 2	Event driven	Unable to quantify	Unable to quantify	Minor	Moderate	Major

MCA Title: Navy Facilities Engineering



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable	Required	Highly desirable
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	One or more national maritime boundaries	Area split by varying quality level or update frequency
Sub Area Requirements	DoD	DoD	Navigationally significant areas, Territorial sea (12 nautical miles)	Federal waters and navigationally significant areas out to the Territorial Sea (12 nautical miles)

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Airfields. Utilities in the coastal zone. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Navy Facilities Engineering
MCA ID	22004
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Department of the Navy
Sub-Agency or Division	Naval Facilities Engineering Command (NAVFAC) Headquarters
Organization Mission	NAVFAC is the Naval Shore and Expeditionary Systems Command that: Plans, builds, and maintains sustainable facilities. Delivers environmental, utilities and other base services. Acquires and manages expeditionary combat force systems and equipment.
Program Name	Military Construction
Total Annual Program Budget	$15,000,000,000
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 29 - Military
Tertiary Business Use	BU 23 - Urban and Regional Planning

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Mooring bollards

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	(a) Special Order (b) Order 1a (c) Order 2
Update Frequency	4-5 years and certain events.	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.
Event type(s)	Project based or change driven.	Project based or change driven.	Project based or change driven.	Project based or change driven.
Quality Level and/or update frequency variability across AOI				Special order for harbors, channels. Order 2 for GT 100m depth. Order 1a between harbors and 100 m.
Acceptable Horizontal Error	Up to 30 cm	Less than 50 cm	Up to 1 meter	Up to 2 meters
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Required	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Nice to have	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Highly desirable	Highly desirable	Highly desirable
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Highly desirable	Nice to have	Nice to have
Full waveform	Nice to have	Highly desirable	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	Nice to have

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Highly desirable	Required	Highly desirable	Highly desirable
Wetlands	Required	Required	Highly desirable	Highly desirable
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Highly desirable	
Cultural resources	Required	Required	Highly desirable	
Coastal and riverine structures	Required	Required	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Specific purpose acquired LiDAR and bathymetric x, y and z data.	Best available	US Army Corps of Engineering survey data Locally obtained side scan sonar data	Best available
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI	Yes		Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Locally derived			
Data that meet my needs are not available				

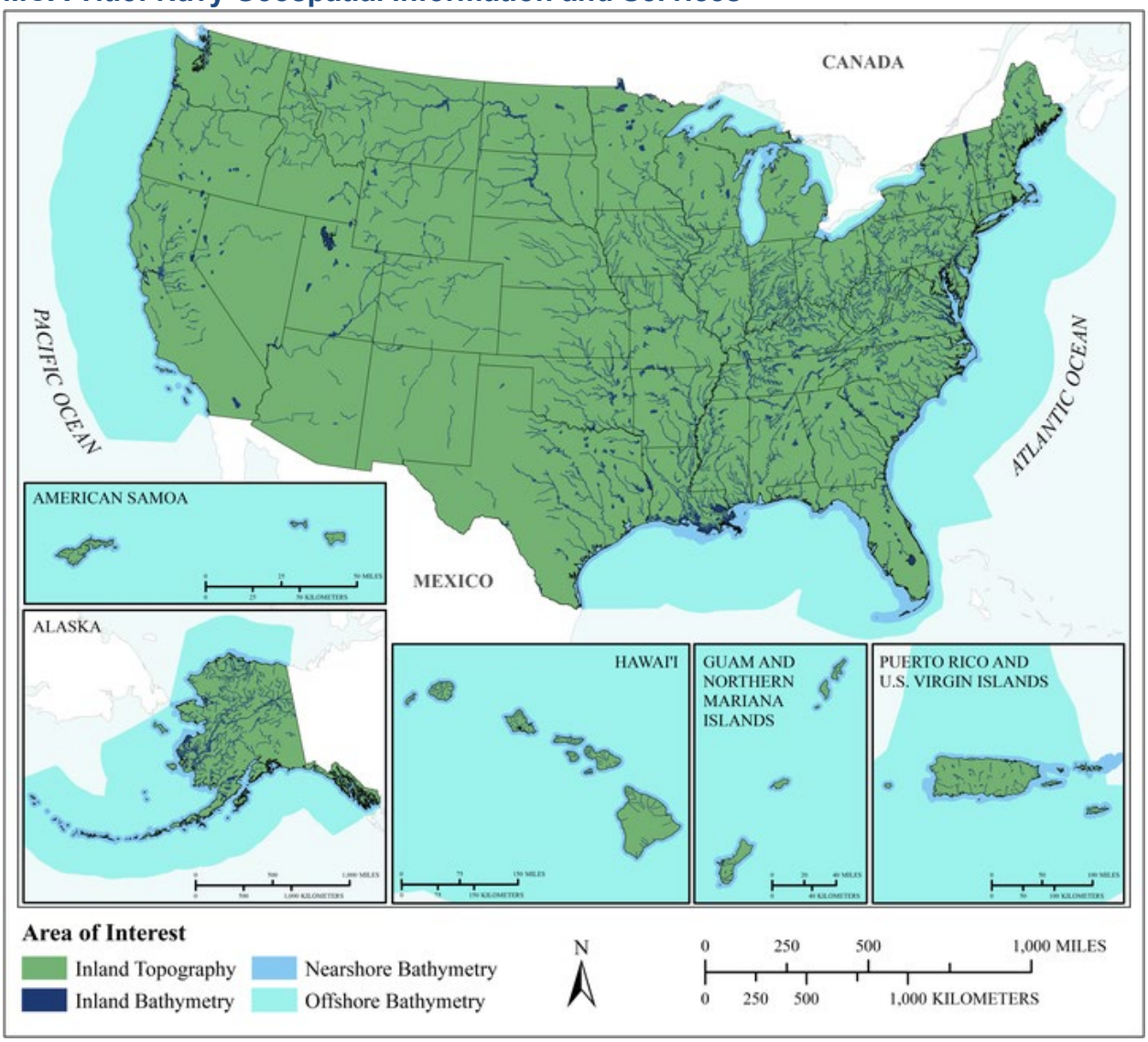
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	Moderate	Moderate
Cost savings/cost reduction	Moderate	I don't know	Minor	Minor
Cost avoidance	Major	I don't know	Minor	Minor
Increased revenues	Minor	Moderate	Minor	Minor
Mission-driven performance improvements	Major	Moderate	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Major	Major
Improved response or timeliness	Major	I don't know	Moderate	Moderate
Improved customer experience	Major	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Moderate	Moderate
Environmental	Moderate	I don't know	I don't know	I don't know
Public safety, including life and property	Major	Moderate	Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	I don't know	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Other operational benefits							Moderate	Unable to provide		Moderate	Unable to provide	
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Other customer service benefits							Moderate	Unable to provide		Moderate	Unable to provide	
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			Moderate			Moderate			Moderate		
Environmental	I don't know			Moderate			I don't know			I don't know		
Public safety, including life and property	I don't know			Moderate			Minor			Minor		
Other												
Other benefits							Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes	Yes	Yes	Yes
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Navy Geospatial Information and Services



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Area split by varying quality level or update frequency	States and/or Territories	All study waters	Area split by varying quality level or update frequency
Sub Area Requirements	All U.S. land	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		All study waters

MCA Description	Response
Mission Critical Activity	Safety of navigation; training; research; system development, testing, and evaluation. Areas of interest are Naval bases, ranges, and support facilities. Harbors, ports, channels and airfields require survey and remote sensing data.
MCA Title	Navy Geospatial Information and Services
MCA ID	1294
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: Department of the Navy
Sub-Agency or Division	Office of the Chief of Naval Operations (OP NAV)
Organization Mission	National Defense, Policy and programming for positioning, navigation, and timing.
Program Name	Positioning, navigation (surface, subsurface, and air), and geospatial information capabilities.
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 29 - Military
Secondary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Tertiary Business Use	BU 21 - Aviation Navigation and Safety

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Global
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Surveyed points, for example, airfield features. 1 meter tube size underwater.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL0 HD (b) QL2	QL0B	I don't know	(a) Order 1a (b) Order 2
Update Frequency	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.
Event type(s)	Depends on events and amount of change, and location (relative to an area of interest).	Depends on amount of change and location (relative to an area of interest).	Depends on the amount of change, event, area, and location (relative to an area of interest).	Change driven. Depends on amount of change and location (relative to an area of interest).
Quality Level and/or update frequency variability across AOI	Depends on area and activities being performed. Naval bases and ranges require highest QL, other areas not as high (QL2). On bases, data would be surveyed, not collected with remote sensing.		Requirement depends on product from NGA and purpose of the product.	Order 1a for harbors, channels, Order 2 for GT 100m depth. More important where naval installations are located.
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 5 meters	I don't know
Acceptable Vertical Error	Up to 50 cm	Up to 30 cm	Up to 50 cm	Less than 1 meter
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			Any tide correction is acceptable, as long as it is defined	Depends on product
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Highly desirable	Nice to have	Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Highly desirable	Nice to have	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Required	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Required	Highly desirable
Intensity imagery/sidescan imagery	Required	Highly desirable	Required	Highly desirable
Ground control/ground truthing	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Required	Required
Bottom type			Highly desirable	Required
Submerged features			Required	Required
Subbottom characteristics			Required	Required
Geologic and seismic data	Nice to have	Highly desirable	Nice to have	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Required	Required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Highly desirable	Highly desirable
Wetlands	Required	Highly desirable	Nice to have	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Required	
Cultural resources	Required		Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Standard products from NGA -DTED1, DTED2, SRTM	Littoral Planning Charts from NGA and custom riverine training products of various quality.	NOAA charts distributed by NGA.	We use finished product from NGA and NOAA--DNC, ENC.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes		Yes
Other description	NGA and USGS National Map	NGA		NOAA charts through NGA
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	I don't know	Minor	I don't know
Cost savings/cost reduction	I don't know	I don't know	I don't know	I don't know

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	I don't know	I don't know	I don't know	I don't know
Increased revenues	I don't know	I don't know	I don't know	I don't know
Mission-driven performance improvements	Major	Moderate	Major	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	I don't know	I don't know
Improved response or timeliness	I don't know	Moderate	I don't know	I don't know
Improved customer experience	I don't know	I don't know	I don't know	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	Minor	Minor	I don't know
Environmental	I don't know	Minor	Moderate	I don't know
Public safety, including life and property	Major	Moderate	Major	Major
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other		Moderate		
Other description		Research, development, testing, and training		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		None			I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Other operational benefits				Minor	Unable to provide							
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Other customer service benefits	Major	Unable to provide								Moderate	Unable to provide	
Other customer service benefits description	Training, system testing, readiness.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Minor			I don't know			Minor		
Education or outreach description	Military training									Probably some		
Environmental	Major			Minor			Moderate			Moderate		
Environmental description	Models and assessments									Unknown, bul likely		
Public safety, including life and property	Major			Major			Major			Major		
Public safety, including life and property description	Disaster recovery and support to civil authorities; aeronautical safety of navigation									Better charting		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				
Other (please specify)	Yes	Yes	Yes	Yes
Other description	NGA and NOAA Standard Products			

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

National Geospatial-Intelligence Agency (NGA)

The NGA's mission is to provide the products and services that decision makers, warfighters, and first responders need, when they need it most. The NGA is the nation's primary source of geospatial intelligence, or GEOINT for the Department of Defense (DOD) and the U.S. Intelligence Community (IC). As a DOD combat support agency and a member of the IC, NGA provides GEOINT, in support of U.S. national security and defense, as well as disaster relief. GEOINT is the exploitation and analysis of imagery and geospatial information that describes, assesses, and visually depicts physical features and geographically referenced activities on the Earth.

To provide support and enable overall mission success:

- NGA delivers the strategic intelligence that allows the president and national policymakers to make crucial decisions on counterterrorism, weapons of mass destruction, global political crises, and more.
- NGA enables the warfighter to plan missions, gain battlefield superiority, precisely target the adversary, and protect our military forces.
- NGA provides timely warnings to the warfighter and national decision makers by monitoring, analyzing, and reporting imminent threats. Often, NGA has the only "eyes" focused on global hot spots and can give unique insight into these critical areas.
- NGA protects the homeland by supporting counterterrorism, counternarcotics, and border and transportation security. NGA supports security planning for special events, such as presidential inaugurations, state visits by foreign leaders, international conferences, and major public events (Olympics, Super Bowls, satellite launchings, etc.).
- NGA ensures safety of navigation in the air and on the seas by maintaining the most current information and highest quality services for U.S. military forces and global transport networks.
- NGA defends the nation against cyber threats by supporting other intelligence agencies with in-depth analysis of cyber networks.
- NGA creates and maintains the geospatial foundation data, knowledge and analysis that enable all other missions.
- NGA assists humanitarian and disaster relief efforts by working directly with the lead federal agencies responding to fires, floods, earthquakes, landslides, hurricanes, or other natural or manmade disasters.

NGA requires Quality Level 0 (QL0) inland topography of federally owned lands updated annually for national security and intelligence purposes, and QL2B nearshore bathymetry and Order 2 offshore bathymetry of all non-U.S. waters updated monthly when changes are detected or according to Navy scheduling for global maritime safety.

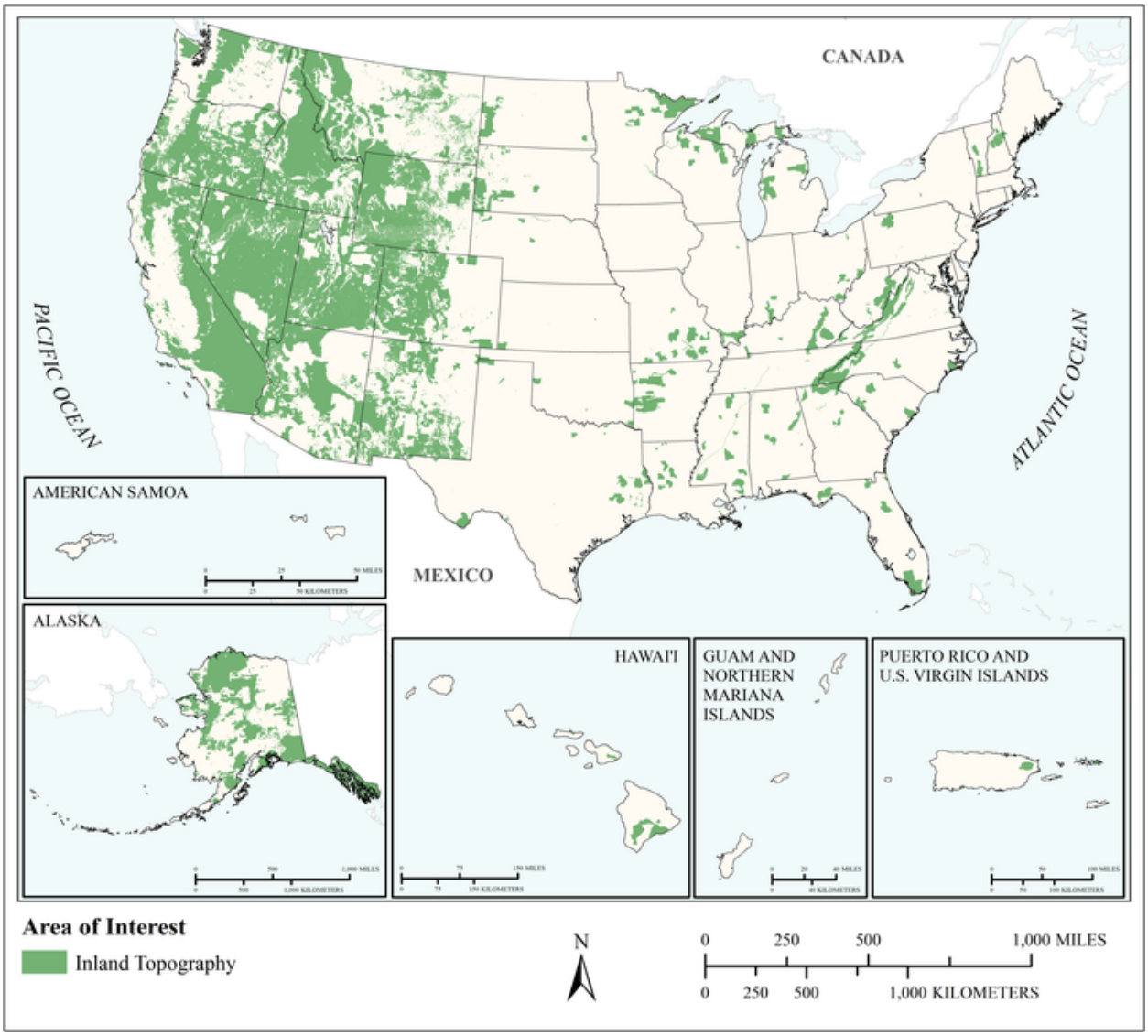
Future benefits from improved elevation data include significant hours saved through more efficient modeling, data acquisition costs saved, avoided accidents caused by human error due to lack of information, increased program effectiveness, faster response to and recovery after an event, and public safety benefits, including life and property.

NGA has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 18 – Homeland Security	DOD: National Geospatial-Intelligence Agency (NGA)	32713	National Security, Intelligence	Inland Topo	QL0	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 20 – Marine and Riverine Navigation	DOD: National Geospatial-Intelligence Agency (NGA)	21693	Safety of Navigation	Nearshore Bathy	QL2B	28 days if change is detected, regular updates per Navy schedule	Unable to quantify	Unable to quantify	Minor	Moderate	Major
				Offshore Bathy	Order 2	28 days if change is detected, regular updates per Navy schedule	Unable to quantify	Unable to quantify	Minor	Moderate	Major

MCA Title: National Security, Intelligence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies			
Sub Area Requirements	BLM, FS, NPS			

MCA Description	Response
Mission Critical Activity	National Security, Intelligence
MCA Title	National Security, Intelligence
MCA ID	32713
Organization Type	Federal Agencies and Commissions
Organization Name	DOD: National Geospatial-Intelligence Agency (NGA)
Sub-Agency or Division	NGA Support Team to the U.S. Northern Command (USNORTHCOM)
Organization Mission	Provide timely, accurate, and relevant geospatial intelligence in support of national security objectives.
Program Name	Defending the Homeland
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Trespass marijuana plants grown on national forest land. Plots of approximately 2000-1000 plants, 0.5 to 3 acres. Hidden human structures under the overstory made out of natural materials.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 5 meters			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Required					
Entire AOI under same environmental conditions	Not required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Not required			
Wetlands	Not required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	I currently don't use elevation data for this mission function, because there is nothing available to the resolution that would be useful.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	None			

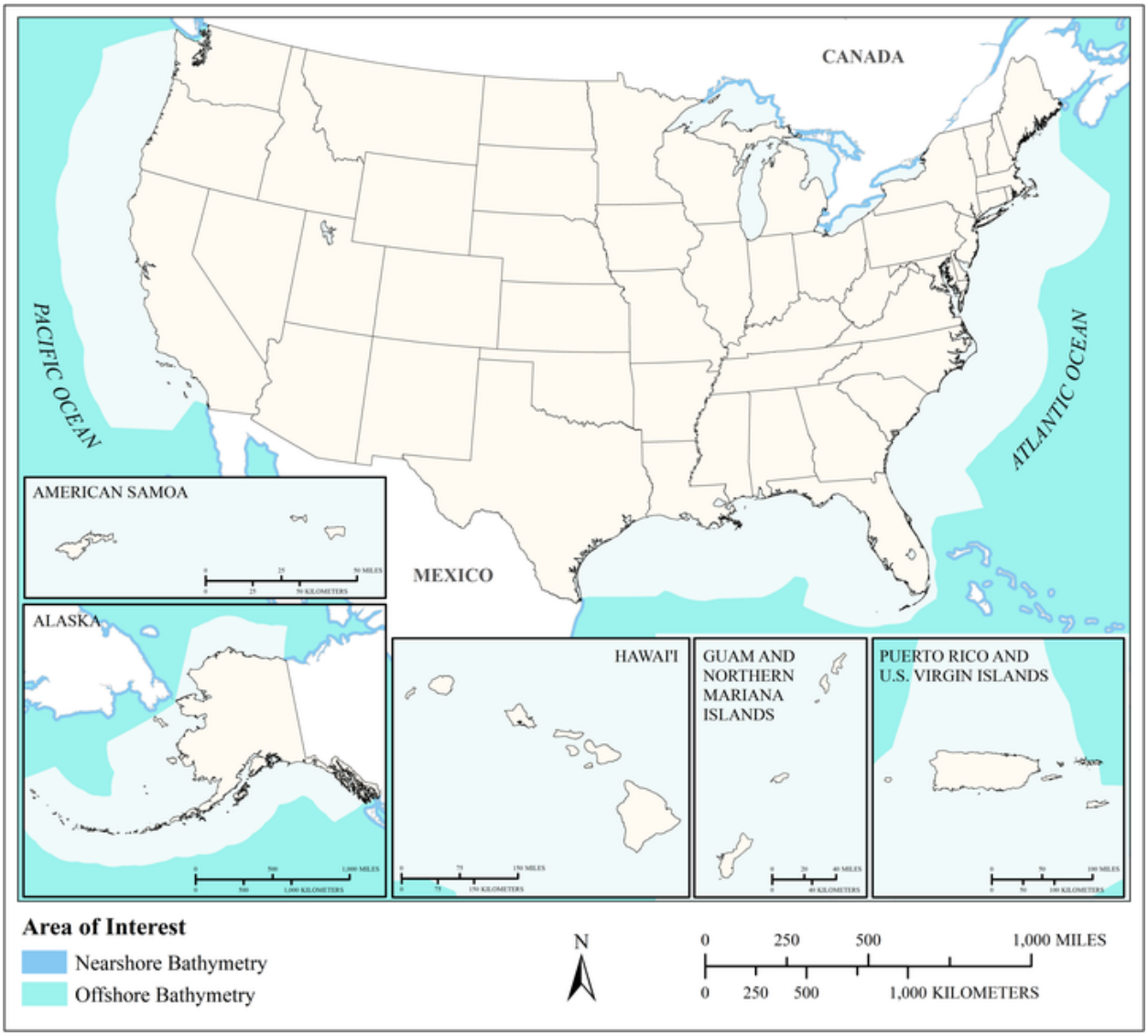
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None			
Mission-driven performance improvements	None			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	None			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	None											
Increased revenues	None											
Mission-driven performance improvements	I don't know	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Safety of Navigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Custom description	Custom description
Sub Area Requirements			All non-U.S. waters globally	All non-U.S. waters globally

MCA Description	Response
Mission Critical Activity	Safety of Navigation. NGA is responsible for maritime safety globally in non-U.S. waters. NOAA is responsible for the U.S. waters. NGA provides nautical charting information to the Navy. The charts provide surface and sub-surface navigation information similar to the NOAA nautical charts. NGA collaborates with international partners and data providers to acquire the needed elevation information. NGA also partners with NOAA and the IHO on standards, technology, etc.
MCA Title	Safety of Navigation
MCA ID	21693
Organization Type	Federal Agencies and Commissions
Organization Name	DOD: National Geospatial-Intelligence Agency (NGA)
Sub-Agency or Division	Maritime Safety Office
Organization Mission	Department of Defense (DoD) Support
Program Name	Maritime Safety Office
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	BU 29 - Military
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Other: Global
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Underwater obstructions, sea floor surface for navigation

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL2B	Order 2
Update Frequency			28 days if change is detected, regular updates per Navy schedule	28 days if change is detected, regular updates per Navy schedule
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 5 meters	Up to 20 meters

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error			Up to 1 meter	Up to 2 meters
How far onshore needed			1 kilometer inland	
How far down the beach profile needed			Below MLLW	
Tide correction requirement			Mean Sea Level (MSL)	MSL
Cross sections and/or transects meet needs				Partial
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Not required	Not required		Not required
Entire AOI under same environmental conditions			Not required	Not required		Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Nice to have	Nice to have		Nice to have
DEM for entire AOI needs to be seamless			Nice to have	Nice to have		Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness			I don't know	I don't know		I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Not required	Not required
DTM			Not required	Not required
DEM			Not required	Not required
Raw point cloud data			Highly desirable	Not required
Classified point cloud			Highly desirable	
Edited/cube XYZ			Highly desirable	Highly desirable
Full waveform			Not required	Not required
Bathymetric Attributed Grid (BAG)			Required	Required
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery			Nice to have	Not required
Ground control/ground truthing			Required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery			Required	Required
Underwater videography			Not required	Not required
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Not required	Not required
Geologic and seismic data			Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Not required	Not required
Boundaries			Not required	Not required
Routes			Not required	Not required
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates			Highly desirable	
Land use/land cover			Not required	Not required
Wetlands			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features			Nice to have	
Bridges/culverts				
Landmark features			Highly desirable	
Cultural resources			Highly desirable	
Coastal and riverine structures			Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			Best available from a wide variety of sources	Best available from a wide variety of sources
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts			Yes	Yes
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Major	Major
Cost savings/cost reduction			Major	Major
Cost avoidance			Major	Major
Increased revenues			None	None
Mission-driven performance improvements			Major	Major

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Major	Major
Improved response or timeliness			Major	Major
Improved customer experience			Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Minor	Minor
Environmental			Major	Major
Public safety, including life and property			Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction							Major	Unable to provide		Major	Unable to provide	
Cost avoidance							Major	Unable to provide		Major	Unable to provide	
Increased revenues							None			None		
Mission-driven performance improvements							Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness							Major	Unable to provide		Major	Unable to provide	
Improved customer experience							Moderate	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Minor			Minor		
Environmental							Moderate			Moderate		
Public safety, including life and property							Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

National Oceanic and Atmospheric Administration (NOAA)

NOAA's Mission is to conduct the Science, Service and Stewardship to understand and predict changes in climate, weather, oceans and coasts; to share that knowledge and information with others; and to conserve and manage coastal and marine ecosystems and resources.

NOAA was formed in 1970, but the agencies that came together at that time date back to 1807, when the United States Coast and Geodetic Survey was formed, followed by the Weather Bureau in 1870, and the Bureau of Commercial Fisheries in 1871. NOAA's products and services affect more than one-third of America's gross domestic product. NOAA's scientists provide citizens, planners, emergency managers, and other decision makers with reliable information including accurate weather forecasts and the data needed to protect and manage the nation's coastal and ocean resources and to enable society to plan and respond to climate change.

NOAA requires high-quality elevation and nearshore/offshore bathymetric data to support the following programs:

- National Marine Fisheries Service, which is responsible for the stewardship of the nation's living marine resources and their habitat;
- National Ocean Service, which provides data, tools, and services that support coastal economies and their contribution to the national economy by advancing the following priorities: safe and efficient transportation and commerce; preparedness and risk reduction; and stewardship, recreation, and tourism;
- National Environmental Satellite, Data, and Information Service, which provides secure and timely access to global environmental data and information from satellites and other sources to promote and protect the nation's security, environment, economy, and quality of life;
- Oceanic and Atmospheric Research, which conducts environmental research, provides the research foundation for understanding the complex systems that support our planet; and
- National Weather Service, which provides weather, water, and climate data, forecasts and warnings for the protection of life and property and enhancement of the national economy.

Additional potential future benefits could be realized by NOAA for numerous Business Uses that require inland topography, inland bathymetry, nearshore bathymetry, and offshore bathymetry at various Quality Levels and update frequencies.

NOAA has identified Business Uses and Mission Critical Activities that rely on topographic and bathymetric elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

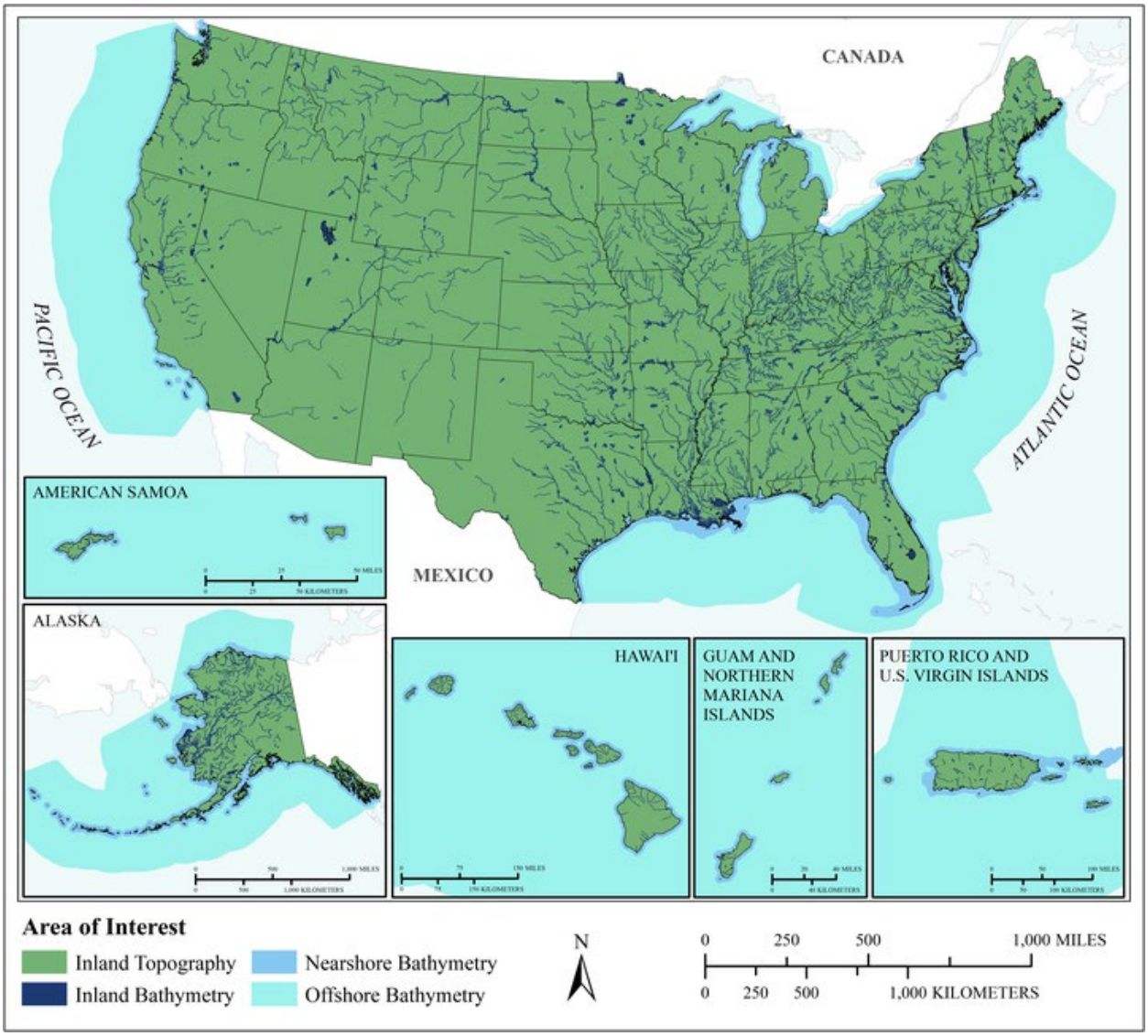
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 03 – Coastal Zone Management	DOC: National Oceanic and Atmospheric Administration (NOAA)	1076	Modeling and Mapping of Coastal Processes and Hazards	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Inland Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Offshore Bathy	Order 1b	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 03 – Coastal Zone Management	DOC: National Oceanic and Atmospheric Administration (NOAA)	21635	Coastal Hazard Mitigation, Resilience, Disaster Monitoring, and Recovery	Inland Topo	QL2	2-3 years	$1,700,395	$899,487	Major	Major	Major
				Inland Bathy	QL0B	2-3 years	$248,137	$506,520	Major	Major	Major
				Nearshore Bathy	QL0B	Annually	$1,616,676	$21,708	Moderate	Moderate	Major
				Offshore Bathy	Special Order	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
BU 03 – Coastal Zone Management	DOC: National Oceanic and Atmospheric Administration (NOAA)	22275	Improve Resilience of Coastal Ecosystems and Communities	Inland Topo	QL0 HD	Annually	$1,283,679	$472,149	Moderate	Moderate	Moderate
				Inland Bathy	QL2B	Event driven	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	4-5 years	$324,974	$43,717	Major	Moderate	Minor
BU 06 – Natural Resource Management	DOC: National Oceanic and Atmospheric Administration (NOAA)	1072	Deep Ocean Exploration and Research	Nearshore Bathy	QL2B	>10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Offshore Bathy	Order 2	>10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
BU 06 – Natural Resource Management	DOC: National Oceanic and Atmospheric Administration (NOAA)	60660	Natural Resources Conservation	Inland Topo	QL1	4-5 years	$95,222,907	$133,955,686	Major	Major	Major
				Inland Bathy	QL1B	6-10 years	$15,161,190	$569,947	Major	Major	Major
				Nearshore Bathy	QL1B	6-10 years	$82,791	$21,931	Moderate	Major	Moderate
BU 07 – Wildlife and Habitat Management	DOC: National Oceanic and Atmospheric Administration (NOAA)	1068	Identification, Designation, and Management of National Marine Sanctuaries	Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Offshore Bathy	Order 1a	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
BU 07 – Wildlife and Habitat Management	DOC: National Oceanic and Atmospheric Administration (NOAA)	60661	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$4,409,595	$895,653	Moderate	Major	Moderate
				Inland Bathy	QL1B	4-5 years	$5,528,695	$2,496,568	Moderate	Major	Moderate
				Nearshore Bathy	QL0B	4-5 years	$182,256	$1,670	Moderate	Major	Moderate
				Offshore Bathy	Order 1a	4-5 years	$4,343,009	$151,315	Moderate	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 09 – Fisheries Management and Aquaculture	DOC: National Oceanic and Atmospheric Administration (NOAA)	21566	Fisheries Management and Aquaculture	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL2B	Annually	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	Special Order	>10 years	$180,900	$54,270	Moderate	Major	None
BU 11 – Geologic Resource Extraction	DOC: National Oceanic and Atmospheric Administration (NOAA)	60662	Geologic Resource Mining and Extraction	Inland Topo	QL1	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Major
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Nearshore Bathy	QL4B	4-5 years	Unable to quantify	Unable to quantify	I don't know	Moderate	I don't know
				Offshore Bathy	Order 1b	4-5 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 12 – Renewable Energy Resources	DOC: National Oceanic and Atmospheric Administration (NOAA)	60663	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	None
				Inland Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL4B	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
				Offshore Bathy	Special Order	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
BU 13 – Oil and Gas Resources	DOC: National Oceanic and Atmospheric Administration (NOAA)	60664	Oil and Gas Resources	Inland Topo	QL2	Annually	Unable to quantify	Unable to quantify	Minor	Major	Major
				Inland Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	None	Minor	Minor
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Offshore Bathy	Order 1a	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 15 – Flood Risk Management	DOC: National Oceanic and Atmospheric Administration (NOAA)	21517	National Water Resource Analysis and Forecasting	Inland Topo	QL0	4-5 years	$443,043,267	$36,696,126	None	None	Major
				Inland Bathy	Cross sections and/or transects meet needs	4-5 years	$28,388,185	$15,806,519	None	None	Major
BU 16 – Sea Level Rise and Subsidence	DOC: National Oceanic and Atmospheric Administration (NOAA)	60665	Sea Level Rise and Subsidence	Inland Topo	QL0	4-5 years	$189,312,424	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
BU 19 – Land Navigation	DOC: National Oceanic and Atmospheric Administration (NOAA)	60666	Land Navigation and Safety	Inland Topo	QL0	2-3 years	Unable to quantify	Unable to quantify	Minor	Major	Major

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 20 – Marine and Riverine Navigation	DOC: National Oceanic and Atmospheric Administration (NOAA)	22146	Tides and Currents Supporting Safe Navigation and Coastal Engineering	Inland Bathy	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 20 – Marine and Riverine Navigation	DOC: National Oceanic and Atmospheric Administration (NOAA)	22525	Navigational Safety and Marine Mapping	Inland Topo	QL1	Annually	Unable to quantify	Unable to quantify	I don't know	Major	Major
				Inland Bathy	QL0B	Annually	Unable to quantify	Unable to quantify	Minor	Minor	Minor
				Nearshore Bathy	QL0B	Annually	$40,000,000	Unable to quantify	I don't know	Minor	Minor
				Offshore Bathy	Order 1a	Annually	$20,000,000	Unable to quantify	I don't know	I don't know	I don't know
BU 21 – Aviation Navigation	DOC: National Oceanic and Atmospheric Administration (NOAA)	60667	Aviation Navigation and Safety	Inland Topo	QL1	Annually	$15,579,236	$9,070,111	Minor	Moderate	Major
BU 22 – Infrastructure Management	DOC: National Oceanic and Atmospheric Administration (NOAA)	1321	The Geodesy Program at National Geodetic Survey (NGS)	Inland Topo	QL0	Event driven	$6,030	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL3B	Event driven	Unable to quantify	Unable to quantify	None	None	I don't know

MCA Title: Modeling and Mapping of Coastal Processes and Hazards



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	States and/or Territories	States and/or Territories	All study waters	All study waters
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		

MCA Description	Response
Mission Critical Activity	Modeling and mapping of coastal processes and hazards. This includes the following: Creation of DEMs for the modeling and mapping of coastal processes, especially coastal inundation modeling and mitigation. Water quality modeling of cyanobacteria harmful algal blooms (cyanoHABs) and hyperspectral camera flyovers to monitor cyanoHABs. Water quality measurements for cyanoHAB detection and environmental sampling processor for toxin detection. Fisheries Management and Aquaculture - Long-term ecological observations, fundamental research on ecological processes, and data used to develop models critical to understanding ecosystem structure and function. Development of models to forecast impacts of multiple stressors e.g., invasive species, climate, and nutrients on water quality, food webs and fisheries. Observations, laboratory, and field experiments to support the development of new concepts, models, forecasting tools and applications to evaluate and forecast impacts of, and mitigation strategies for, present and future stressors. Anticipate, monitor, analyze, understand, and forecast changes in the Great Lakes and coastal ecosystems to strengthen capacity for managing water quality, fisheries, and ecosystem and human health. Fate and transport of contaminants. Oil Spill Modeling. Pollution risk mitigation. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, and vessel spills. Land use and environmental planning. Modeling of biological and ecological systems. Management of diverse coral reef communities, marine mammals, protected fish species, and trust resources. Disaster response. Data dissemination.
MCA Title	Modeling and Mapping of Coastal Processes and Hazards
MCA ID	1076
Organization Type	Federal Agencies and Commissions
Organization Name	DOC: National Oceanic and Atmospheric Administration (NOAA)
Sub-Agency or Division	Multiple Line Offices, including the National Ocean Service, the National Fisheries Services, and the National Environmental Satellite, Data, and Information Service
Organization Mission	NOAA's Mission: Science, Service and Stewardship 1. To understand and predict changes in climate, weather, oceans and coasts; 2. To share that knowledge and information with others; and 3. To conserve and manage coastal and marine ecosystems and resources.
Program Name	Multiple programs and divisions use aspects of this MCA, including: COASTAL Act, NOAA's Coastal Ocean Modeling Program, VDatum, NOAA's Water Initiative, Digital Coast, National Tsunami Hazard Mitigation Program, NOAA Tsunami Program, Emergency Response Division, Assessment and Restoration Division, NOAA Environmental Research Labs, and the Marine Debris Program.
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable

What Needs to be Measured in 3D	Response
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required
Other	Required
Other description	Coastal structures (jetties, breakwaters)

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Interested in large features as they relate to mapping at scales of 1:2000 to 1:24000 to meet regional mapping needs and local project work. These include shipwrecks, hardened shoreline structures, manmade reef structures, and other items for hazard identification, habitat mapping, and littoral processes modeling. Jetties, breakwaters, impediments to wave models, or other surface (non-veg) features posing a barrier to the flow of water. Rivers for modeling purposes. Features large enough to influence our modeling outputs for fate and transport or habitat distribution - that size or volume varies depending on the site we are trying to characterize. For example, being able to resolve seagrass beds to a 2m scale would be very helpful, but not required. Also, being able to distinguish topography differences that would serve as collection points for chemicals or debris would help our models and our operational response for cleanup efforts along shorelines. Features that may affect the hydrodynamic model simulations in coastal areas. Many of our models include high resolution representation of nearshore features, as well as onshore features that may affect coastal inundation.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	Order 1b
Update Frequency	2-3 years	2-3 years	2-3 years and certain events.	2-3 years
Event type(s)			Event triggered geomorphic responses to an event that alter coastal processes/circulation (barrier island breaching, for instance)	
Quality Level and/or update frequency variability across AOI	Depends on location		AOI depends on spill or restoration location, however areas near coral or sensitive habitats are of particular interest - depends on request from funder	
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm	Up to 40 cm	Less than 1 meter
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			Multiple requirements: NAVD88, ellipsoidal or orthometric heights, Mean Sea Level (MSL), Mean Lower Low Water (MLLW)	Multiple requirements: NAVD88, ellipsoidal or orthometric heights, Mean Sea Level (MSL), Mean Lower Low Water (MLLW)
Cross sections and/or transects meet needs		Partial	Partial	Partial

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement		It is hard to determine these requirements. Something would be better than nothing. Would be dependent on contaminated area or potential area for restoration and surrounding sensitive habitats. We focus on coastal states and their water bodies as pathways. Likely whatever is needed for navigation would be sufficient depending on models and how they evolve.	This would depend on the area of interest for the spill or restoration area. Vertical accuracy = up to 30 cm @ 95% confidence level. Transect spacing would be dependent upon shoreline/nearshore configuration & complexity	This would depend on the AOI for an incident. Up to 5m @ the 95% confidence level.

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Other	Highly desirable		Highly desirable	Nice to have		Highly desirable
Other description	Tide coordinated					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	Required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Full waveform	Nice to have	Highly desirable	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Required	Required	Required
Breaklines required for standard hydro-flattening	Highly desirable	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Required	Required
Intensity imagery/sidescan imagery	Required	Highly desirable	Highly desirable	Required
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Required	Highly desirable	Highly desirable
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Required	Required
Geologic and seismic data	Nice to have	Nice to have	Highly desirable	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Required	Required
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Required	Required
Boundaries			Required	Required
Routes			Highly desirable	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	Highly desirable
Wetlands	Required	Required	Required	Required
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Lidar data typically downloaded from NOAA digital coast, collected for numerous federal agencies, e.g., NOAA, USGS, NGS, NGA, USACE, or the National Map, or state, or county-level collected lidar available at respective GIS departments. The quality level varies for each data set and lower quality levels are used in absence of newer data sets. Use multiple sources including state lidar collects, JALBTCX data, and NOAA collected data. Whatever we can get our hands on. The "best available" data we can find (usually the most recent acquisitions).	NOAA collected lidar (QL2), multibeam sonar. Downloaded from Digital Coast or USACE hydrographic survey web page. Data quality varies by collection date and instrumentation. NOAA Bathy and ENC datasets as available from the NOAA data viewer, highest resolution available. Local or state partner datasets Information requirements can vary greatly based on other details of incident. Whatever we can get our hands on. The "best available" data we can find (usually the most recent acquisitions).	NOAA lidar, NOS hydrographic surveys, NOAA ENCs, NOAA NCEI mulitbeam, USACE hydrographic surveys, USACE channel condition surveys, bathymetric lidar, JALBTCX lidar, NPS multibeam. NOAA nautical charts and ENCs/ bathy, but if more detailed information is needed we may look at localized special studies. Whatever we can get our hands on. The "best available" data we can find (usually the most recent acquisitions	NOS hydrographic surveys, NOAA ENC, NOAA NCEI multibeam, NOAA single beam, NPS multibeam, USACE channel conditions surveys, bathymetric lidar closer to shore. Whatever we can get our hands on. The "best available" data we can find (usually the most recent acquisitions).
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI	Yes	Yes	Yes	Yes
Open Topography	Yes			
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS			Yes	Yes
State Repositories	Yes	Yes	Yes	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	Minnesota GeoCommons, Illinois State Geological Survey, WisconsinView, Indiana GIS Clearinghouse, Depends on the area in which we're working, and whether or not the data can be found in one of the federal clearinghouses. Other considerations, such as ease of download, etc. are also made. The TNRIS data portal is a good example of a state repository that has been used in the past.	Varies depending on AOI but state's geo-spatial repositories are searched and used when needed for response or restoration planning.	Depends on AOI for incident, but generally check state data sources as well as federal when stating to gather available data for AOI	
Other			Yes	Yes
Other description			USACE District Offices, Academic labs specializing seafloor mapping (CSUMB, OSU, Etc)	USACE District Offices, Academic labs specializing seafloor mapping (CSUMB, OSU, Etc)
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Major	Major	Major
Increased revenues	None	Moderate	Major	None
Mission-driven performance improvements	Major	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major
Improved response or timeliness	Major	Major	Major	Major
Improved customer experience	Major	Major	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	Major

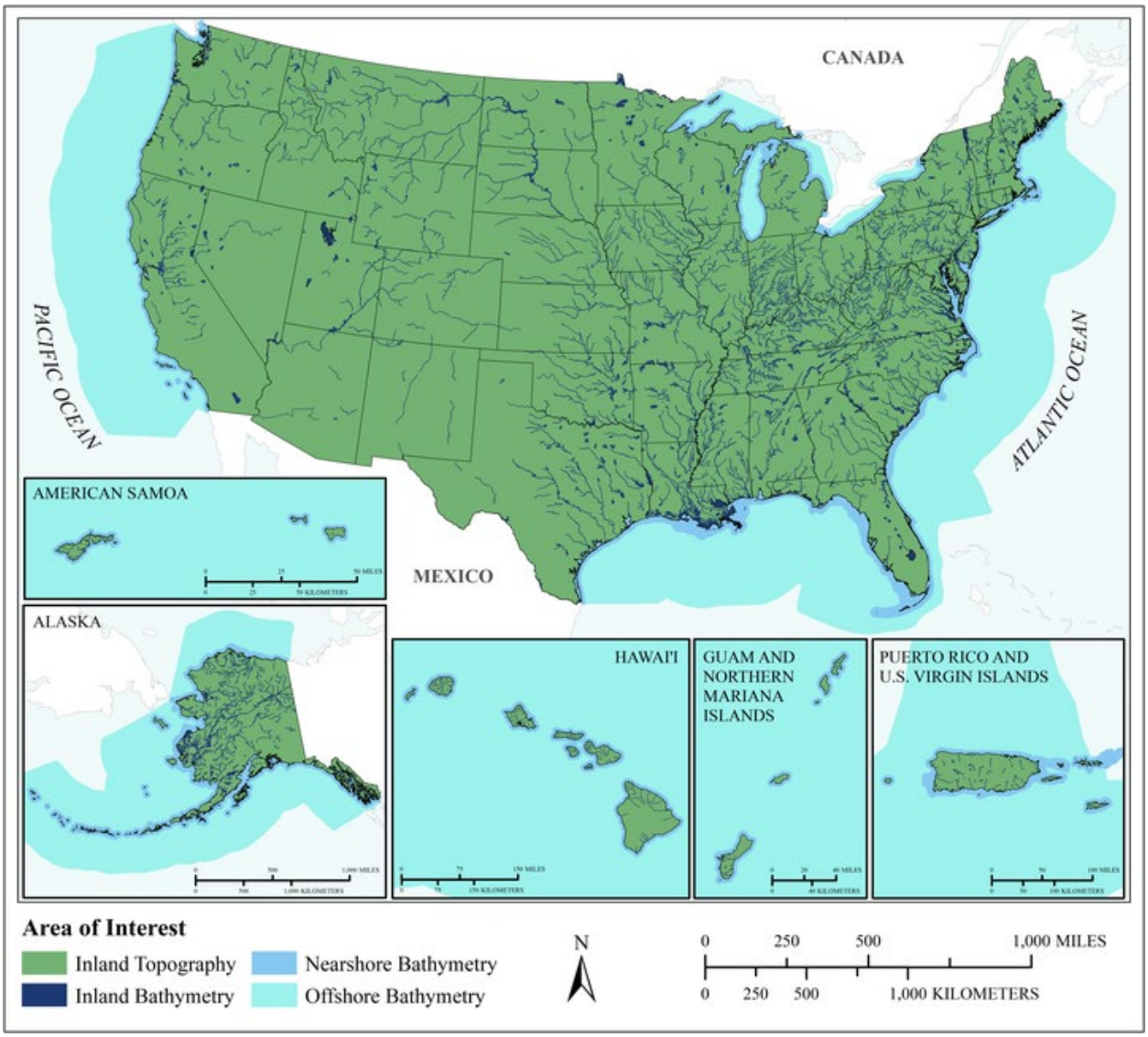
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental	Major	Major	Major	Major
Public safety, including life and property	Major	Major	Major	Major
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other				Minor
Other description				

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Time savings description	A lot of our time is spent on the manipulation of the data to meet our needs and our partner needs.			This would be our primary saving of time but unclear on how to estimate since source data varies so much by location.								
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other operational benefits				Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other customer service benefits				Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Major			Major		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Major			Major			Major			Major		
Other												
Other benefits				Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	Yes
Aspect maps				
Curvature maps	Yes	Yes	Yes	Yes
Cross sections		Yes	Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	Yes
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Coastal Hazard Mitigation, Resilience, Disaster Monitoring, and Recovery



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Nationwide, inland areas	Nationwide, inland areas	Custom description	Custom description
Sub Area Requirements			States, Puerto Rico, U.S. Virgin Islands, American Samoa, Guam, and CNMI out to the EEZ	States, Puerto Rico, U.S. Virgin Islands, American Samoa, Guam, and CNMI out to the EEZ

MCA Description	Response
Mission Critical Activity	Coastal hazard mitigation, resilience, disaster monitoring, and recovery. Support for coastal hazard preparedness and mitigation. Analysis of coastal erosion, inundation and water levels. Analysis of inland inundation. Sea level rise mapping. Coastal intelligence and coastal management. Habitat restoration. Establishment and maintenance of marine and land boundaries. Downscaling of numerical weather prediction models and providing weather forecasts at appropriate scales and resolutions. Understanding and prediction of weather, air quality, and climate.
MCA Title	Coastal Hazard Mitigation, Resilience, Disaster Monitoring, and Recovery
MCA ID	21635
Organization Type	Federal Agencies and Commissions
Organization Name	DOC: National Oceanic and Atmospheric Administration (NOAA)
Sub-Agency or Division	NOAA National Ocean Service
Organization Mission	NOAA's Mission: Science, Service and Stewardship 1. To understand and predict changes in climate, weather, oceans and coasts; 2. To share that knowledge and information with others; and 3. To conserve and manage coastal and marine ecosystems and resources
Program Name	
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Single family homes, dams, levees, flood gates, dunes, inlets, channels, trees, shrubs, wetland areas, etc. We're moving to high resolution land cover with 1 meter resolution. Individual large trees and houses would be of interest. Minimum mapping unit is officially 1/10 of an acre, but need to pick up things smaller than that. Also coral head of a colony, wetland vegetation, shoreline features that could block water flow, levees, seawalls, etc., including widths; navigation hazards in particular.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL0B	Special Order
Update Frequency	2-3 years	2-3 years	Annually	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	Key focus area is within 10 meters upland and down-land from the MLLW line. We might need higher frequency update following significant storms landfall.			
Acceptable Horizontal Error	Less than 20 cm	Less than 50 cm	Less than 50 cm	Less than 50 cm
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	Less than 1 meter
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MSL	MLLW
Cross sections and/or transects meet needs			Partial	
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Required	Required	Required	Required	Required
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	Nice to have
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Highly desirable	Highly desirable
Full waveform	Highly desirable	Highly desirable	Required	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	Highly desirable
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Required	Required
Intensity imagery/sidescan imagery	Required	Highly desirable	Required	Nice to have
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Required	Nice to have
Bottom texture			Required	Nice to have
Bottom type			Required	Nice to have
Submerged features			Required	Required
Subbottom characteristics			Required	Nice to have
Geologic and seismic data	Required	Required	Required	Nice to have
Water column properties - Physical			Required	Required
Water column properties - Chemical			Required	Nice to have
Water column properties - Biological			Required	Required
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Required	Nice to have
Habitat distribution and classification			Required	Not required
Boundaries			Required	Required
Routes			Required	Nice to have
Offshore cadastral			Highly desirable	Nice to have
Lease areas			Highly desirable	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Required	
Land use/land cover	Highly desirable	Highly desirable	Required	Nice to have
Wetlands	Highly desirable	Highly desirable	Required	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Nice to have
Inland surface water features	Required	Required	Required	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USACE Topobathy LiDAR, NOAA Topographic LiDAR, USGS LiDAR, USACE Topobathy LiDAR; . Any available lidar data sets in an area. Typically find the data through the USIEI. GMTED 2010, GTOP30, Coastal Relief Model. Best available lidar data. QL2 or better is the desired state. QL3 is only used if there is no better. NCEI DEMs. Specific Point elevation provided through NGS IDB or OPUS-DB on specific bench marks.	USACE Topobathy LiDAR. Bathy data from the NOAA/NOS/OCS data inventories. NCEI DEM tiles. Satellite imagery.	USACE Topobathy; MBES, bathy Lidar, SDB, SFM derived. NOAA/NOS/OCS data sources. USACE dredge surveys, NOS lidar bathymetry; https://maps.ngdc.noaa.gov/viewers/bathymetry/	NOAA/NOS/OCS data sets, ETOPO NCEI DEMs
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI	Yes	Yes	Yes	Yes
Open Topography	Yes			
NOAA nautical charts		Yes	Yes	Yes

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USACE navigation charts		Yes		
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	All state GIS repositories: Maryland, Texas, Oregon, Louisiana, South Carolina, Probably others.			
Other	Yes	Yes	Yes	
Other description	Other websites	University of Hawaii SOEST	Our own collections	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Minor
Cost savings/cost reduction	Major	None	Major	Minor
Cost avoidance	Major	Moderate	Major	Minor
Increased revenues	Major	None	Minor	None
Mission-driven performance improvements	Major	Minor	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Moderate
Improved response or timeliness	Major	Major	Major	Minor
Improved customer experience	Major	Major	Major	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	Minor
Environmental	Major	Major	Moderate	Minor
Public safety, including life and property	Major	Major	Major	Major

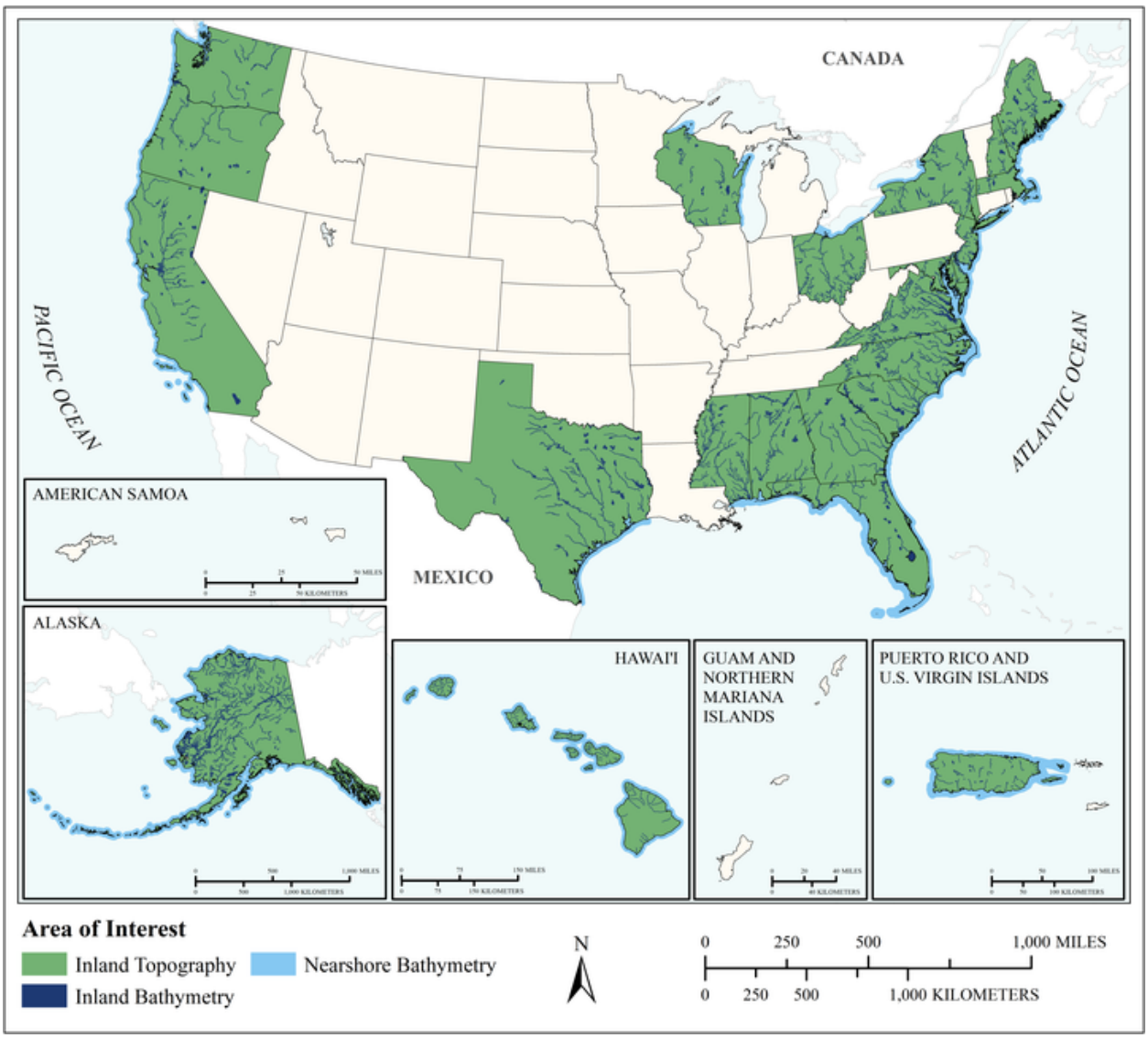
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$280,395	Major	Annual dollars saved/realized	$128,138	Major	Annual dollars saved/realized	$296,676	Moderate	Unable to provide	
Time savings description	Premade DEMs save many hours of data processing for analysis. Reduces need for other ancillary data sets to resolve confusion. Allow for better identification of periodic flooding events, sea level rise, high tide inundation events and reduced associated modeling efforts. Avoiding adjustments needed to combine data sources. Avoid field surveys of low lying coastal areas. Allow for better identification of periodic flooding events, sea level rise, high tide inundation events. Modeling based on elevation saves manual editing time. Reduce time to condition DEMs to hydro-enforced like state for water connectivity. Fewer errors from resolving canopy heights leads to less editing time. Improvement in the ability to do desk top recons prior to going to field. This will be dependent on new projects and updates to ongoing projects and associated environmental compliance and permitting needs. Having a consistent process, by having uniform data available everywhere, makes it more efficient.			Reduced error is vital for end product and helps all end users.			Reduced effort fitting data sets together.					
Cost savings/cost reduction	Major	Annual dollars saved/realized	$300,000	Moderate	Unable to provide		Major	Annual dollars saved/realized	$200,000	Minor	Unable to provide	
Cost savings/cost reduction description	Avoiding collection costs where current data is unavailable. Costs when contracting for the product should be reduced for the same reasons as given for time savings. These savings could be more significant in the long term as most production will be contracted.						Estimated as annualized amount from purchases over the last 8 years.					
Cost avoidance	Major	Annual dollars saved/realized	$120,000	Major	Annual dollars saved/realized	$60,000	Major	Annual dollars saved/realized	$120,000	Minor	Unable to provide	
Cost avoidance description	Reduced error of merging multiple data sets to accomplish coverage. Frees up analysts to generate analysis/end user products instead of data production. This is primarily captured in time savings already. improved efficiency of modeling and GIS assessments. Consistent outputs would reduce the amount and variety of processing needed. These benefits are received by the public and not us. Cannot estimate. Benefit from not building where they shouldn't.											
Increased revenues	Major	Unable to provide		Major	Annual dollars saved/realized	$60,000	Major	Unable to provide		Major	Unable to provide	
Increased revenues description	PORTS program relies on providing real time oceanographic data to enable transportation of commercial ships in and out of major seaports. So improved data improves accuracy and ability to transit larger ships with smaller clearances.			Increased capacity for commercial shipping is a key portion of work here and increasing the load capacity is vital.								
Mission-driven performance improvements	Major	Annual percent improvement	22%	Moderate	Unable to provide		Major	Annual percent improvement	20%	Major	Unable to provide	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Mission-driven performance improvements description	Ties back to the time savings. Having the elevation data improves the overall product accuracy. Better data everywhere leads to a better and more credible overall product.											
Other operational benefits	Major	Annual dollars saved/realized	$1,000,000				Major	Annual dollars saved/realized	$1,000,000			
Other operational benefits description	Potentially significant.						Potentially large.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Value added to products or services description	Improved shoreline leads to better models. Benefit is for the customer. Users would have the savings from an improved product. Location specific benefits for better navigation as well as improved ability to use RTK for survey needs.											
Improved response or timeliness	Moderate	Annual dollars saved/realized	$146,228	Major	Annual dollars saved/realized	$289,440	Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Annual dollars saved/realized	$253,260	Major	Annual dollars saved/realized	$217,080	Major	Annual dollars saved/realized	$21,708	Minor	Unable to provide	
Other customer service benefits	Moderate	Annual dollars saved/realized	$500,000				Major	Unable to provide				
Other customer service benefits description	Mainly quality issues.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			Minor		
Education or outreach description	3D printed elevation models, topographic maps, etc. are used for K-12 outreach. Better message to outreach if data is accurate and consistent nationally.											
Environmental	Major			Major			Moderate			Minor		
Environmental description	Accurate elevation data helps us understand watershed dynamics and model pathways of sediment and/or pollutants. Improved quantification of current landscape provides information for more informed environmental decisions and greater confidence in change analysis.											
Public safety, including life and property	Major			Major			Major			Minor		
Public safety, including life and property description	Improved quantification of current landscape provides information on risk and possible mitigation options, higher confidence in product.						Greater confidence in the data to use for public safety decisions					
Other												
Other benefits							Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes	Yes	Yes	Yes
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	Yes
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Improve Resilience of Coastal Ecosystems and Communities



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	The National Estuarine Research Reserve System (NERRS) is a network of 29 coastal sites designated to protect and study estuarine systems. Established through the Coastal Zone Management Act, the reserves represent a partnership program between NOAA and the coastal states. NOAA provides funding and national guidance, and each site is managed on a daily basis by a lead state agency or university with input from local partners. The NERRS was established to promote informed management of the Nation's estuaries and coastal habitats Elevation data are needed to do the following. Improve resilience of coastal ecosystems and communities to anthropogenic and natural drivers of environmental change. Monitor response of coastal ecosystems to habitat change and alteration. Develop knowledge about processes governing connectivity of habitats and communities from watershed to ocean. Monitor vulnerability of critical coastal habitats to climate and human-induced stressors. Monitor, research and manage estuarine and associated habitats. Conduct estuarine research to inform coastal management. Perform estuarine research monitoring, natural resource management, habitat mapping, inundation mapping, sea level rise mapping, coastal communities, outreach, and education. Coastal hazard mitigation, non-point source pollution modeling. Land use and environmental planning, Coastal resiliency, wetlands mapping and characterization, and mapping the effects of sea level rise or subsidence.
MCA Title	Improve Resilience of Coastal Ecosystems and Communities
MCA ID	22275
Organization Type	Federal Agencies and Commissions
Organization Name	DOC: National Oceanic and Atmospheric Administration (NOAA)
Sub-Agency or Division	National Estuarine Research Reserve System (NERRS)
Organization Mission	NOAA's Mission: Science, Service and Stewardship 1. To understand and predict changes in climate, weather, oceans and coasts; 2. To share that knowledge and information with others; and 3. To conserve and manage coastal and marine ecosystems and resources
Program Name	National Estuarine Research Reserve System (NERRS)
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Roads, dunes, hummocks, creeks, pans, ponds, docks, piers, shoreline armor; Plant species, individual plant identification, shrub and tree line at the inland interface with salt marsh, vegetation species, critical wetland habitats (communities) - such as low spartina marsh, high paten marsh, ponds, etc. It depends on the instruments used, to get a topographical map of an area use a 10x10 meter grid or finer resolution.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL2B	QL2B	
Update Frequency	Annually	Event driven only – Data need to coincide with a specific event.	4-5 years	
Event type(s)		Event driven only		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 5 meters	Up to 5 meters	
Acceptable Vertical Error	Less than 5 cm	Up to 40 cm	Up to 40 cm	
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	Below MLLW		Below MLLW	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement			Multiple: NAVD88, Mean High Water (MHW)	
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	Vertical accuracy of <3 cm, longitudinal transect spacing of <5 m, contour dependent for beach dune systems portion of interest.			

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Required	Nice to have	Required		Nice to have	Required
Other	Required					
Other description	Similar tide phase					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Required	
DTM	Required	Nice to have	Required	
DEM	Highly desirable	Nice to have	Required	
Raw point cloud data	Required	Nice to have	Nice to have	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Not required	Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Required	
Ground control/ground truthing	Highly desirable	Nice to have	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Required	
Aerial and/or satellite imagery	Required	Nice to have	Nice to have	
Underwater videography			Highly desirable	
Bottom texture			Required	
Bottom type			Required	
Submerged features			Required	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Required	
Water column properties - Biological			Required	
Currents			Required	
Tide/wave heights			Required	
Sea ice conditions			Highly desirable	
Habitat distribution and classification			Required	
Boundaries			Required	
Routes			Highly desirable	
Offshore cadastral			Nice to have	
Lease areas			Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Fixed obstructions			Required	
Floating observation/navigation systems			Required	
Shorelines – current, historic, change rates	Required	Nice to have	Required	
Land use/land cover	Required	Nice to have	Highly desirable	
Wetlands	Required	Nice to have	Required	
Estuaries			Required	
Inland surface water features	Required	Nice to have	Highly desirable	
Bridges/culverts	Required	Nice to have		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Required	Nice to have	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USACE Topobathy LIDAR with vertical accuracy of 10 cm2 rmse; 2011 Northeast Lidar Project (vertical accuracy 0.067m); USGS/FEMA Lidar Data Sets, NAIP Imagery, AUS Data Collections (2016 and 2017) - Specific Reserve Components, LiDAR and USGS topographic maps, and in house data	Best available	Proposing to collect it on our own, and patching parts together from past focused surveys. Quality levels and dates vary.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				

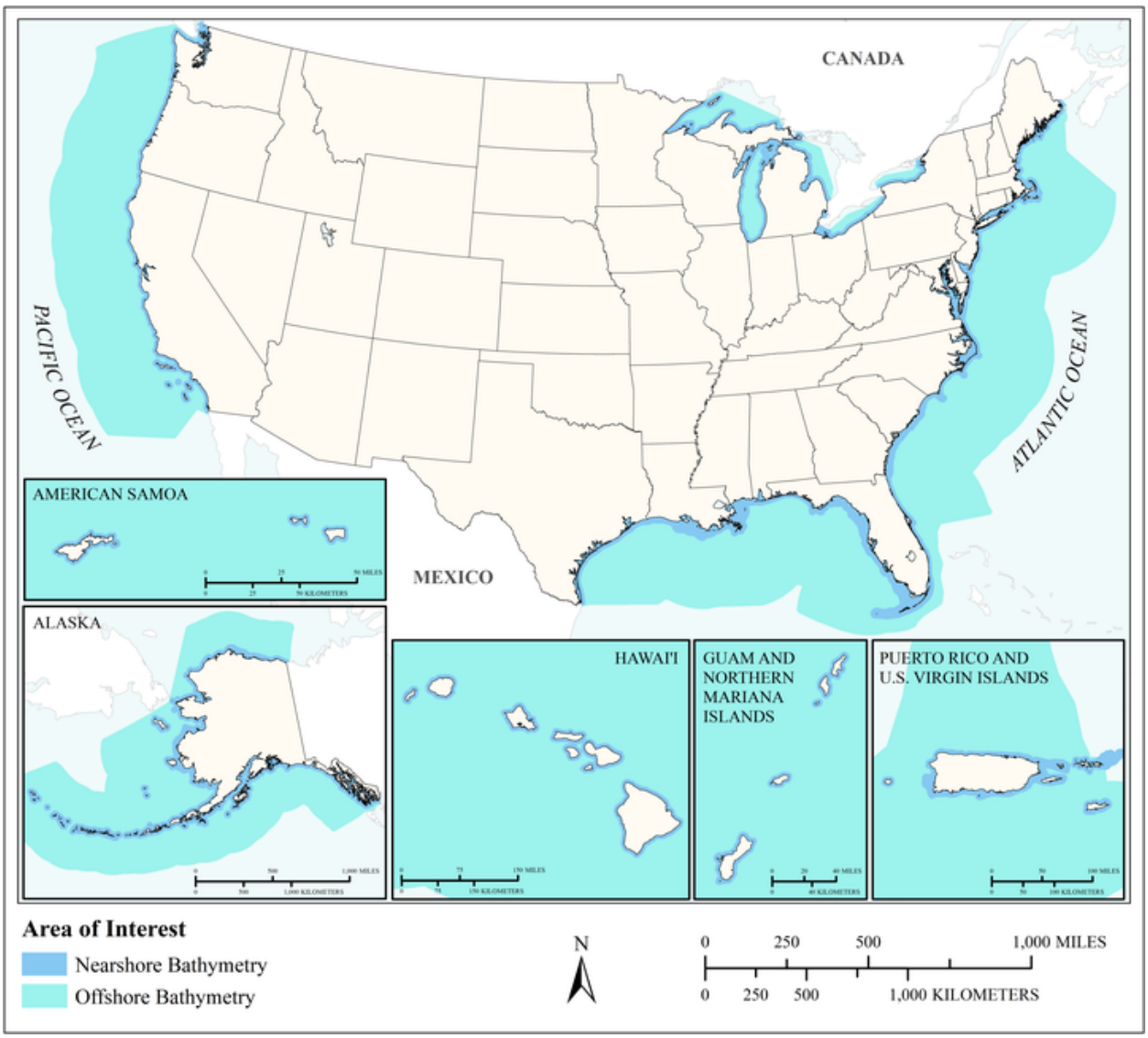
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	State GIS repositories, Internal servers, NRIS,	Internal servers	Internal servers, state GIS repositories	
Other	Yes		Yes	
Other description	VA LIDAR Site		Collected by our own vessels prior to focused habitat work.	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	Major	
Cost savings/cost reduction	Moderate	I don't know	None	
Cost avoidance	Major	I don't know	Major	
Increased revenues	None	I don't know	None	
Mission-driven performance improvements	Major	I don't know	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	None	
Improved response or timeliness	Major	I don't know	Moderate	
Improved customer experience	Major	I don't know	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	I don't know	Major	
Environmental	Major	I don't know	Major	
Public safety, including life and property	Major	I don't know	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$558,680	I don't know	Unable to provide		Major	Annual dollars saved/realized	$34,974			
Time savings description	Avoid field elevation survey. It would save hundreds of hours of field work.						Don't have to do field survey before deploying mobile equipment. Easier to generate figures for publication and outreach.					
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$290,000	I don't know	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction description	Equipment acquisition saved. No budget, data acquisition/processing would simply not be possible. Dependent on restoration projects planned.											
Cost avoidance	Moderate	Annual dollars saved/realized	$435,000	I don't know	Unable to provide		Major	Annual dollars saved/realized	$290,000			
Cost avoidance description	Reduced salary costs.						Reduced salary allotment to those tasks.					
Increased revenues	None			I don't know	Unable to provide		None					
Mission-driven performance improvements	Major	Annual percent improvement	18%	I don't know	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements description	Better data, greater efficiency in assessing change in condition.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$419,688	I don't know	Unable to provide		None					
Value added to products or services description	Reduced time allocation to these tasks.											
Improved response or timeliness	Moderate	Unable to provide		I don't know	Unable to provide		Major	Annual dollars saved/realized	$34,974			
Improved response or timeliness description	Event dependent. Varies annually.						Enhanced understanding/modeling of propagule dispersal for fisheries ecology. Relevant to permitting for the maintenance of our own infrastructure.					
Improved customer experience	Major	Annual dollars saved/realized	$52,461	I don't know	Unable to provide		Major	Annual dollars saved/realized	$8,744			
Improved customer experience description	Less time searching disparate data bases.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know			Major					
Education or outreach description	Greater efficiency in product generation. Enhanced outreach materials to property owners and coastal managers						Easier preparation of figures for publication and outreach; Dependent on change in condition over time					
Environmental	Moderate			I don't know			Moderate					
Environmental description	Greater efficiency in product generation, identify migration pathways, inform restoration/management						Better prioritization of restoration efforts for lasting impact; Evaluate migration potential; tidal flooding potential					
Public safety, including life and property	Moderate			I don't know			Minor					
Public safety, including life and property description	Greater efficiency in product generation. Assist emergency response planning.						Emergency response planning					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes		Yes	
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes		Yes	
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Deep Ocean Exploration and Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			All study waters	All study waters
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Mapping to support deep ocean exploration and research. BU 10 Geological Assessment and Hazard Mitigation is an additional Business Use.
MCA Title	Deep Ocean Exploration and Research
MCA ID	1072
Organization Type	Federal Agencies and Commissions
Organization Name	DOC: National Oceanic and Atmospheric Administration (NOAA)
Sub-Agency or Division	Oceanic Research (OAR) – Ocean Exploration and Research (OER)
Organization Mission	NOAA's Mission: Science, Service and Stewardship 1. To understand and predict changes in climate, weather, oceans and coasts; 2. To share that knowledge and information with others; and 3. To conserve and manage coastal and marine ecosystems and resources
Program Name	Okeanos Explorer
Total Annual Program Budget	$9,000,000
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 09 - Fisheries Management and Aquaculture
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Archaeological assets, coral, gas seep, wreck

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL2B	Order 2
Update Frequency			>10 years	>10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error			Up to 5 meters	Up to 5 meters
Acceptable Vertical Error			Up to 1 meter	Up to 2 meters

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far onshore needed			None	
How far down the beach profile needed			None	
Tide correction requirement			Any tide correction is acceptable, as long as it is defined	No requirement for tide correction
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Not required	Not required		Required
Entire AOI under same environmental conditions			Not required	Not required		Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Not required	Required		Required
DEM for entire AOI needs to be seamless			Not required	Required		Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Highly desirable	Highly desirable
DTM			Highly desirable	Required
DEM			Highly desirable	Highly desirable
Raw point cloud data			Highly desirable	Nice to have
Classified point cloud			Highly desirable	
Edited/cube XYZ			Highly desirable	Highly desirable
Full waveform			Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)			Highly desirable	Required
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Not required
Tide Predictions			Highly desirable	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Not required
Intensity imagery/sidescan imagery			Highly desirable	Required
Ground control/ground truthing			Highly desirable	Required
Other			Highly desirable	
Other description				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery			Highly desirable	Highly desirable
Underwater videography			Required	Required
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Required	Required
Geologic and seismic data			Required	Required
Water column properties - Physical			Required	Required
Water column properties - Chemical			Required	Required
Water column properties - Biological			Required	Required
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Required	Required
Habitat distribution and classification			Required	Required
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Required	Required
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Land use/land cover			Required	Required
Wetlands			Highly desirable	Highly desirable
Estuaries			Highly desirable	Highly desirable
Inland surface water features			Not required	
Bridges/culverts				
Landmark features			Not required	
Cultural resources			Not required	
Coastal and riverine structures			Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			Bathymetric data collected with multibeam sonar using IHO order 1 standards in waters deeper than 200 m	Bathymetric data collected with multibeam sonar using IHO order 2 standards in waters deeper than 200 m
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				Yes
Open Topography				
NOAA nautical charts				Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Major	Major
Cost savings/cost reduction			Major	Major

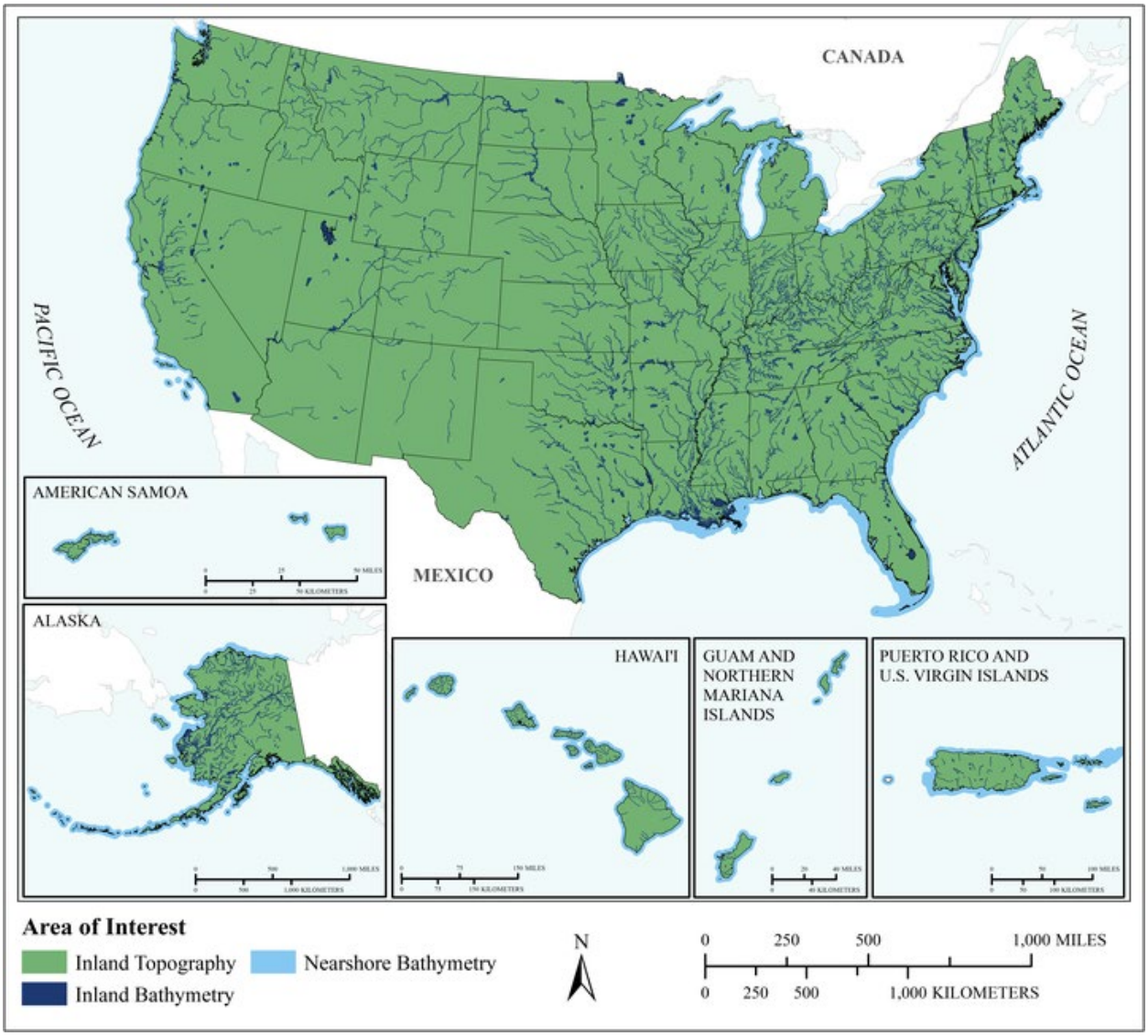
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance			Major	Major
Increased revenues			Moderate	Moderate
Mission-driven performance improvements			Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Major	Major
Improved response or timeliness			Major	Major
Improved customer experience			Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Major	Major
Environmental			Major	Major
Public safety, including life and property			Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction							Major	Unable to provide		Major	Unable to provide	
Cost avoidance							Major	Unable to provide		Major	Unable to provide	
Increased revenues							None			None		
Mission-driven performance improvements							Moderate	Unable to provide		Moderate	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							None			None		
Improved response or timeliness							Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience							Moderate	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Moderate			Moderate		
Environmental							Moderate			Moderate		
Public safety, including life and property							Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours			Yes	Yes
Hillshades			Yes	Yes
Slope maps			Yes	Yes
Aspect maps			Yes	Yes
Curvature maps			Yes	Yes
Cross sections			Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60660
Organization Type	Federal Agencies and Commissions
Organization Name	DOC: National Oceanic and Atmospheric Administration (NOAA)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	
Update Frequency	4-5 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Required	Highly desirable
Entire AOI under same environmental conditions	Required	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Required	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	
Wetlands	Required	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	
Cost savings/cost reduction	Major	Moderate	Moderate	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	Minor	Minor	None	
Mission-driven performance improvements	Major	Major	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	

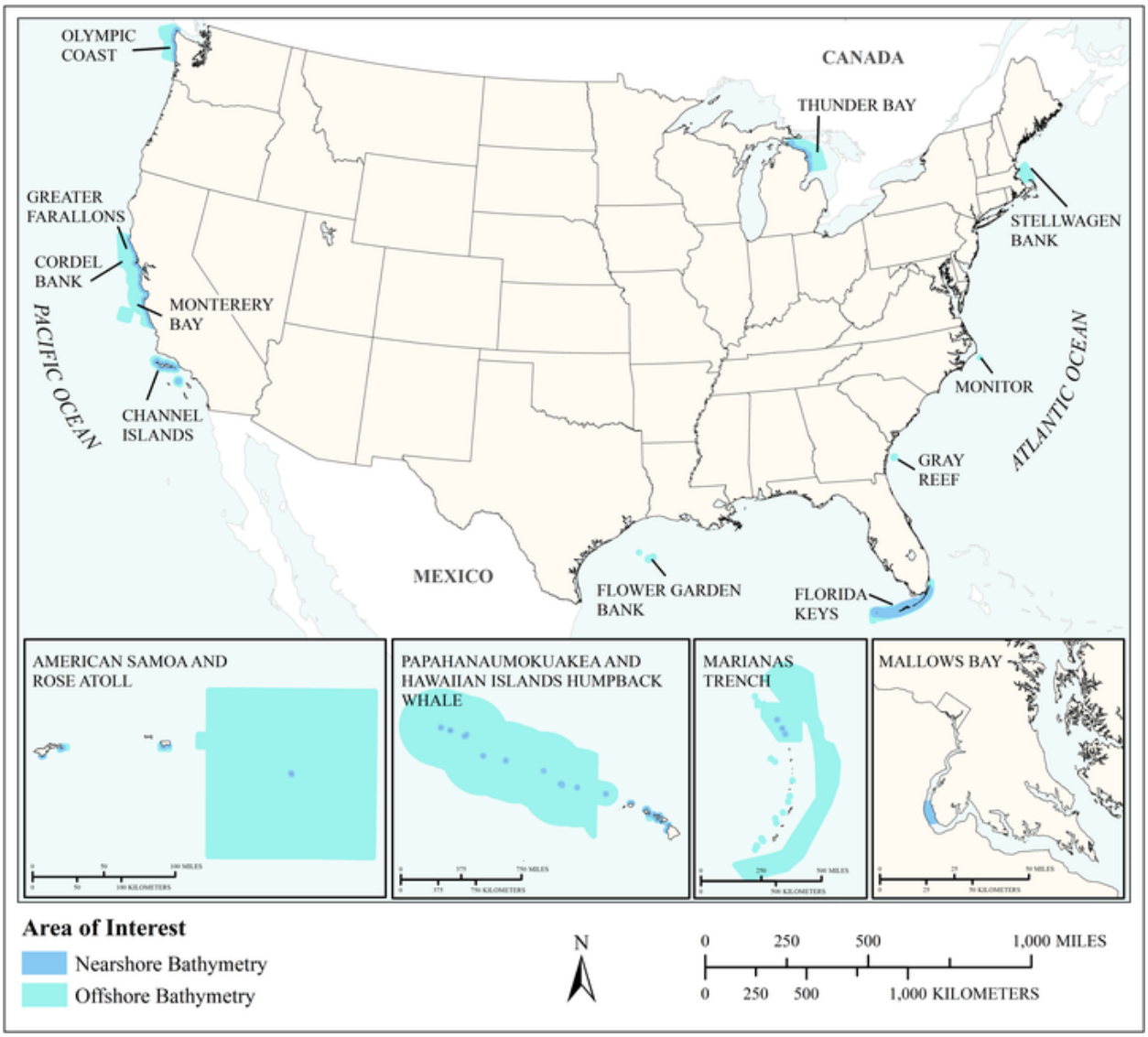
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Major	Moderate	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	
Environmental	Major	Major	Major	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$95,222,907		Annual dollars saved/ realized	$15,161,190		Annual dollars saved/ realized	$82,791			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$133,955,686		Annual dollars saved/ realized	$569,947		Annual dollars saved/ realized	$21,931			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Major			Major			Major					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes		Yes	
Curvature maps			Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes		Yes	
Viewshed maps	Yes	Yes	Yes	
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Identification, Designation, and Management of National Marine Sanctuaries



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Marine sanctuaries and/or marine national monuments	Marine sanctuaries and/or marine national monuments

MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Sub Area Requirements			American Samoa, Channel Islands, Cordel Bank, Florida Keys, Flower Garden Banks, Grays Reef, Greater Farallons, Hawaiian Islands Humpback Whale, Mallows Bay, Marianas Trench, Monitor, Monterery Bay, Olympic Coast, Papahanaumokuakea, Rose Atoll, Stellwagen Bank, Thunder Bay	American Samoa, Channel Islands, Cordel Bank, Florida Keys, Flower Garden Banks, Grays Reef, Greater Farallons, Hawaiian Islands Humpback Whale, Mallows Bay, Marianas Trench, Monitor, Monterery Bay, Olympic Coast, Papahanaumokuakea, Rose Atoll, Stellwagen Bank, Thunder Bay

MCA Description	Response
Mission Critical Activity	Identification, designation, and management of marine and Great Lakes areas of special national significance as national marine sanctuaries. Manage natural, cultural, historical resources within sites. Identify habitat types (coral, sea seeps, vegetation type, shipwrecks, archaeological features – for determination of area and in management of sites.
MCA Title	Identification, Designation, and Management of National Marine Sanctuaries
MCA ID	1068
Organization Type	Federal Agencies and Commissions
Organization Name	DOC: National Oceanic and Atmospheric Administration (NOAA)
Sub-Agency or Division	Office of National Marine Sanctuaries
Organization Mission	NOAA's Mission: Science, Service and Stewardship 1. To understand and predict changes in climate, weather, oceans and coasts; 2. To share that knowledge and information with others; and 3. To conserve and manage coastal and marine ecosystems and resources
Program Name	National Marine Sanctuary System
Total Annual Program Budget	$50,000,000
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 14 - Cultural Resources Preservation and Management
Tertiary Business Use	BU 27 - Recreation

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required

What Needs to be Measured in 3D	Response
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	200,000 sq mi - 2 million sq mi (e.g. large state, large multi-state region such as the Great Basin, standard Federal region, etc.)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Shipwrecks, geological and biological features

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL2B	Order 1a
Update Frequency			2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				Varies according to site.
Acceptable Horizontal Error			Up to 1 meter	Up to 1 meter
Acceptable Vertical Error			Up to 40 cm	Less than 1 meter
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed			Below MLLW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs			Partial	Partial
Cross section/transect requirement			This is sanctuary and project-specific and can't be described uniformly. We consider these specs on a case by case basis.	This varies among projects and sites. Specs are assessed on a case by case basis.

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Nice to have	Nice to have		Highly desirable
Entire AOI under same environmental conditions			Nice to have	Required		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Nice to have	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless			Nice to have	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Not required	Not required
DTM			Nice to have	Required
DEM			Required	Required
Raw point cloud data			Nice to have	Not required
Classified point cloud			Required	
Edited/cube XYZ			Not required	Not required
Full waveform			Not required	Not required
Bathymetric Attributed Grid (BAG)			Required	Required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Highly desirable	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Not required
Intensity imagery/sidescan imagery			Highly desirable	Required
Ground control/ground truthing			Required	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	Not required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery			Nice to have	Required
Underwater videography			Highly desirable	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Required	Required
Geologic and seismic data			Required	Required
Water column properties - Physical			Required	Required
Water column properties - Chemical			Required	Required
Water column properties - Biological			Required	Required
Currents			Required	Highly desirable
Tide/wave heights			Required	Nice to have
Sea ice conditions			Nice to have	Not required
Habitat distribution and classification			Required	Required
Boundaries			Required	Required
Routes			Required	Highly desirable
Offshore cadastral			Nice to have	Required
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates			Required	
Land use/land cover			Nice to have	Not required
Wetlands			Highly desirable	Not required
Estuaries			Highly desirable	Not required
Inland surface water features			Highly desirable	
Bridges/culverts				
Landmark features			Required	
Cultural resources			Required	
Coastal and riverine structures			Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			We use this data for a broad array of management actions including permitting, exploration, emergency response, habitat and cultural resource characterization. Specific application varies among sanctuaries and projects. We currently use the best available data.	We use best available data from numerous sources
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	Yes
NCEI			Yes	Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				

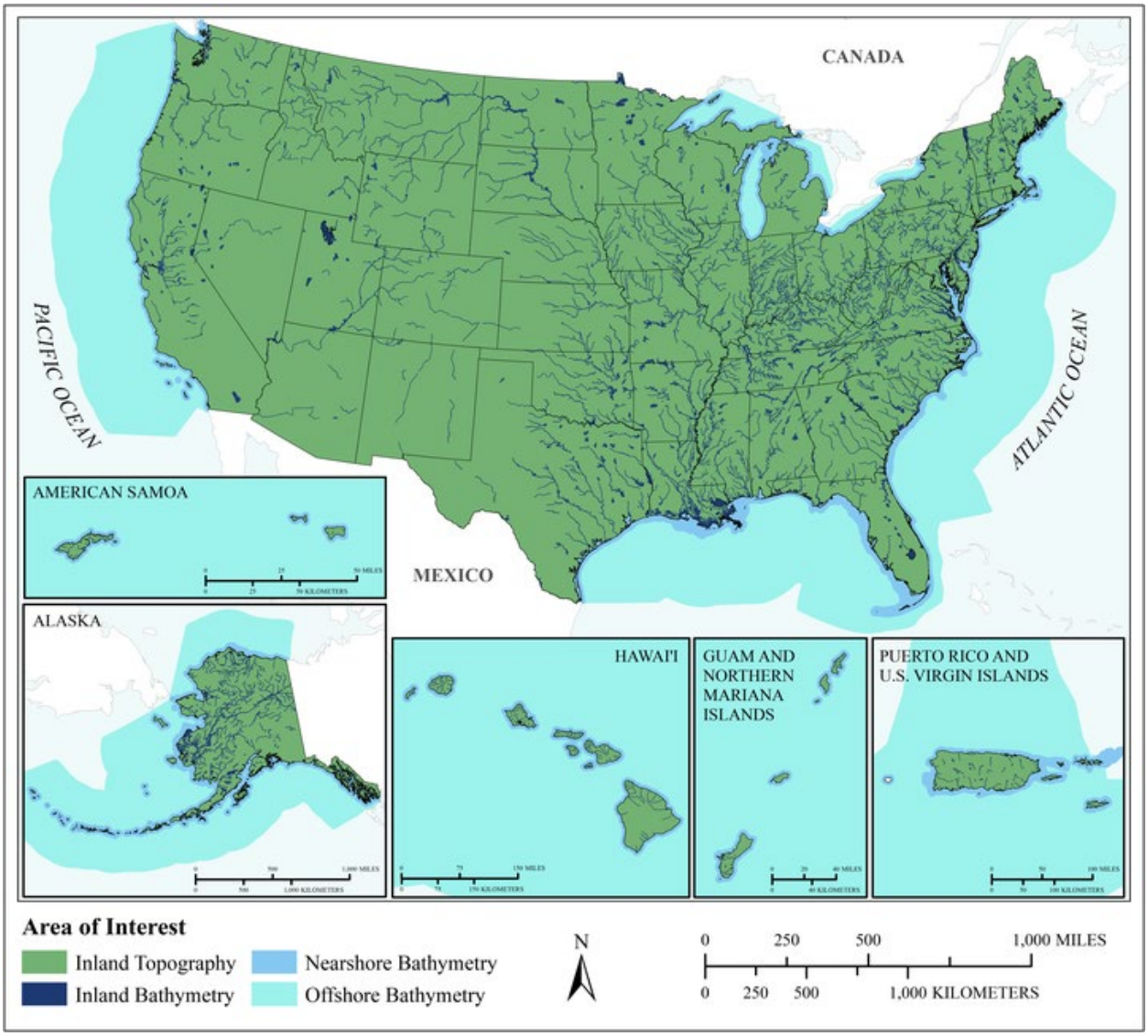
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other			Yes	
Other description			Academic and non-profit partners	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Moderate	Moderate
Cost savings/cost reduction			Moderate	Moderate
Cost avoidance			Moderate	Moderate
Increased revenues			I don't know	Moderate
Mission-driven performance improvements			Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Moderate	Moderate
Improved response or timeliness			Moderate	Moderate
Improved customer experience			Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Moderate	Moderate
Environmental			Major	Moderate
Public safety, including life and property			Minor	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction							I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance							I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues							I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements							Moderate	Unable to provide		Moderate	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Moderate	Unable to provide		None		
Improved response or timeliness							Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience							I don't know	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Moderate			Moderate		
Environmental							Moderate			Moderate		
Public safety, including life and property							Moderate			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours			Yes	Yes
Hillshades			Yes	Yes
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps			Yes	Yes
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints			Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60661
Organization Type	Federal Agencies and Commissions
Organization Name	DOC: National Oceanic and Atmospheric Administration (NOAA)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL0B	Order 1a
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Required
Aerial and/or satellite imagery	Required	Required	Highly desirable	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Highly desirable	Required
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Required
Boundaries			Highly desirable	Required
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Major	Major	Moderate	Moderate
Cost avoidance	Major	Moderate	Moderate	Major
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	Moderate

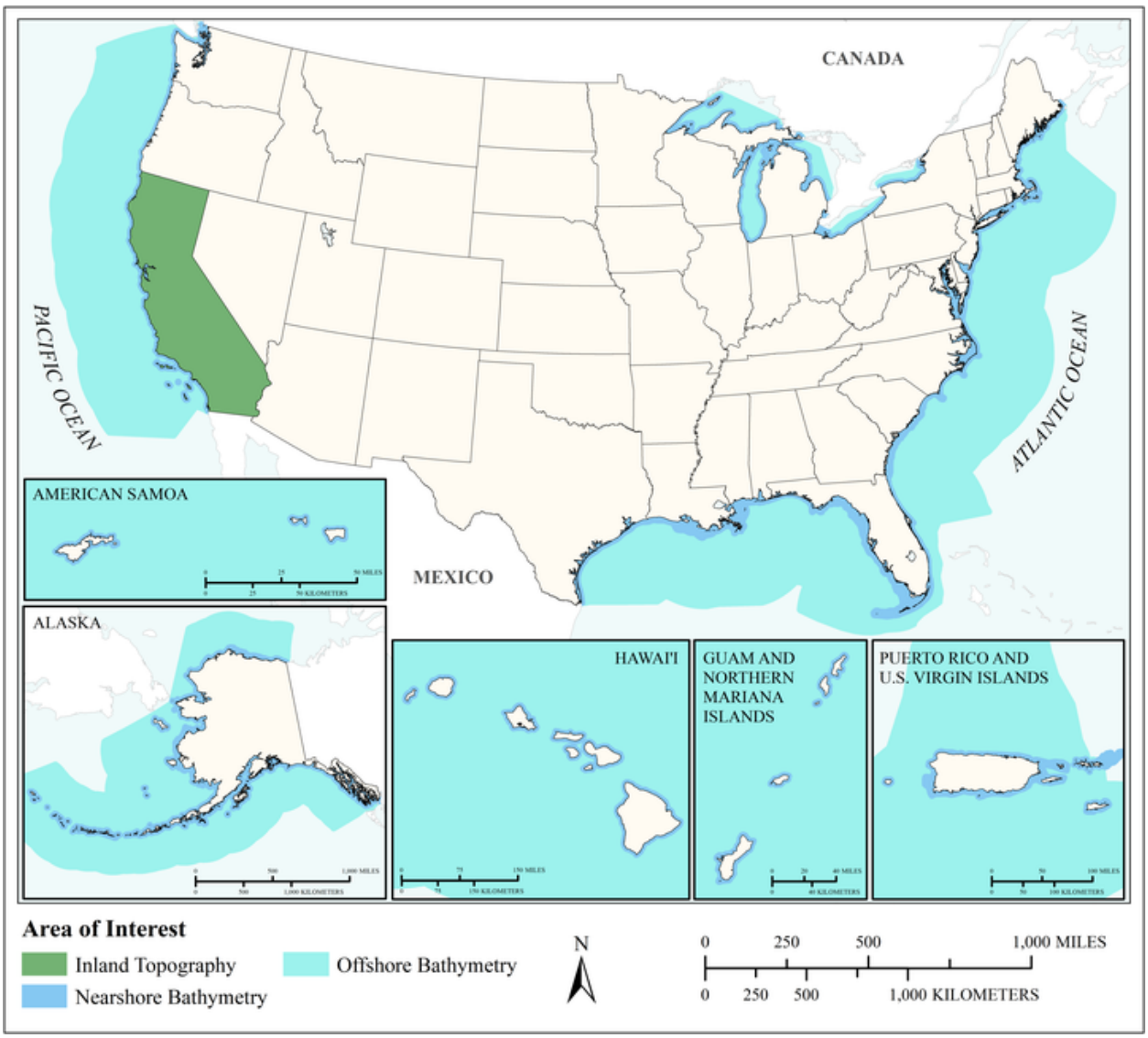
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Minor	Minor	Minor
Improved customer experience	Minor	Moderate	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Minor	Minor
Environmental	Major	Major	Major	Major
Public safety, including life and property	Minor	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$4,409,595		Annual dollars saved/ realized	$5,528,695		Annual dollars saved/ realized	$182,256		Annual dollars saved/ realized	$4,343,009
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$895,653		Annual dollars saved/ realized	$2,496,568		Annual dollars saved/ realized	$1,670		Annual dollars saved/ realized	$151,315
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			Yes
Curvature maps	Yes	Yes		Yes
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			Yes
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	One or more states, territories, or counties		All study waters	All study waters
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Fisheries management and aquaculture. Fish habitat assessment in rivers, estuaries and the ocean. Mapping of marine habitats for use in Fisheries Science. Exploration, description, and modeling of marine fisheries habitats in support of sustainable fisheries, fishery stock assessments and fisheries management.
MCA Title	Fisheries Management and Aquaculture
MCA ID	21566
Organization Type	Federal Agencies and Commissions
Organization Name	DOC: National Oceanic and Atmospheric Administration (NOAA)
Sub-Agency or Division	Fisheries Science Centers
Organization Mission	NOAA's Mission: Science, Service and Stewardship 1. To understand and predict changes in climate, weather, oceans and coasts; 2. To share that knowledge and information with others; and 3. To conserve and manage coastal and marine ecosystems and resources
Program Name	National Marine Fisheries Service
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Bottom sand waves, patches of rock, gravel, and cobble on the order of 2 m horizontal dimension and 1-2 m vertical dimension, wetland vegetation (about the size of a small island), coral pinnacles, boulders, and large trees.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL2B	Special Order
Update Frequency	4-5 years		Annually	>10 years
Event type(s)				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI			We have specific study areas within a broader geographic range. The specific study areas would need to be higher resolution.	Depends on known characteristics of bottom: higher res in complex topography, lower res in flatter areas
Acceptable Horizontal Error	Up to 60 cm		Up to 5 meters	Up to 1 meter
Acceptable Vertical Error	Up to 20 cm		Up to 40 cm	Less than 1 meter
How far onshore needed			500 meters inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs				Partial
Cross section/transect requirement				2m vertical accuracy, 1 km transects

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Required	Nice to have		Required
Entire AOI under same environmental conditions	Nice to have		Required	Highly desirable		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable		Highly desirable	Required		Nice to have
DEM for entire AOI needs to be seamless	Highly desirable		Highly desirable	Required		Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		Required	Highly desirable
DTM	Highly desirable		Highly desirable	Required
DEM	Required		Required	Required
Raw point cloud data	Nice to have		Highly desirable	Required
Classified point cloud	Highly desirable		Highly desirable	
Edited/cube XYZ			Required	Highly desirable
Full waveform	Not required		Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)			Required	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	Required
Ground control/ground truthing	Required		Required	Required
Other				Required
Other description				Other Multibeam sonar backscatter data

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Highly desirable		Required	Highly desirable
Underwater videography			Highly desirable	Required
Bottom texture			Highly desirable	Required
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Required	Highly desirable
Geologic and seismic data	Nice to have		Highly desirable	Highly desirable
Water column properties - Physical			Required	Required
Water column properties - Chemical			Required	Required
Water column properties - Biological			Required	Required
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Highly desirable	Nice to have
Habitat distribution and classification			Required	Required
Boundaries			Required	Highly desirable
Routes			Highly desirable	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required		Required	
Land use/land cover	Highly desirable		Required	Highly desirable
Wetlands	Highly desirable		Required	Highly desirable
Estuaries			Required	Highly desirable
Inland surface water features	Highly desirable		Highly desirable	
Bridges/culverts	Not required			
Landmark features	Not required		Highly desirable	
Cultural resources	Not required		Highly desirable	
Coastal and riverine structures	Highly desirable		Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available		Almost exclusively LIDAR data collected by Army Corps and NOAA, with some multibeam bathymetry in deeper areas. Generally 1 -2 meter horizontal accuracy and <1 m vertical accuracy. Most data ~ 5-10 years old	Bathymetric data characteristics used vary widely, based on availability of pre-existing data, as our ability to conduct or direct our own field ops of specified quality in target areas is extremely limited, and much of the area of interest is outside the near-shore and navigational traffic zones of recent high-resolution NOS coverage (e.g. mid- and outer northeast U.S. shelf and slope, Georges Bank, central Gulf of Maine).
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Digital Coast	Yes		Yes	Yes
NCEI	Yes		Yes	Yes
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS			Yes	
State Repositories	Yes		Yes	
State repositories used	Any available		All available coastal states	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know		Major	Major
Cost savings/cost reduction	I don't know		Major	Major
Cost avoidance	I don't know		Major	Major
Increased revenues	I don't know		Minor	Moderate
Mission-driven performance improvements	I don't know		Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know		Major	Major
Improved response or timeliness	I don't know		Moderate	Major
Improved customer experience	I don't know		Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know		Moderate	Moderate
Environmental	I don't know		Major	Major
Public safety, including life and property	I don't know		Moderate	Moderate

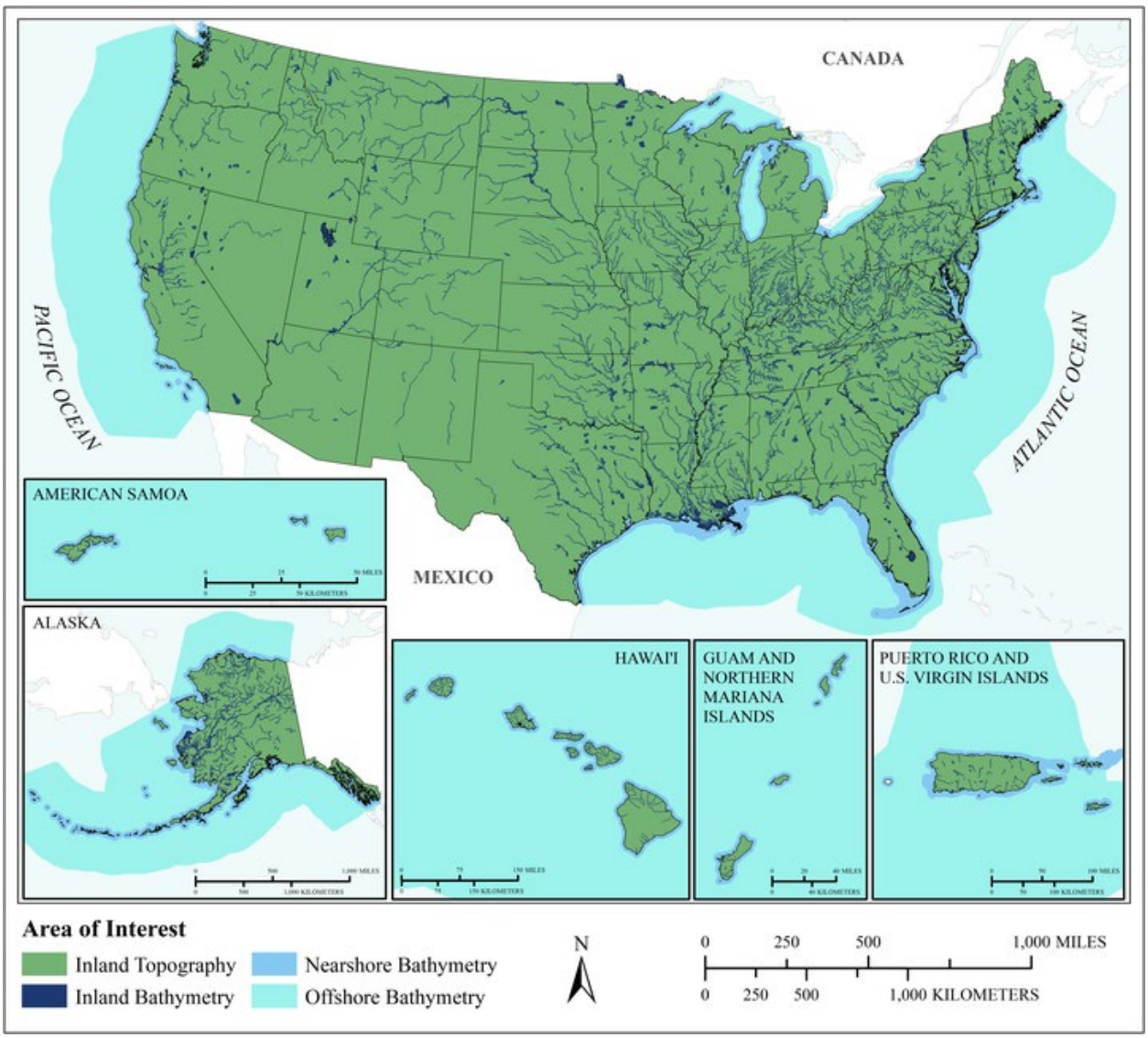
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide					Major	Unable to provide		Major	Annual dollars saved/realized	$180,900
Time savings description										Avoiding de novo mapping time aboard ships. Avoiding data manipulation for uniform display. Avoiding cruise planning. Additional field sampling for non-bathymetric variables still essential.		
Cost savings/cost reduction	I don't know	Unable to provide					Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction description							30% reduction in effort.					
Cost avoidance	I don't know	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Increased revenues	I don't know	Unable to provide					Major	Unable to provide		None		
Mission-driven performance improvements	I don't know	Unable to provide					Major	Annual percent improvement	40%	Major	Annual percent improvement	460%
Mission-driven performance improvements description							30% reduction in effort. Improved Survey Design.			Can plan to double effectiveness assuming personnel resources available. Can plan to greatly improve decision making assuming personnel resources available. Can plan to double extent of mission assuming personnel resources available.		
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide					Major	Unable to provide		Moderate	Unable to provide	
Value added to products or services description										New program; additional products not yet envisioned.		
Improved response or timeliness	I don't know	Unable to provide					Major	Unable to provide		Major	Annual dollars saved/realized	$36,180
Improved response or timeliness description										Faster response for providing maps for offshore events (planned or unplanned).		
Improved customer experience	I don't know	Unable to provide					Major	Unable to provide		Major	Annual dollars saved/realized	$18,090
Improved customer experience description										More sophisticated-looking 3-D maps are better accepted by customers. One-stop data shopping will be a particular improvement.		
Other customer service benefits							Moderate	Unable to provide				
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know						Moderate			Moderate		
Education or outreach description										More attractive professional graphic presentation attracts more attention at outreach events		
Environmental	I don't know						Major			Major		
Environmental description										Can greatly improve fisheries habitat definition through presentation		
Public safety, including life and property	I don't know						Moderate			None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other				
Other benefits			Major	

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	Yes
Contours	Yes		Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes		Yes	Yes
Curvature maps	Yes		Yes	Yes
Cross sections	Yes		Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes		Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Resource Mining and Extraction



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Onshore or offshore mineral extraction. Monitoring sand as a local resource. Seabed resources. Open mine volume computations. Stockpile analysis. Environmental impact assessment and site restoration.
MCA Title	Geologic Resource Mining and Extraction
MCA ID	60662
Organization Type	Federal Agencies and Commissions
Organization Name	DOC: National Oceanic and Atmospheric Administration (NOAA)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL4B	Order 1b
Update Frequency	2-3 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 10 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 50 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Not required	Not required	Not required	Not required
Entire AOI under same environmental conditions	Highly desirable	Required	Not required	Not required	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Required	Required	Highly desirable	Required
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Required	Required	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Nice to have	Nice to have
DTM	Required	Highly desirable	Nice to have	Nice to have
DEM	Required	Highly desirable	Nice to have	Nice to have
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Nice to have	Nice to have
Ground control/ground truthing	Nice to have	Highly desirable	Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery	Required	Required	Not required	Not required
Underwater videography			Not required	Not required
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Required	Required
Geologic and seismic data	Highly desirable	Nice to have	Highly desirable	Highly desirable
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Not required	Not required
Floating observation/navigation systems			Not required	Not required
Shorelines – current, historic, change rates	Not required	Highly desirable	Not required	
Land use/land cover	Nice to have	Not required	Not required	Not required
Wetlands	Nice to have	Highly desirable	Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Not required	Not required
Inland surface water features	Highly desirable	Required	Not required	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Highly desirable	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Nice to have	Highly desirable	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Moderate
Cost savings/cost reduction	Major	Major	Moderate	Moderate
Cost avoidance	Moderate	Major	Moderate	Moderate
Increased revenues	None	None	None	None
Mission-driven performance improvements	Moderate	Major	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	Moderate

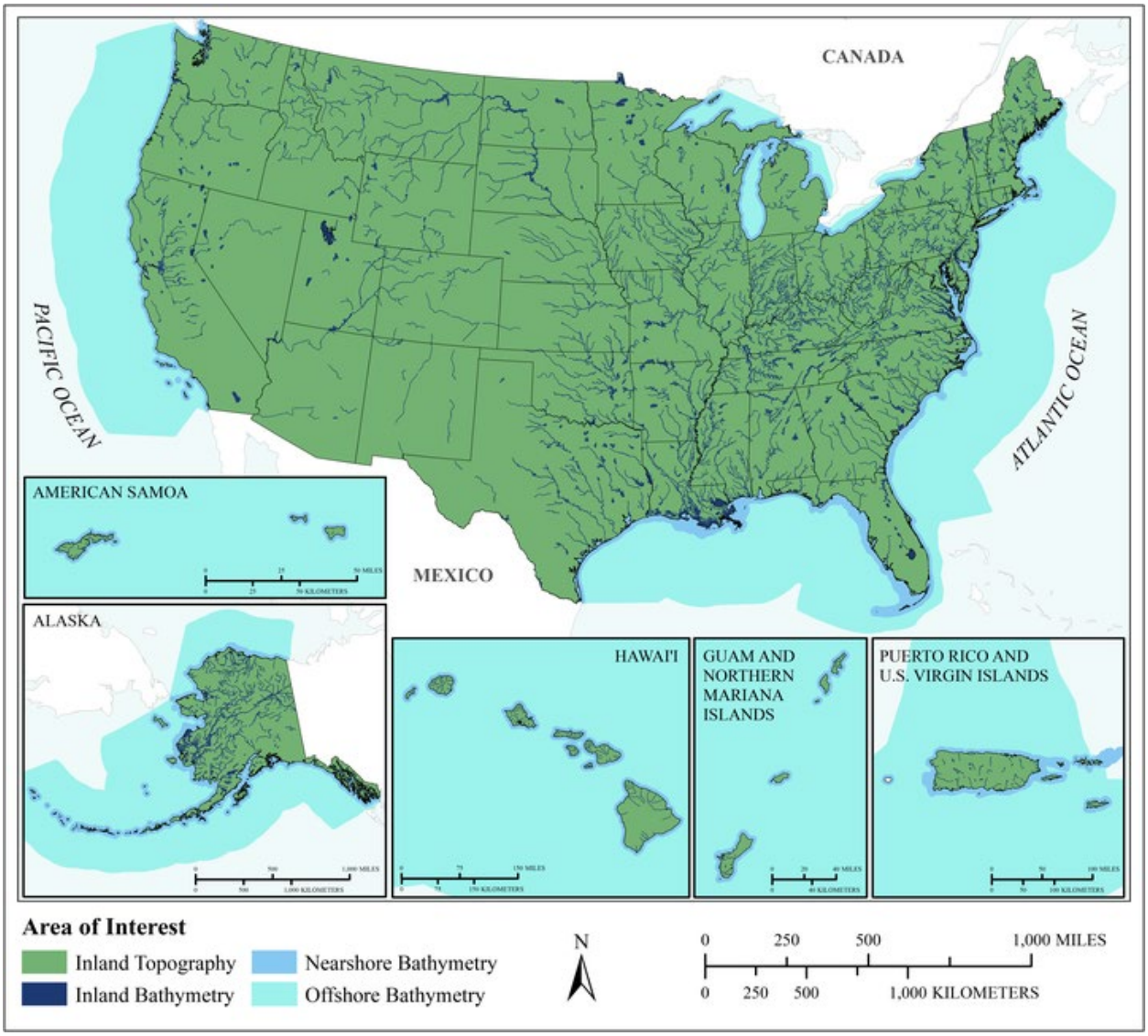
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Moderate	Moderate	Moderate
Improved customer experience	Moderate	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	I don't know	I don't know
Environmental	Major	Major	I don't know	I don't know
Public safety, including life and property	Major	Moderate	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	None			None			Moderate	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Minor	Unable to provide		None			I don't know	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Moderate			I don't know			I don't know		
Environmental	Moderate			Major			Moderate			I don't know		
Public safety, including life and property	Major			Major			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes		Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60663
Organization Type	Federal Agencies and Commissions
Organization Name	DOC: National Oceanic and Atmospheric Administration (NOAA)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	I don't know
Rivers and Streams	
Less than 10 ft	I don't know
10 - 50 ft	I don't know
51 - 100 ft	I don't know
101 - 500 ft	I don't know
501 - 2,500 ft	I don't know
Greater than 2,500 ft	I don't know
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	I don't know
½ - 1 acre	I don't know
1.1 – 2 acres	I don't know
2.1 – 5 acres	I don't know
5.1 – 10 acres	I don't know
Greater than 10 acres	I don't know

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	I don't know	QL4B	Special Order
Update Frequency	6-10 years	I don't know	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	I don't know	Up to 10 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	I don't know	Up to 50 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					I don't know	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	I don't know	Highly desirable	Highly desirable	I don't know	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	I don't know	Highly desirable	Highly desirable	I don't know	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	I don't know	Highly desirable	Highly desirable	I don't know	Highly desirable
DEM for entire AOI needs to be seamless	Required	I don't know	Required	Highly desirable	I don't know	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	I don't know	Highly desirable	Required
DTM	Required	I don't know	Required	Required
DEM	Required	I don't know	Required	Required
Raw point cloud data	Highly desirable	I don't know	Highly desirable	Nice to have
Classified point cloud	Highly desirable	I don't know	Highly desirable	
Edited/cube XYZ		I don't know	Nice to have	Nice to have
Full waveform	Nice to have	I don't know	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		I don't know	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Nice to have	I don't know		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Nice to have	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Not required
Intensity imagery/sidescan imagery	Not required	I don't know	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	I don't know	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	I don't know	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Required	Highly desirable
Geologic and seismic data	Not required	I don't know	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Required	Required
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Nice to have	I don't know	Highly desirable	
Land use/land cover	Highly desirable	I don't know	Required	Highly desirable
Wetlands	Nice to have	I don't know	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Nice to have	I don't know	Required	
Bridges/culverts	Nice to have	I don't know		
Landmark features	Nice to have	I don't know	Not required	
Cultural resources	Not required	I don't know	Highly desirable	
Coastal and riverine structures	Nice to have	I don't know	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know	Major	Moderate
Cost savings/cost reduction	Major	I don't know	Moderate	Moderate
Cost avoidance	Minor	I don't know	Moderate	Moderate
Increased revenues	None	I don't know	Major	Major
Mission-driven performance improvements	Moderate	I don't know	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know	Major	Major

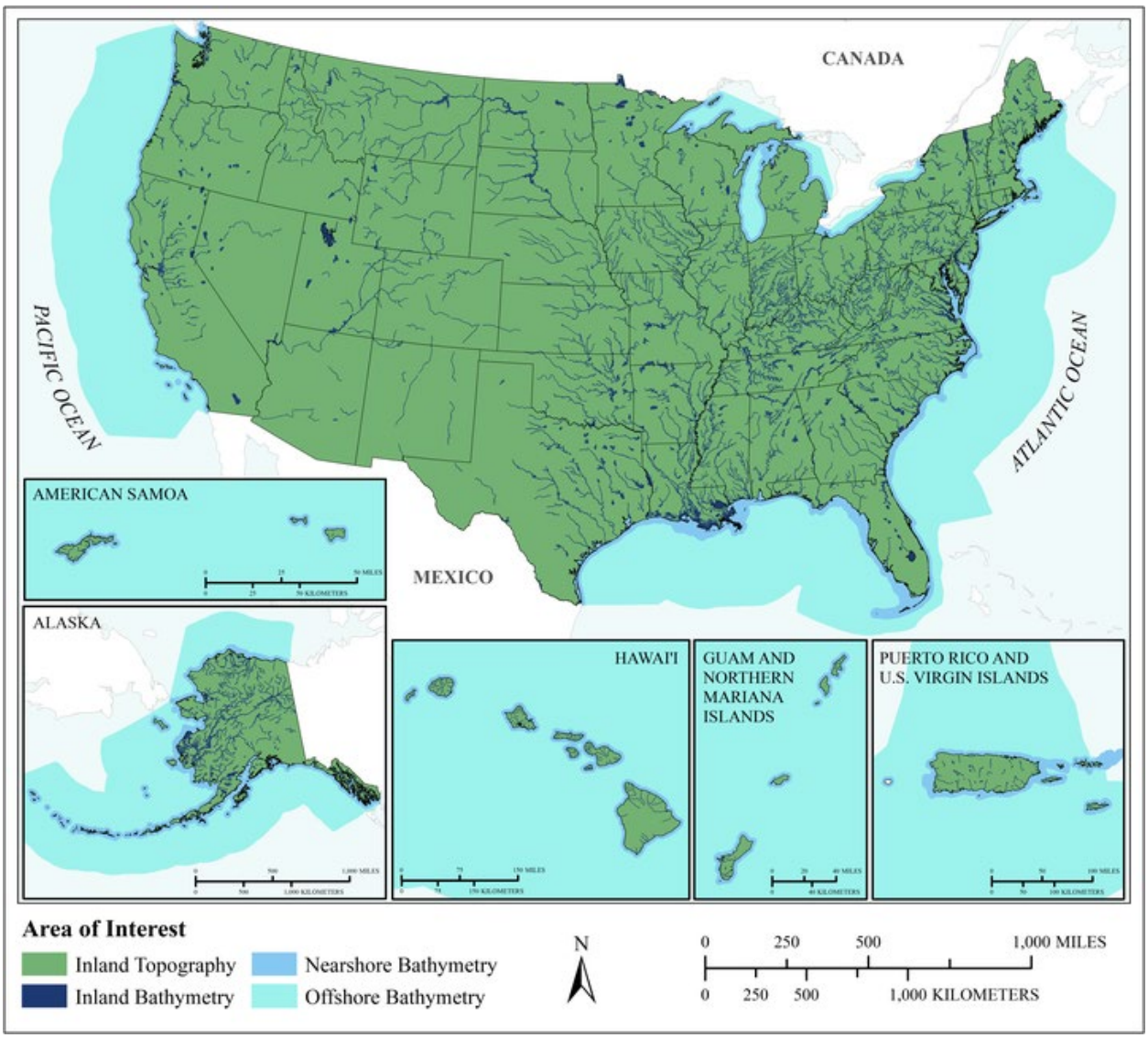
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	None	I don't know	Major	Major
Improved customer experience	None	I don't know	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know	Major	Moderate
Environmental	Major	I don't know	Major	Major
Public safety, including life and property	Minor	I don't know	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Minor	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			I don't know			Minor			Minor		
Environmental	Moderate			I don't know			Moderate			Moderate		
Public safety, including life and property	None			I don't know			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours	Yes		Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes		Yes	Yes
Curvature maps			Yes	Yes
Cross sections			Yes	Yes
Height-Above-Ground maps	Yes		Yes	Yes
Viewshed maps	Yes		Yes	Yes
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes		Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Oil and Gas Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Oil and gas exploration and production. Pipeline and route selection. Facility siting to mitigate geologic hazards. Construction planning. Environmental impact assessment and mitigation. Regulatory compliance.
MCA Title	Oil and Gas Resources
MCA ID	60664
Organization Type	Federal Agencies and Commissions
Organization Name	DOC: National Oceanic and Atmospheric Administration (NOAA)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	Order 1a
Update Frequency	Annually	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Highly desirable	Highly desirable	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Required	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Required	Highly desirable
DEM	Required	Highly desirable	Required	Highly desirable
Raw point cloud data	Highly desirable	Nice to have	Required	Nice to have
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Nice to have	Nice to have
Full waveform	Nice to have	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Nice to have	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Underwater videography			Nice to have	Required
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Required
Geologic and seismic data	Highly desirable	Nice to have	Highly desirable	Required
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Required
Routes			Highly desirable	Required
Offshore cadastral			Highly desirable	Required
Lease areas			Highly desirable	Required
Fixed obstructions			Highly desirable	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Nice to have	Nice to have	Required	
Land use/land cover	Nice to have	Nice to have	Highly desirable	Highly desirable
Wetlands	Highly desirable	Nice to have	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Nice to have	Nice to have	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Nice to have	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	None	Moderate	Major
Cost savings/cost reduction	Minor	None	Moderate	Moderate
Cost avoidance	Minor	None	Moderate	Minor
Increased revenues	None	None	None	Minor
Mission-driven performance improvements	Minor	Minor	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Moderate	Major

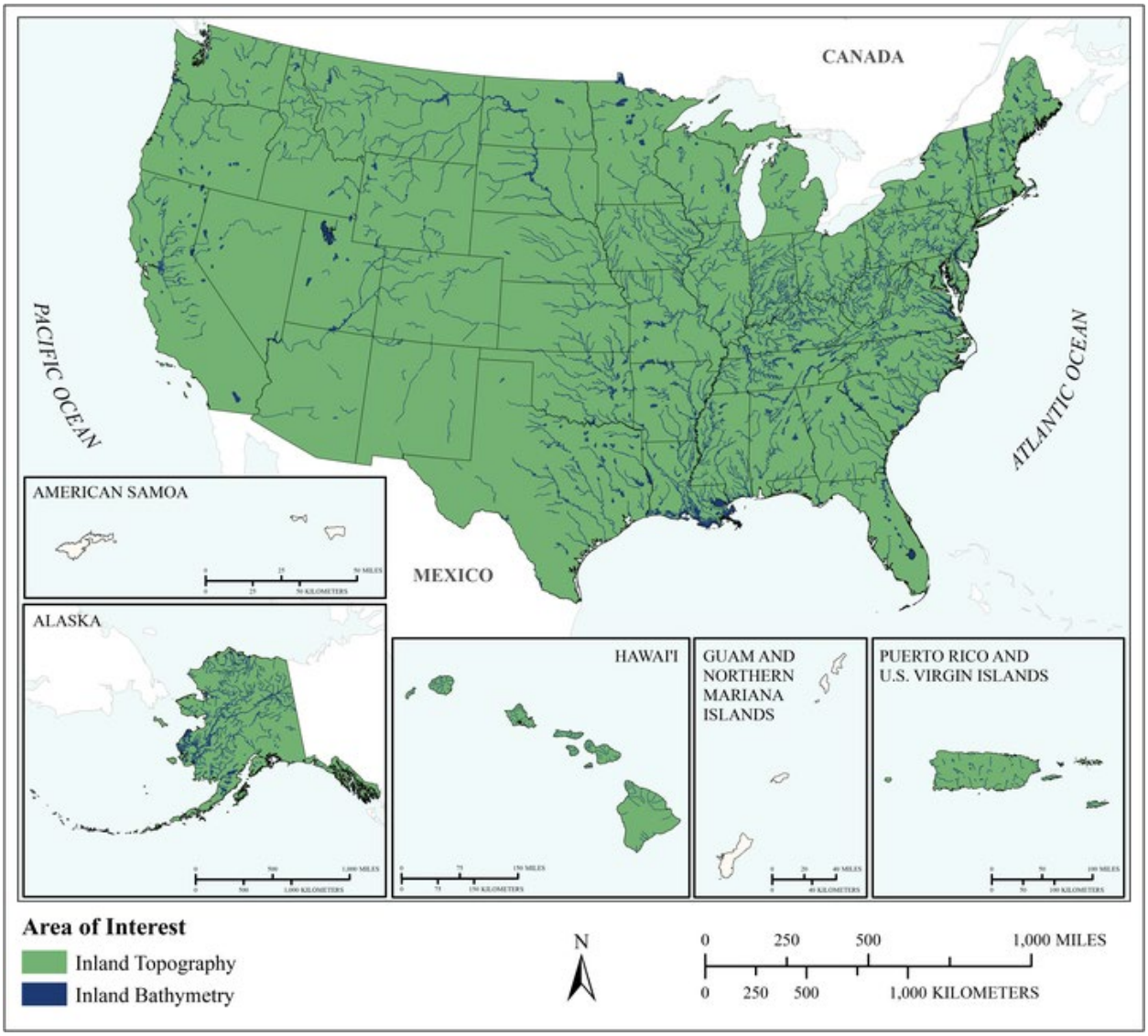
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	None	None	Major
Improved customer experience	Minor	None	None	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	None	Moderate	Major
Environmental	Minor	Minor	Major	Major
Public safety, including life and property	Minor	Minor	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		None			Major	Unable to provide		None		
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Increased revenues	None			None			I don't know	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Minor	Unable to provide		None			I don't know	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			None			Major			Major		
Environmental	Major			Minor			Major			Major		
Public safety, including life and property	Major			Minor			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps			Yes	Yes
Curvature maps			Yes	Yes
Cross sections	Yes		Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: National Water Resource Analysis and Forecasting



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Nationwide, inland areas	Nationwide, inland areas		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	NWS provides weather, water, and climate data, forecasts and warnings for the protection of life and property and enhancement of the national economy. National water resource analysis and forecasting for high, low, and normal flows/levels, from small streams to large rivers, and including the coastal tidal boundary. Atmospheric forecasts do not require high resolution elevation data, but factors into models, water models are controlled by elevation for movement of water, H&H model input, specific flood forecasts at gage stations, national water model expanding to 2.7 million locations, highly dependent on hi res inland topo and inland bathy, into coastal zone but freshwater only.
MCA Title	National Water Resource Analysis and Forecasting
MCA ID	21517
Organization Type	Federal Agencies and Commissions
Organization Name	DOC: National Oceanic and Atmospheric Administration (NOAA)
Sub-Agency or Division	NWS Office of Water Prediction
Organization Mission	NOAA's Mission: Science, Service and Stewardship 1. To understand and predict changes in climate, weather, oceans and coasts; 2. To share that knowledge and information with others; and 3. To conserve and manage coastal and marine ecosystems and resources.
Program Name	Integrated Water Prediction
Total Annual Program Budget	$30,000,000
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Interested in flow of water across inland topography and within inland bathymetry. For micro-scale water modeling, important to know about features, man-made and natural, obstructing flow of water.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required
Other	Highly desirable
Other description	For large reservoirs would like storage-elevation info

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	Cross sections and/or transects meet needs		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Because of focus on overland and channel water flow, higher accuracy needed in very flat land areas and very level channel reaches. QL2 in relief areas, QL0 in flatter areas.			
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter		
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement		10 cm accuracy, currently, enhanced model domain expects cross section info every 2 km or less for rivers/stream. For water bodies, storage-elevation information is needed, by whatever data density/approach is used.		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Not required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required		
DTM	Highly desirable	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Nice to have	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Not required		
Land use/land cover	Highly desirable	Required		
Wetlands	Nice to have	Highly desirable		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	National Elevation Dataset (NED) from USGS	Mostly using approximations using regional regression or other studies, with select but few locations having detailed cross-section survey data or possibly some LIDAR. Separate, limited studies have collected data from USGS offices.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	Includes direct consult with USGS			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Minor	None		
Cost avoidance	Major	Major		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor		
Environmental	Minor	None		
Public safety, including life and property	Moderate	Major		

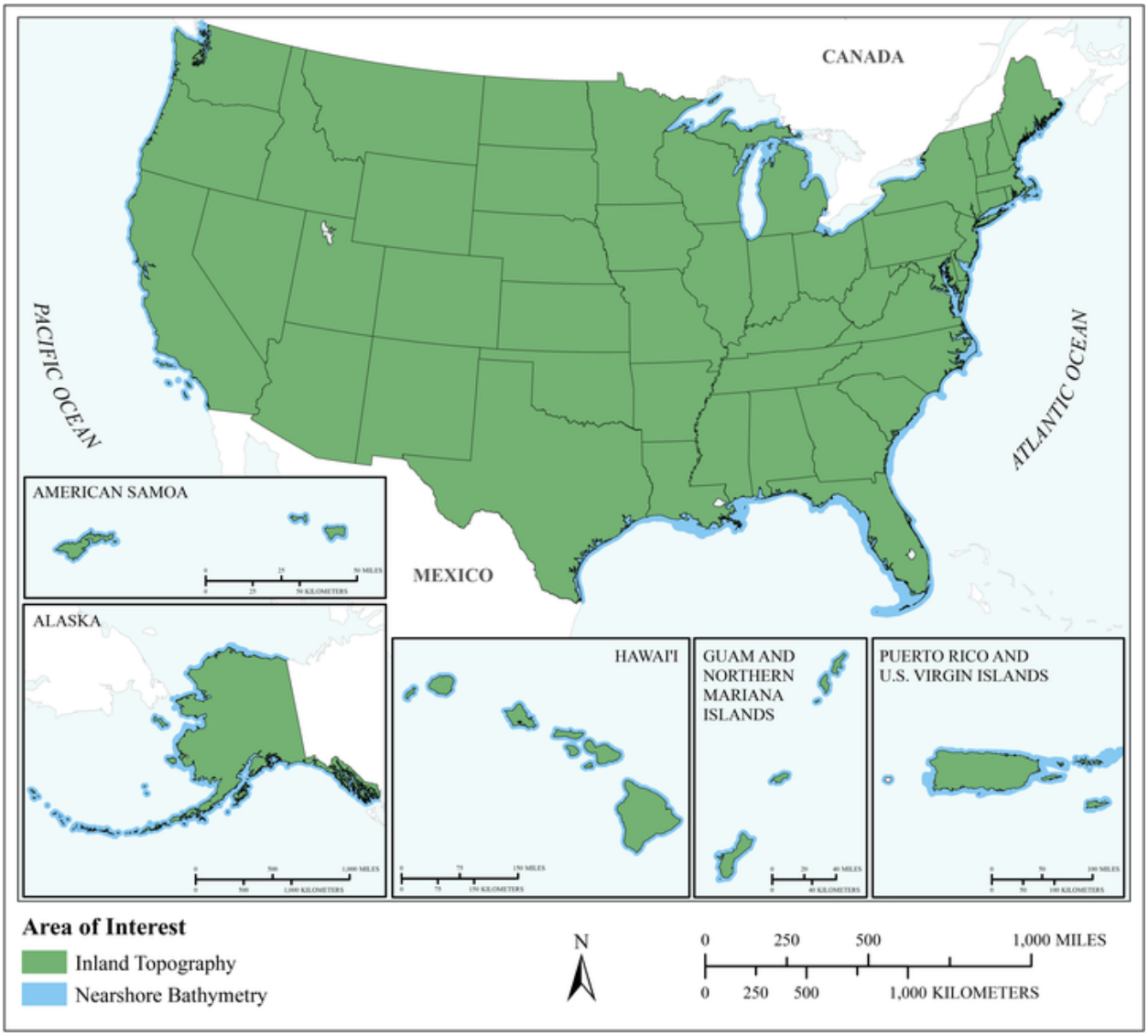
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Time savings description	Improvements to national, regional, and local hydro modeling done for NWS. Improvements to amount of data manipulation done by NWS or partners for future mission needs. Minor impact on modest amount of river point surveys done by NWS.			The small number of NWS site visits could be minimized. Avoidance of QA/QC. Improved modeling capabilities expected. Avoidance of new work to do this.								
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction description	Can leverage this instead of planning for new acquisition costs.			Indispensable data for mission.								
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Cost avoidance description	Considerable savings on hydrotreatment. Assume improved data leads to improved model accuracy and to reduced losses.			Improved water forecast capabilities. Hydrotreatment.								
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description	Improvements to integrated water prediction.			Improved decision support services.								
Future annual operational benefits added during validation		Annual dollars saved/ realized	$443,043,267		Annual dollars saved/ realized	$28,388,185						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Value added to products or services description	Expanded suite of products, services and apps expected. Expanded areas covered for flood warnings, and improved water resources products and services.			Improved info accuracy expected. Expanded area covered.								
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness description	Improved accuracy and volume of forecasts for flood and other water hazards. Improved incident response info available within NWS. Significant potential for expanded flood inundation services. Improved ability to provide decision support info and tools.			Quicker decision support capabilities. Expect improved forecast capabilities for water resources. Expanded inundation maps expected. Assume partner use of info has potential.								
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Improved customer experience description	Expect enhanced accuracy. Data availability is a separate issue. Expect improved data sets for customers.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$36,696,126		Annual dollars saved/ realized	$15,806,519						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None								
Environmental	None			None								
Public safety, including life and property	Major			Major								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property description	NWS mission for life and property is supported better	Overall improved support for NWS life and property mission		
Other	Inland topo is foundational data set for expansion of NWS water resources goals	Bathy is foundational dataset expected for next generation of water resources products and services		
Other benefits	Major	Major		
Other description	Inland topo is foundational data set for expansion of NWS water resources goals	Bathy is foundational dataset expected for next generation of water resources products and services		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	Federal Review AOIs		Federal Review AOIs	
Sub Area Requirements	All study land areas		All nearshore study waters	

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60665
Organization Type	Federal Agencies and Commissions
Organization Name	DOC: National Oceanic and Atmospheric Administration (NOAA)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0		QL1B	
Update Frequency	4-5 years		2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm		Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm		Up to 30 cm	
How far onshore needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have		Required			Required
Entire AOI under same environmental conditions	Highly desirable		Required			Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Required			Required
DEM for entire AOI needs to be seamless	Required		Required			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Required		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Highly desirable		Nice to have	
Classified point cloud	Required		Highly desirable	
Edited/cube XYZ			Not required	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Not required	
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable		Highly desirable	
Ground control/ground truthing	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required		Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have		Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Required	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required		Required	
Land use/land cover	Required		Highly desirable	
Wetlands	Required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required		Required	
Bridges/culverts	Required			
Landmark features	Highly desirable		Nice to have	
Cultural resources	Nice to have		Nice to have	
Coastal and riverine structures	Required		Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Major	
Cost savings/cost reduction	Major		Major	
Cost avoidance	Major		Major	
Increased revenues	None		Minor	
Mission-driven performance improvements	Major		Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Major	

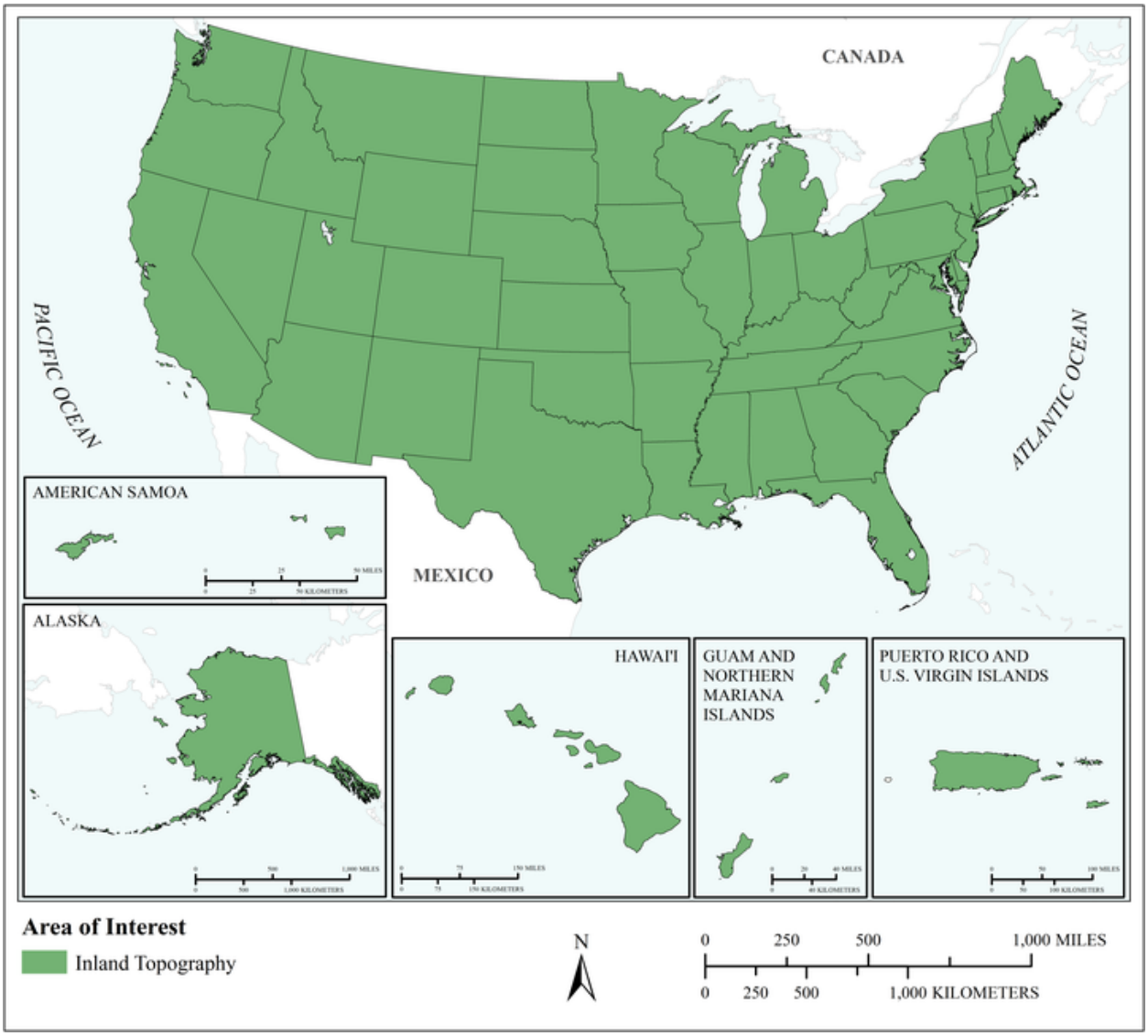
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate		Moderate	
Improved customer experience	Moderate		Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major		Moderate	
Environmental	Major		Major	
Public safety, including life and property	Major		Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide					Major	Unable to provide				
Cost avoidance	Major	Unable to provide					Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide					Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$189,312,424									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide					Major	Unable to provide				
Improved customer experience	Major	Unable to provide					Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Major					
Environmental	Moderate						Major					
Public safety, including life and property	Moderate						Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	
Contours	Yes		Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps	Yes		Yes	
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Land Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federal Review AOIs			
Sub Area Requirements	All study land areas			

MCA Description	Response
Mission Critical Activity	Road and railroad route selection and maintenance. Slope analysis for autonomous cars. GPS navigation visualization.
MCA Title	Land Navigation and Safety
MCA ID	60666
Organization Type	Federal Agencies and Commissions
Organization Name	DOC: National Oceanic and Atmospheric Administration (NOAA)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 19 - Land Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Day-to-day is not needed
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Moderate			
Increased revenues	None			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

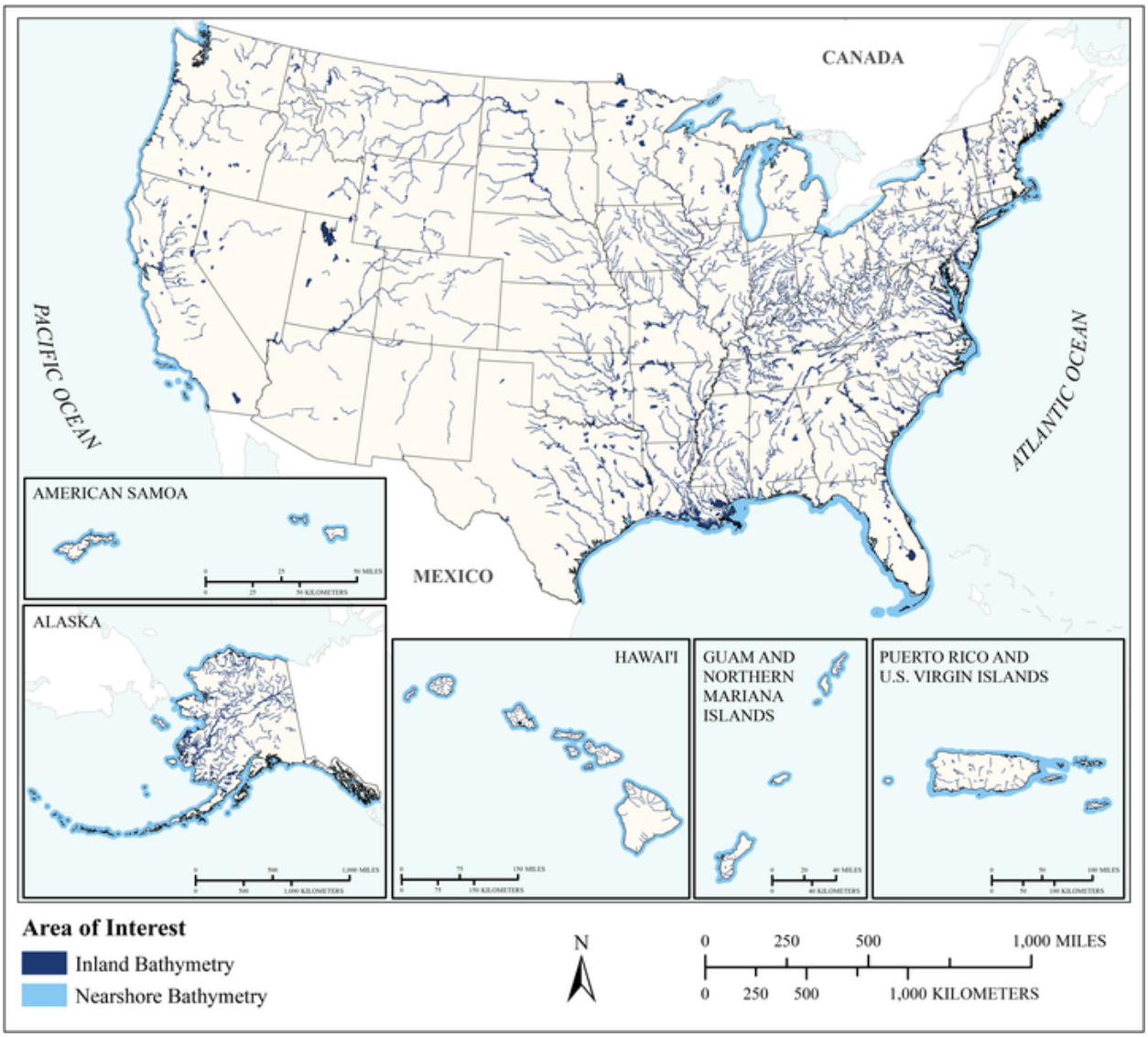
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades				
Slope maps	Yes			
Aspect maps				
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	1
Update frequency	3

MCA Title: Tides and Currents Supporting Safe Navigation and Coastal Engineering



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required	Required	
Geographic Area Requirements		Nationwide, inland areas	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	The Center for Operational Oceanographic Products and Services (CO-OPS) and its predecessors have gathered oceanographic data along our nation's coasts for over 200 years to protect life, property, and the environment. Serving both the public and other government agencies, CO-OPS is the authoritative source for accurate, reliable, and timely water-level and current measurements that support safe and efficient maritime commerce, sound coastal management, and recreation. The combined efforts, knowledge, and experience of CO-OPS's technicians, scientists, and engineers working to carry out a central mission has led to the development of a reliable center of expertise for coastal physical oceanography.
MCA Title	Tides and Currents Supporting Safe Navigation and Coastal Engineering
MCA ID	22146
Organization Type	Federal Agencies and Commissions
Organization Name	DOC: National Oceanic and Atmospheric Administration (NOAA)
Sub-Agency or Division	National Ocean Service, Center for Operational Oceanographic Products and Services (CO-OPS)
Organization Mission	NOAA's Mission: Science, Service and Stewardship 1. To understand and predict changes in climate, weather, oceans and coasts; 2. To share that knowledge and information with others; and 3. To conserve and manage coastal and marine ecosystems and resources
Program Name	Center for Operational Oceanographic Products and Services (CO-OPS)
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	BU 30 - Maritime and Land Boundary Management

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Tidal bench marks

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		Cross sections and/or transects meet needs	Cross sections and/or transects meet needs	
Update Frequency		2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Less than 50 cm	Less than 50 cm	
Acceptable Vertical Error		Less than 10 cm	Less than 10 cm	
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed			To MLLW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs		Yes	Yes	
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Not required	Not required			Required
Entire AOI under same environmental conditions		Not required	Not required			Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Not required	Not required			Not required
DEM for entire AOI needs to be seamless		Not required	Not required			Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Not required	Not required	
DTM		Not required	Not required	
DEM		Required	Not required	
Raw point cloud data		Not required	Not required	
Classified point cloud		Not required	Not required	
Edited/cube XYZ		Not required	Not required	
Full waveform		Not required	Not required	
Bathymetric Attributed Grid (BAG)		Required	Not required	
Breaklines required for standard hydro-flattening		Not required		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Required	
Intensity imagery/sidescan imagery		Not required	Not required	
Ground control/ground truthing		Not required	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Required	
Aerial and/or satellite imagery		Required	Required	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data		Not required	Not required	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Required	
Sea ice conditions			Highly desirable	
Habitat distribution and classification			Not required	
Boundaries			Highly desirable	
Routes			Required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates		Required	Highly desirable	
Land use/land cover		Not required	Not required	
Wetlands		Required	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	
Inland surface water features		Not required	Highly desirable	
Bridges/culverts		Not required		
Landmark features		Not required	Not required	
Cultural resources		Not required	Not required	
Coastal and riverine structures		Required	Nice to have	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used		Bathy integrated into OCS OFS Models	Bathy integrated into OCS OFS Models	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI			Yes	
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Major	Moderate	
Cost savings/cost reduction		Moderate	Moderate	
Cost avoidance		Minor	Minor	
Increased revenues		None	None	
Mission-driven performance improvements		None	None	

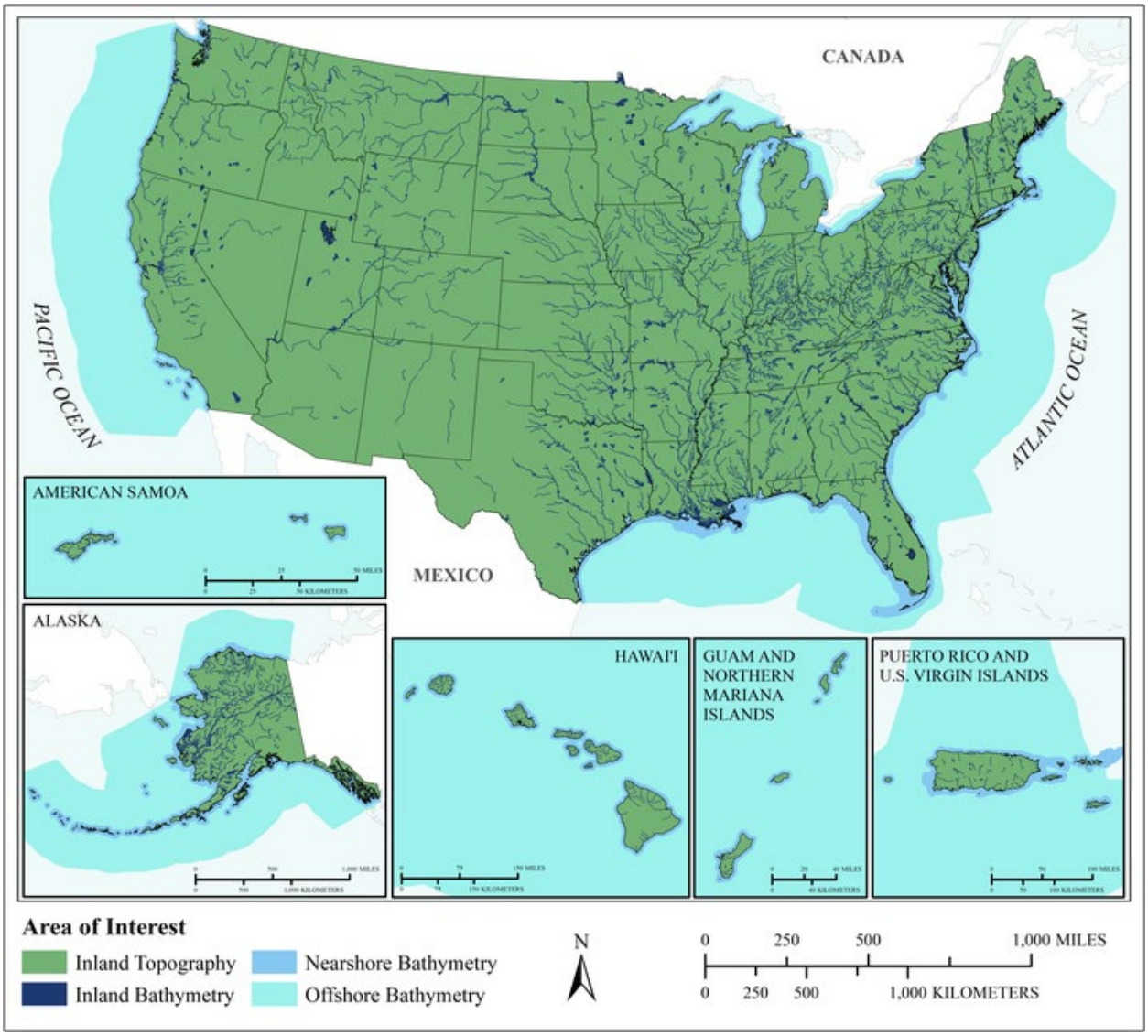
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Major	Moderate	
Improved response or timeliness		Major	Moderate	
Improved customer experience		Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		I don't know	I don't know	
Environmental		I don't know	I don't know	
Public safety, including life and property		Major	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction				Major	Unable to provide		I don't know	Unable to provide				
Cost avoidance				Major	Unable to provide		Major	Unable to provide				
Increased revenues				Major	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements				Moderate	Unable to provide		Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Major	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness				Major	Unable to provide		I don't know	Unable to provide				
Improved customer experience				Major	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				I don't know			I don't know					
Environmental				I don't know			I don't know					
Public safety, including life and property				I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

MCA Title: Navigational Safety and Marine Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	States and/or Territories	States and/or Territories	All study waters	All study waters
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		

MCA Description	Response
Mission Critical Activity	Navigational safety and marine mapping. This includes the following: Providing data and services that enable mariners to navigate U.S. waterways safely and efficiently. Facilitating safe navigation for commercial, recreational, government other vessels through continuously updated nautical charts and related products. Providing marine navigation services (forecasts, real-time oceanographic conditions and navigationally-critical information such as underkeel and under-bridge clearance). Identification of hazards to navigation. Bathymetric measurements of near-shore submerged coastal topography. Sediment management at coastal navigation projects. Determining the official shoreline and nearshore bathymetry of the U.S. that primarily supports NOAA Nautical Charts but also numerous other applications including inundation mapping and modeling, nearshore and benthic habitat mapping, the Marine Cadastre, and other coastal resilience and intelligence applications. Response and recovery efforts of U.S. coastal impacts from hurricanes and other natural and manmade events using pre- and post-event georeferenced imagery. Planning, acquiring, integrating, and disseminating ocean and coastal geospatial data.
MCA Title	Navigational Safety and Marine Mapping
MCA ID	22525
Organization Type	Federal Agencies and Commissions
Organization Name	DOC: National Oceanic and Atmospheric Administration (NOAA)
Sub-Agency or Division	Office of Coast Survey
Organization Mission	NOAA's Mission: Science, Service and Stewardship 1. To understand and predict changes in climate, weather, oceans and coasts; 2. To share that knowledge and information with others; and 3. To conserve and manage coastal and marine ecosystems and resources
Program Name	Nautical charts
Total Annual Program Budget	$90,000,000
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	BU 30 - Maritime and Land Boundary Management
Tertiary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)

General Geographic Area and Size	
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Pilings, piers, rocks, trees, antennas, etc. A 1x1 meter cube object is the generally accepted norm for the size feature we are interested in. Depth and resolution/scale dependent. From 3m depth contour out to 20m depth, 1x1x1 meter object on the sea floor. Anything that can sink a ship - wrecks and hazards to marine navigation.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Other	Highly desirable
Other description	Any areas we chart
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	Order 1a
Update Frequency	Annually	Annually	Annually	Annually
Event type(s)				
Quality Level and/or update frequency variability across AOI	Depends on many factors: port usage, technology used in previous surveys, etc.			
Acceptable Horizontal Error	Less than 20 cm	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	Less than 50 cm
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Less than 10 cm	Less than 1 meter
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	WGS84 + VDatum

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Required	Highly desirable	Highly desirable	Required
Entire AOI under same environmental conditions	Nice to have	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Highly desirable	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Highly desirable	Required	
Edited/cube XYZ		Highly desirable	Required	Required
Full waveform	Not required	Highly desirable	Highly desirable	Highly desirable
Bathymetric Attributed Grid (BAG)		Required	Required	Required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Required	Required
Intensity imagery/sidescan imagery	Not required	Highly desirable	Required	Required
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Required	Nice to have
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Required	Required
Geologic and seismic data	Nice to have	Nice to have	Not required	Not required
Water column properties - Physical			Required	Required
Water column properties - Chemical			Required	Required
Water column properties - Biological			Required	Required
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Required	Required
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Required	Required
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Nice to have	Highly desirable	Nice to have	Highly desirable
Wetlands	Nice to have	Highly desirable	Required	Highly desirable
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Required	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS, NOAA sources	We are collecting IHO order 1 and 2 data for these areas	Lidar, acoustic	Acoustic
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				

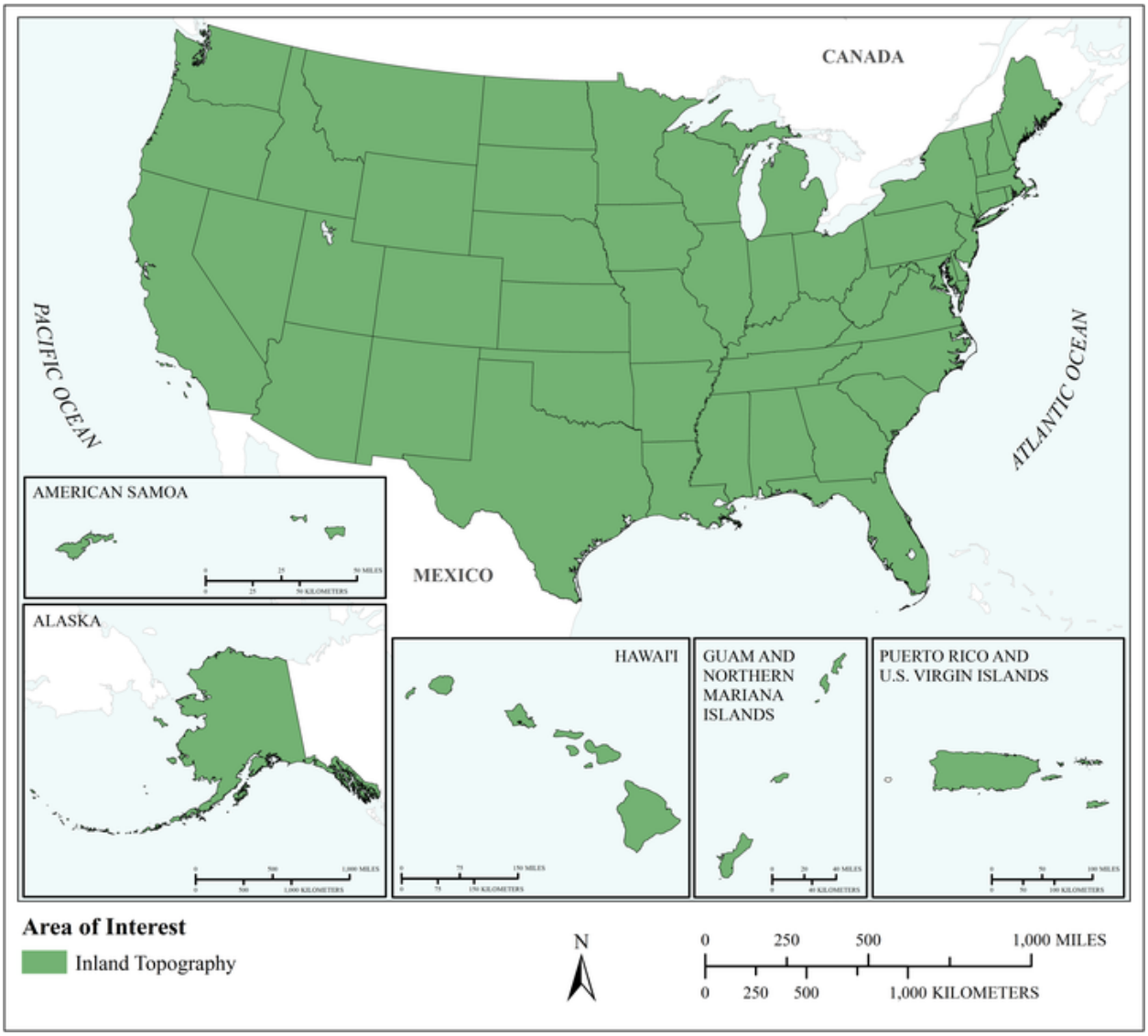
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other		Yes		
Other description		We collect data that is in NCEI. We also use data from other reliable sources such as professional surveyors.		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major	Major	Moderate
Cost savings/cost reduction	Major	Major	Major	Moderate
Cost avoidance	Major	Major	Major	Moderate
Increased revenues	Moderate	Moderate	Moderate	Moderate
Mission-driven performance improvements	Major	Major	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Moderate
Improved response or timeliness	Major	Major	Major	Moderate
Improved customer experience	Major	Major	Major	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Major	Major	Minor
Environmental	Moderate	Major	Major	Minor
Public safety, including life and property	Major	Major	Major	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Time savings description				If national, seamless topo/ bathy were available, this would radically restructure charting.								
Cost savings/cost reduction	Minor	Unable to provide		Major	Unable to provide		Moderate	Annual dollars saved/realized	$10,000,000	Major	Unable to provide	
Cost avoidance	Minor	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Major	Unable to provide		Major	Unable to provide		Moderate	Annual dollars saved/realized	$20,000,000	Moderate	Unable to provide	
Mission-driven performance improvements	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other operational benefits				Moderate	Unable to provide		Moderate	Annual dollars saved/realized	$10,000,000	Major	Annual dollars saved/realized	$20,000,000
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Other customer service benefits										Major	Unable to provide	
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			Minor			I don't know			I don't know		
Environmental	Major			Minor			Minor			I don't know		
Public safety, including life and property	Major			Minor			Minor			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes	Yes	Yes	Yes
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Aviation Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federal Review AOIs			
Sub Area Requirements	All study land areas			

MCA Description	Response
Mission Critical Activity	Determination of in-flight hazards and path obstructions. Aeronautical charting. Runway construction and repair.
MCA Title	Aviation Navigation and Safety
MCA ID	60667
Organization Type	Federal Agencies and Commissions
Organization Name	DOC: National Oceanic and Atmospheric Administration (NOAA)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 21 - Aviation Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Worldwide
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	Annually			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Highly desirable			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Required			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Required			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

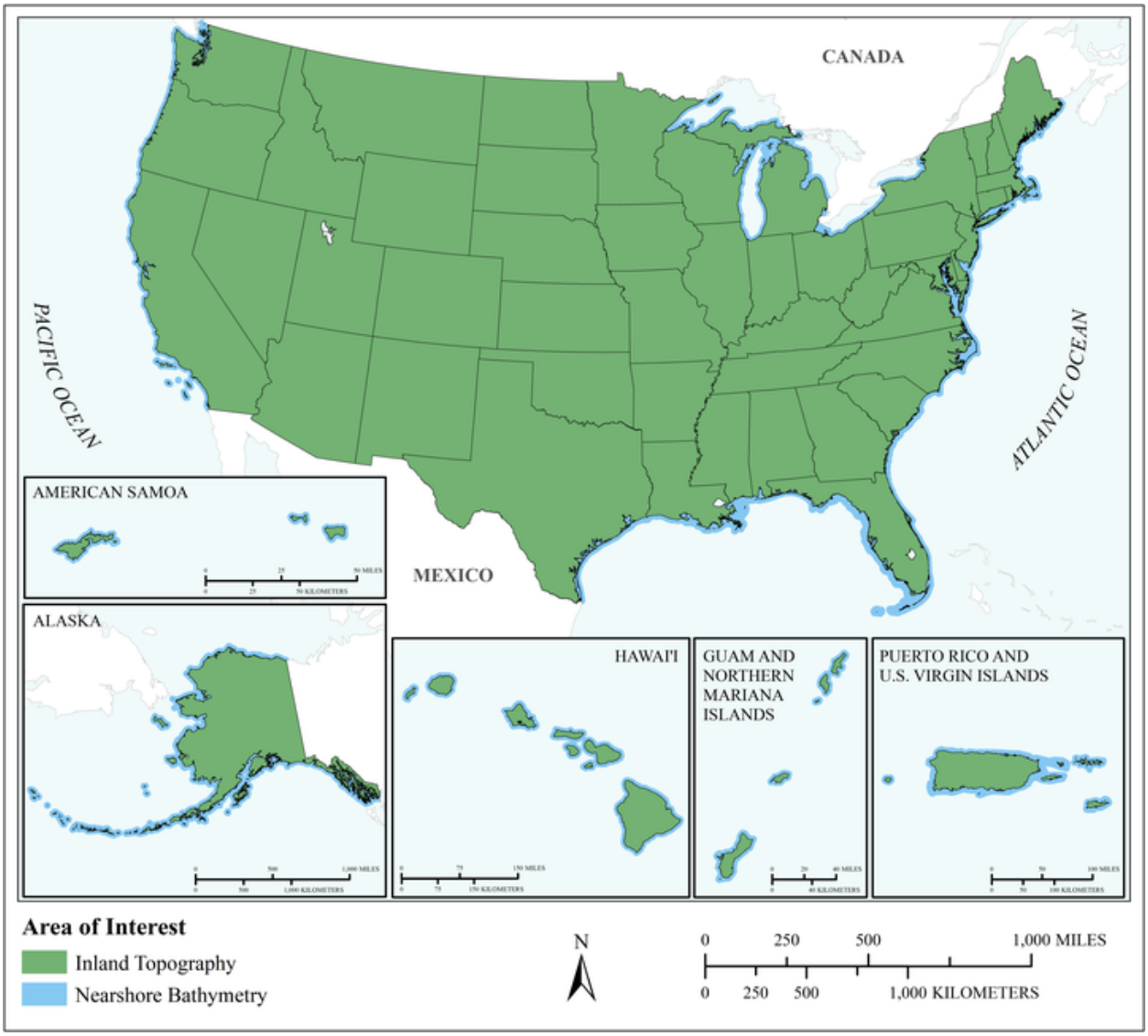
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$15,579,236									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$9,070,111									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Moderate											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps	Yes			
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: The Geodesy Program at National Geodetic Survey (NGS)



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	States and/or Territories		States and/or Territories	
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	

MCA Description	Response
Mission Critical Activity	The Geodesy Program at NGS is a mission critical area that focuses on positioning and measurement activities across the entire country. When another government agency or private entity seeks to do any of the below listed Business Uses, they almost always have a positional accuracy requirement. About 95% of all activities require to know when and WHERE something was located to compare to a different time and (possibly) place. Elements of the Geodesy program ensure that the National Spatial Reference System (NSRS) is maintained and can be accessed using standards that NGS provides to ensure that all users of the NSRS can accomplish all the below Business Uses. Geodesy underpins ALL activities listed below. It provides the datums for measuring coordinates and the accuracy of derived positions. NGS defines the datums from which observations are made. NGS relies on Digital Elevation Models (DEMs) and Digital Bathymetric Models (DBMs) to evaluate the mass effects, and ultimately provides the fiducial control for determining heights and coordinates. There is a need for particularly physical, geodesy to understand the terrain as a tool for describing mass variations. Likewise offshore, the difference in density between water and sediment/rock also contributes to the gravity signal and, hence, determination of physical heights. DEMs are less required by geometric positioning (i.e., from GPS). Nevertheless, the change in geometric coordinates of the surface describe the deformation models required to provide precise positioning. It should be noted that the more accurate the models provided, the more refined the geodetic control will be. However, there is a point of diminishing returns. The overall goal of the coordinates derived from geodetic control is at about the cm-level. However, the input values do not necessarily need to be of that caliber of precision. A meter to dm- level uncertainty in the terrain model may be sufficient to resolve the reference frame to the cm-level. I listed below primary BU for infrastructure (generally geometric geodesy), with determination of heights above a flood plain as secondary (physical geodesy) and ties to MSL as tertiary (since the vertical datum is nominally considered to be MSL.
MCA Title	The Geodesy Program at National Geodetic Survey (NGS)
MCA ID	1321
Organization Type	Federal Agencies and Commissions
Organization Name	DOC: National Oceanic and Atmospheric Administration (NOAA)
Sub-Agency or Division	National Ocean Service (NOS) National Geodetic Survey
Organization Mission	NOAA's Mission: Science, Service and Stewardship 1. To understand and predict changes in climate, weather, oceans and coasts; 2. To share that knowledge and information with others; and 3. To conserve and manage coastal and marine ecosystems and resources
Program Name	Maintain and provide access to the National Spatial Reference System
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required

What Needs to be Measured in 3D	Response
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	North America, Caribbean, and Pacific
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Geodetic Control is about providing precision and accuracy to positioning. Hence, any feature should be resolved at the highest standard - currently in cm-range. Ties are made at the shoreline, so inland and up to the beaches. Offshore signals are of less concern but cm- to dm-level accuracy is helpful though m-level bathymetry would likely be sufficient.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0		QL3B	
Update Frequency	Event driven only – Data need to coincide with a specific event.		Event driven only – Data need to coincide with a specific event.	
Event type(s)	Earthquakes, volcanic eruptions, etc.		Event driven only	
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need		The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Less than 5 cm		Up to 40 cm	
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required		Not required			Not required
Entire AOI under same environmental conditions	Highly desirable		Nice to have			Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Not required			Not required
DEM for entire AOI needs to be seamless	Required		Required			Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required		Not required	
DTM	Required		Required	
DEM	Highly desirable		Required	
Raw point cloud data	Not required		Not required	
Classified point cloud	Not required		Not required	
Edited/cube XYZ			Not required	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Not required	
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Not required		Not required	
Ground control/ground truthing	Not required		Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Not required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Highly desirable		Required	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Highly desirable		Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Required		Highly desirable	
Land use/land cover	Not required		Not required	
Wetlands	Nice to have		Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	
Inland surface water features	Nice to have		Highly desirable	
Bridges/culverts	Not required			
Landmark features	Not required		Not required	
Cultural resources	Not required		Not required	
Coastal and riverine structures	Not required		Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	An amalgamation of US, Canadian, and international data sets. GTOPO30, SRTM, etc. This produces a three arcsecond model for residual terrain modeling. The vertical and horizontal uncertainties are such that this impacts the residual terrain models used to develop geopotential (geoid) models. Use of these geoid models with GNSS would be validated by comparisons with DEM's at the highest resolution possible. We are also investigating possible use of TANDEM-X in combination with NASA's LVI data planned for collection on ISS.		None currently being used. We ignore this and treat the ocean as same density as land. Improved near-shore bathymetry will better resolve physical heights at shoreline.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Digital Coast				
NCEI			Yes	
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes		Yes	
Other description	Above data sets are available online.		The NGS Remote Sensing Division currently collects Topo/Bathy lidar as part of its mission (separate MCA).	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None		None	
Cost savings/cost reduction	Moderate		None	
Cost avoidance	Major		None	
Increased revenues	None		None	
Mission-driven performance improvements	Major		None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		None	
Improved response or timeliness	Major		None	
Improved customer experience	Minor		None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		None	
Environmental	Moderate		None	
Public safety, including life and property	Major		None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$6,030				Minor	Unable to provide				
Time savings description	We'll make better products. Harder to estimate impact on our customers. Melding above mentioned data sets. This is done once though. If new data comes forth, then this must be evaluated. A consistent DEM would ensure less likelihood of this being required in the future. Much of this work is automated. However, the accuracy of the data directly impacts user positional accuracy.											
Cost savings/cost reduction	Major	Unable to provide					Minor	Unable to provide				
Cost savings/cost reduction description	TANDEM-X can be very expensive data and may not be for further release (i.e., to our customers).											
Cost avoidance	Moderate	Unable to provide					Moderate	Unable to provide				
Cost avoidance description	ORR models movement of spills. A refined geoid model will calibrate the offshore ocean topography and better indicate local current flows (i.e., where's the oil slick going). Improved vertical control will refine flood plain mapping and SLOSH models.											
Increased revenues	Moderate	Unable to provide					Minor	Unable to provide				
Increased revenues description	CM-level positioning potentially enabling Real Tim positioning Networks (RTN) for UAS (FAA), automate cars (DOT), etc. Improvements to positioning of geodetic infrastructure as a part of the PORTS program would enable shipping to enter port with more cargo if there were greater certainty about position of ship with respect to the ocean bottom, bottom of bridge, etc.						PORTS program.					
Mission-driven performance improvements	Major	Annual percent improvement	100%				Moderate	Unable to provide				
Mission-driven performance improvements description	We enable other groups to make better informed decisions. Still do same mission - just less accurately. Currently 4-10 cm is vertical accuracy standard. This work would cut that in half.											
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Aim is for Canada and Mexico to use same data sets to enable better models across the borders and, ideally, into the Caribbean Nations. International Collaboration.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide					Moderate	Unable to provide				

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Value added to products or services description	As above. Positional uncertainties of the geodetic infrastructure add to the uncertainties of any products derived using the infrastructure (the geodetic errors pass through to the end products). This is more about enabling DOT and other groups to do their work better and more accurately.											
Improved response or timeliness	Major	Unable to provide					Moderate	Unable to provide				
Improved response or timeliness description	Primary customers are surveyors who perform cadastral work. Eventual tools will provide improved and more timely positioning products. Geodetic infrastructure is used to aid in post-disaster recovery by other groups. Again, geodetic control provides improvements to these products and more.											
Improved customer experience	Major	Unable to provide					Moderate	Unable to provide				
Improved customer experience description	New NSRS will improve positional accuracy for a variety of purposes and customers. New tools will be developed to capitalize on the data improvements and derived products. A consistent and sole sourced elevation model will make numerous applications more consistent.											
Other customer service benefits	Moderate	Unable to provide										
Other customer service benefits description	A convention is being developed that will require coordination of geodetic control, positioning and reference frames between all countries. The US would be in compliance, assuming then ideas envisioned here are put in place. Consistency with evolving international standards.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						None					
Education or outreach description	A larger group of customers would have greater understanding of the benefits and limitations of the improved data sets.											
Environmental	Moderate						None					
Environmental description	Improved positional accuracy will impact a number of areas that are affected by tracking the flow of contaminants.											
Public safety, including life and property	Moderate						I don't know					
Public safety, including life and property description	Positioning in flood plains and for tsunamis and inundation are improved. Again, improved geodetic infrastructure impacts other areas reliant upon the control for starting point.											
Other							Improved vertical control near shore					
Other benefits							Minor					
Other description							This would provide a better estimate of gravity effect of offshore masses. Geoid surface is typically taken as MSL. Masses above it must be removed. The difference between rock and se water must also be taken into account to reduce the effects of the terrain into a gravity field product.					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				
Other (please specify)	Yes		Yes	
Other description	Residual terrain models			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

National Park Service (NPS)

The NPS preserves unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

The U.S. Congress established Yellowstone as America's first national park in 1872. In the years that followed, environmentalists lobbied for wilderness preservation throughout the American West with the creation of several more national parks and monuments. President Woodrow Wilson established the NPS in 1916 to consolidate management of America's federal parklands under one agency. The NPS today manages 84 million acres across all U.S. states and territories, and has served as a model for countries around the world.

NPS relies heavily on data collection agencies for nearly all of the data used for management purposes. The 3DEP program is vital to NPS. Elevation data are used for coastal zone management, forest and ecosystem monitoring and modeling, cultural resources protection, and geologic mapping.

Remote sensing data, to include 3D elevation data, support all service-wide programs and their modeling activities – activities that analyze the plants, animals, and ecosystems that can indicate the overall biological health of parks. This includes modeling and mapping the dynamic changes of coastal, estuarine, and wetland systems; identification of potential hazards to infrastructure and impacts to cultural resources; mapping those cultural resources (e.g. using 3D models to find trails that cannot be seen from air photos); forest canopy modeling and monitoring; landslide and rockfall mapping, monitoring, and analysis; fluvial process mapping and analysis. Bathymetry in particular is needed for sea level rise analysis, flood extent modeling, and change detection at coastal structures.

In order to achieve most of these activities, NPS generally requires Quality Level 1 (QL1) inland topography and QL1B inland bathymetry updated every 4-5 years, and QL1B nearshore bathymetry updated every 2-3 years. Order 1 offshore bathymetry is required for the monitoring and mapping of coastal erosion, inundation, and hazards every 4-5 years.

Major benefits from higher quality elevation data include significant time saved from faster and/or avoided field visits/inspections; hours saved from reduced or avoided data manipulation and errors; hours saved through more efficient modeling, reviews, reporting, data dissemination, mapping, or other procedures; data acquisition costs saved; data processing avoided; better preparedness for emergencies and responses allowing a faster response and recovery to an event; increased program effectiveness; and improved customer experience.

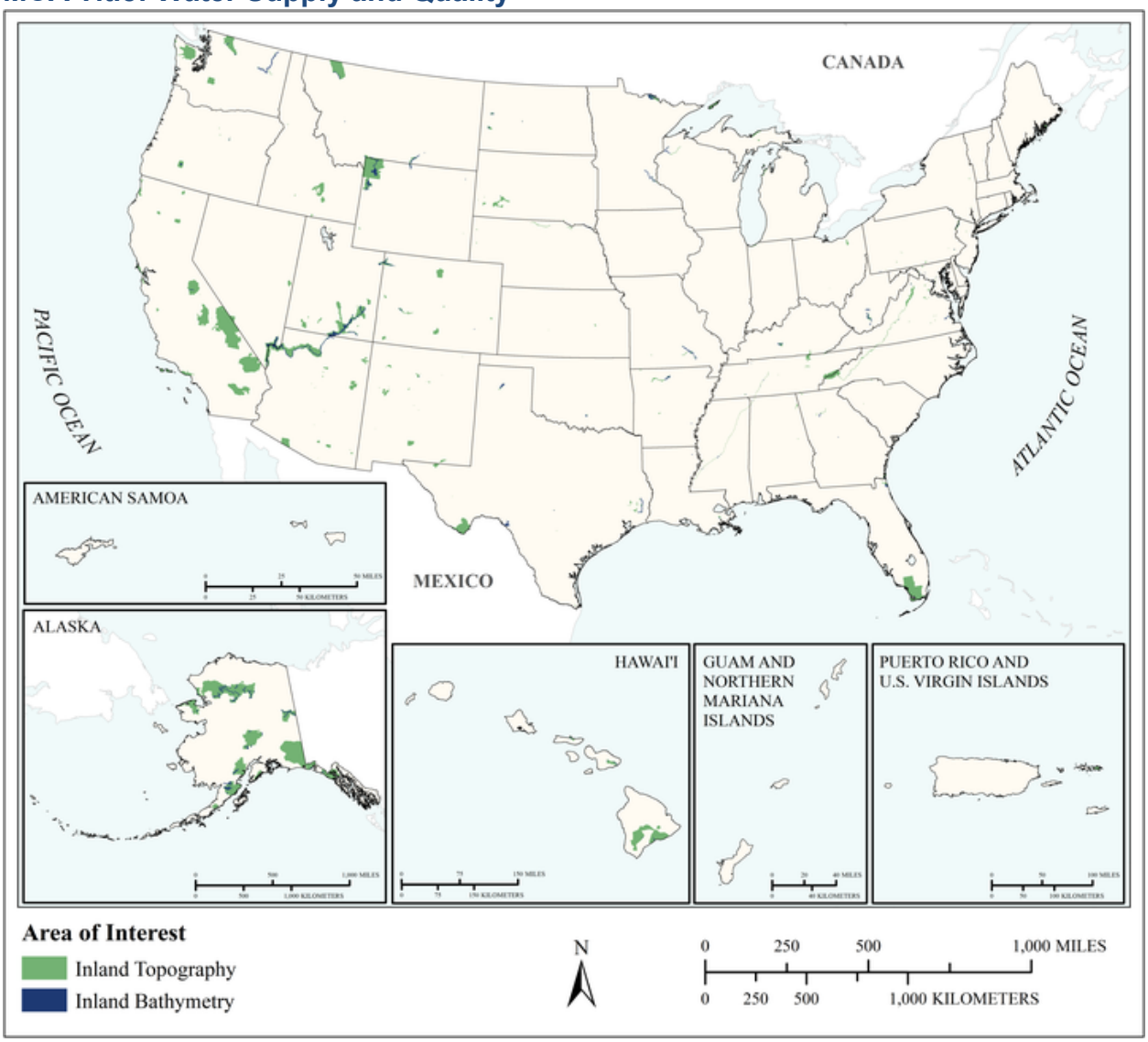
The NPS has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	DoI: National Park Service (NPS)	60701	Water Supply and Quality	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
				Inland Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
BU 02 – Riverine Ecosystem Management	DoI: National Park Service (NPS)	60702	Riverine Ecosystem Management	Inland Topo	QL1	6-10 years	$1,917,597	$114,923	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$1,020,805	$47,986	Major	Major	Major
BU 03 – Coastal Zone Management	DoI: National Park Service (NPS)	1284	Coastal Zone Management in National Parks	Inland Topo	QL0	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
				Inland Bathy	QL2B	4-5 years	$2,244,720	Unable to quantify	Moderate	Major	Major
				Nearshore Bathy	QL2B	2-3 years	$4,748,202	$8,140	Moderate	Major	Moderate
BU 06 – Natural Resource Management	DoI: National Park Service (NPS)	1161	Natural and Cultural Resources Protection in National Parks	Inland Topo	QL1	2-3 years	$293,047	$1,857,722	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	6-10 years	$114,972	$50,049	Moderate	Major	Minor
				Nearshore Bathy	QL1B	2-3 years	$81,949	$21,708	Minor	Major	Moderate
				Offshore Bathy	Order 1	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
BU 06 – Natural Resource Management	DoI: National Park Service (NPS)	1328	Forest Inventory and Monitoring	Inland Topo	QL1 HD	6-10 years	$231,072	Unable to quantify	I don't know	I don't know	I don't know
BU 07 – Wildlife and Habitat Management	DoI: National Park Service (NPS)	22381	Ecosystem Monitoring in National Parks	Inland Topo	QL2	6-10 years	$916,953	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL1B	6-10 years	$36,783	Unable to quantify	Moderate	I don't know	I don't know
BU 09 – Fisheries Management and Aquaculture	DoI: National Park Service (NPS)	60703	Fisheries Management and Aquaculture	Inland Topo	QL1	4-5 years	$1,280,630	$1,390,816	Moderate	Major	Moderate
				Inland Bathy	QL2B	6-10 years	$2,506,776	$1,140,933	Major	Major	Moderate
				Nearshore Bathy	QL1B	4-5 years	$5,971,069	$875,873	Moderate	Major	Minor
BU 10 – Geologic Assessment	DoI: National Park Service (NPS)	22224	Geologic Mapping and Analysis	Inland Topo	QL1	4-5 years	$79,899	$18,090	Moderate	Moderate	Major
				Inland Bathy	QL1B	4-5 years	$32,412	Unable to quantify	Major	Moderate	Moderate
				Nearshore Bathy	QL1B	2-3 years	$2,110	Unable to quantify	Moderate	Moderate	Moderate
BU 14 – Cultural Resource Management	DoI: National Park Service (NPS)	60704	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$584,951	$100,385	Moderate	Moderate	Minor
				Inland Bathy	QL0B	6-10 years	$401,938	Unable to quantify	Moderate	Moderate	Minor
				Nearshore Bathy	QL0B	4-5 years	$325,908	Unable to quantify	Minor	Moderate	Minor

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 16 – Sea Level Rise and Subsidence	DoI: National Park Service (NPS)	1318	Shoreline Monitoring and Analysis	Inland Topo	QL0	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
				Nearshore Bathy	QL0B	Annually	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
BU 17 – Wildfire Management	DoI: National Park Service (NPS)	60705	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$5,152,023	Unable to quantify	Major	Major	Major
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 22 – Infrastructure Management	DoI: National Park Service (NPS)	60706	Infrastructure and Construction Management	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	Minor	Moderate	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Moderate
				Nearshore Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
BU 27 – Recreation	DoI: National Park Service (NPS)	60707	Recreation	Inland Topo	QL1	4-5 years	$287,471	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	4-5 years	$173,122	Unable to quantify	Major	Major	Moderate
				Nearshore Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Moderate
BU 30 – Maritime and Land Boundary Management	DoI: National Park Service (NPS)	60708	Maritime and Land Boundary Management	Inland Topo	QL1	4-5 years	$1,798,230	$1,894,525	Major	Minor	Minor
				Inland Bathy	QL0B	4-5 years	$739,422	$73,889	Major	Major	Moderate
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies		
Sub Area Requirements	NPS	NPS		

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60701
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: National Park Service (NPS)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Highly desirable	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Minor		
Cost avoidance	Major	Minor		
Increased revenues	Minor	None		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		

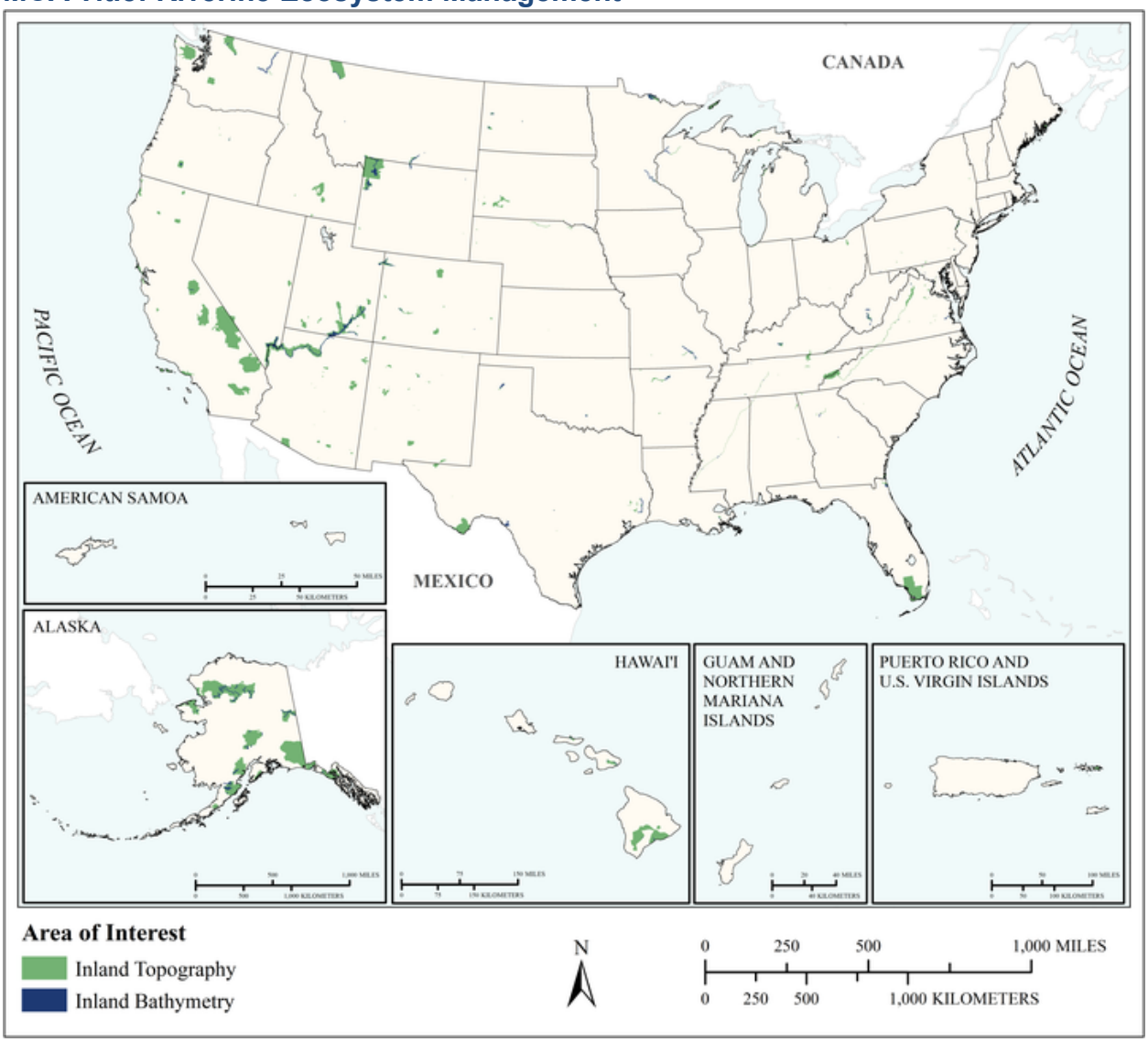
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Major								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies		
Sub Area Requirements	NPS	NPS		

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60702
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: National Park Service (NPS)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	6-10 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Required			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Moderate	Moderate		
Cost avoidance	Moderate	Minor		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate		

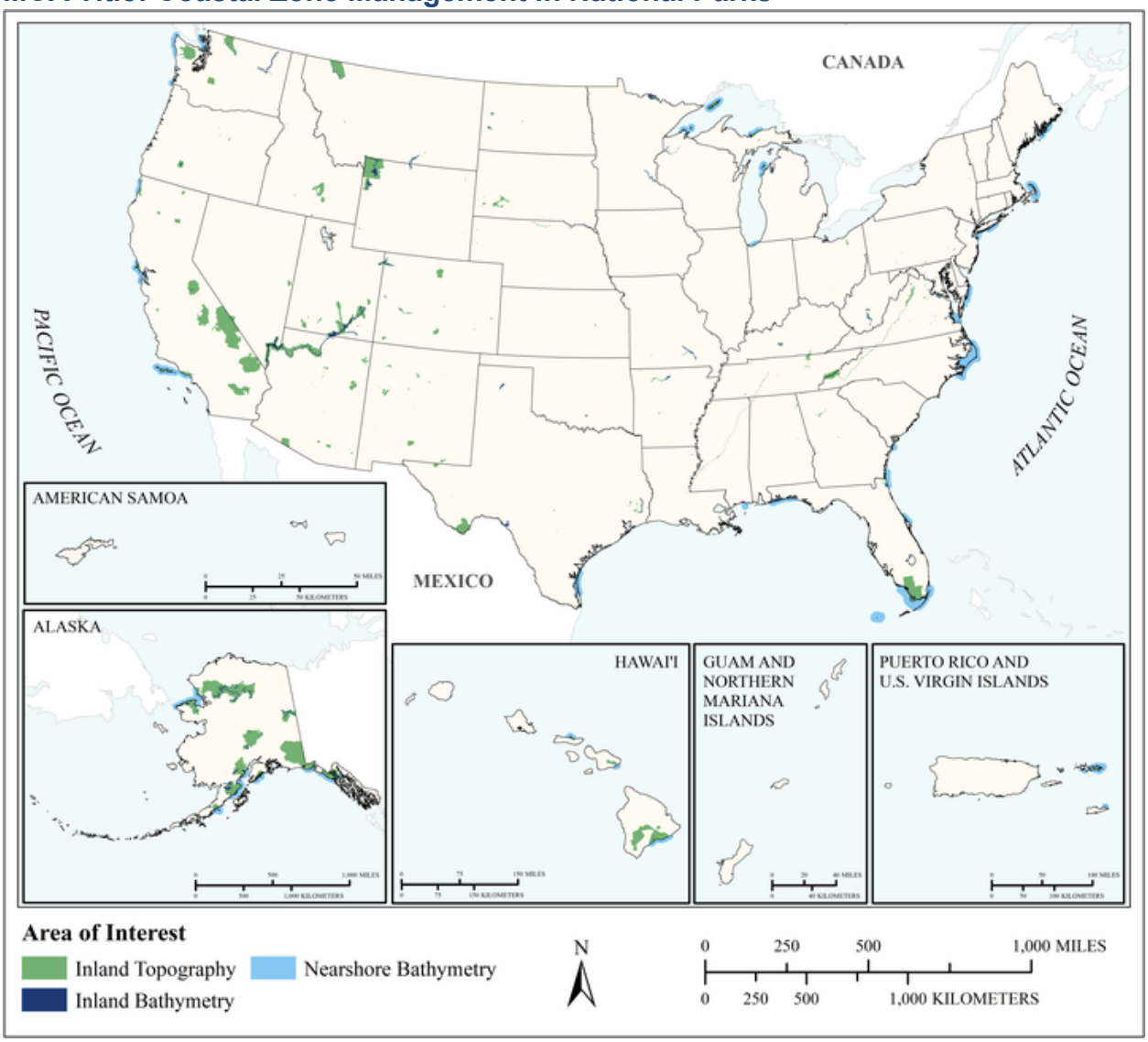
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Minor		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Major		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Minor	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,917,597		Annual dollars saved/ realized	$1,020,805						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$114,923		Annual dollars saved/ realized	$47,986						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Coastal Zone Management in National Parks



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Nearshore areas along the coast (including the Great Lakes) of Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	
Sub Area Requirements	NPS	NPS	NPS	

MCA Description	Response
Mission Critical Activity	Our main interests are to understand, map, and manage the dynamic changes of coastal, estuarine, and wetland systems. Therefore, our primary interests are in coastal zone management, cultural resources preservation and management, flood risk management, water supply and quality, sea level rise and subsidence.
MCA Title	Coastal Zone Management in National Parks
MCA ID	1284
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: National Park Service (NPS)
Sub-Agency or Division	Natural Resources Stewardship and Science: Water Resources Division
Organization Mission	The Water Resources Division (WRD) of the National Park Service works to conserve, protect and restore water resources in America's national parks. WRD provides assistance, expertise, and guidance for aquatic ecosystem stewardship in national parks, so that current and future generations can experience healthy aquatic ecosystems for years to come.
Program Name	At the Water Resources Division we assist with park, regional, or national level research needs to address specific questions or issues
Total Annual Program Budget	$5,750,000
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Texture of and changes in submerged surface sediments (grain size, cobble); small patches of sea grass, coral reef, wetland vegetation; Individual shrubs and trees

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Greater than 2,500 ft	Required
Other	Nice to have
Other description	
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required
Other	Nice to have
Other description	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL2B	QL2B	
Update Frequency	4-5 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Less than 50 cm	Less than 50 cm	
Acceptable Vertical Error	Less than 5 cm	Up to 40 cm	Up to 40 cm	
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	To MLLW		Below MLLW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Required	Nice to have		Required	Highly desirable
Other			Nice to have		Nice to have	Highly desirable
Other description						
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Nice to have		Required	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Required	Required
Other					Nice to have	
Other description						
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Highly desirable	
DTM	Nice to have	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Nice to have	Nice to have	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	
Full waveform	Nice to have	Not required	Nice to have	
Bathymetric Attributed Grid (BAG)		Not required	Required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Required	Nice to have	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Required	
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	
Underwater videography			Required	
Bottom texture			Required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Not required	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Highly desirable	
Habitat distribution and classification			Required	
Boundaries			Required	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Required	Required	
Estuaries			Required	
Inland surface water features	Highly desirable	Nice to have	Required	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			
Other			Nice to have	
Other description				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	2013 USGS/NPS Jean Lafitte Lidar, QL3, Mar 5 - 8, 2013	Nearly all of the data used are from federal collections, such as DAV (elevation, imagery) and USGS (satellite/photos). Other data sets are derived from park collections, but there are very few of these; 2006 USGS/NASA/NPS Experimental Advanced Airborne Research Lidar (EAARL): Jean Lafitte National Historical Park and Preserve, LA, QL3, 22 Sept 2006	NPS typically uses data collected by other Governmental, state, and county groups.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
NCEI		Yes	Yes	
Open Topography				
NOAA nautical charts		Yes	Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major	Major	
Cost savings/cost reduction	Moderate	Major	Major	
Cost avoidance	Minor	Major	Major	
Increased revenues	Minor	None	None	
Mission-driven performance improvements	Moderate	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Major	
Improved response or timeliness	Minor	Major	Major	
Improved customer experience	Moderate	Minor	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Moderate	
Environmental	Moderate	Major	Major	
Public safety, including life and property	Minor	Moderate	Major	

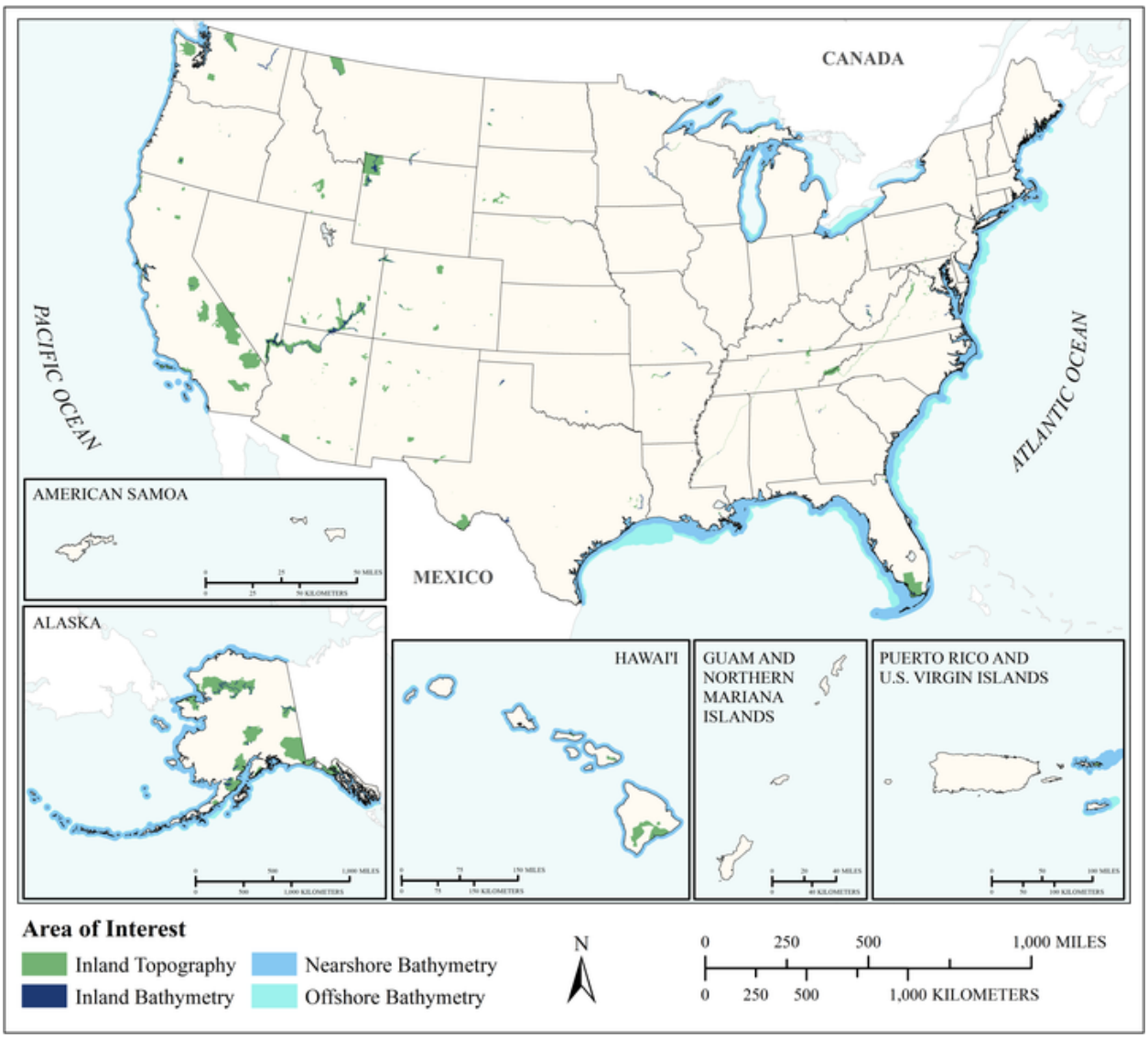
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Annual dollars saved/realized	$144,720	Major	Annual dollars saved/realized	$748,202			
Time savings description				Do not collect data often. Do not plan data collection often. 10 hour field visits * 3 days *30 parks * 4 staff = 3600 hours saved, at least, probably more. A lot of time spent prepping data.			88 parks * 5 days * 10 hours * 4 people =17,600 hrs. NPS generally doesn't collect data. 17,600 hours of data collection / 3 hours of processing=5866. 10 hours/week * 4.5 weeks/mo. 15 hrs/week * 4.5 weeks/mo.					
Cost savings/cost reduction	Moderate	Unable to provide		Major	Annual dollars saved/realized	$2,000,000	Major	Annual dollars saved/realized	$1,000,000			
Cost savings/cost reduction description				Great Lakes data collection example of 4 parks for sonar, backscatter, drop camera work. Projects are case by case and widely vary.			With over 88 ocean and coastal parks, the savings of collecting data for each park much larger than $1 million. Unsure of how each park saves on these materials, likely to increase in the future.					
Cost avoidance	Moderate	Unable to provide		Major	Annual dollars saved/realized	$100,000	Major	Annual dollars saved/realized	$3,000,000			
Cost avoidance description				Having professional data analyzers process data is a huge benefit. NPS rarely processes data, but we often contract such efforts, so the savings would be large, >$100,000/yr. Better data means better prepared for emergencies and responses.			Always a concern and better if one organization does it to minimize the diversity of errors. Probably more, but just considering all of the spatial analysts' salaries and time spent doing such tasks. Would be on a case by case basis for NPS and more of a preparedness operation.					
Increased revenues	None			None			Moderate	Unable to provide				
Increased revenues description							Better maps for visitor experience and resource management purposes.					
Mission-driven performance improvements	Moderate	Unable to provide		Major	Annual percent improvement	75%	Major	Annual percent improvement	92%			
Mission-driven performance improvements description				Having consistent and quality data on hand is such a benefit.			Better protect U.S's natural and cultural resources. Better data, better products. NPS has very few benthic maps, new data would be ideal for this project.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Value added to products or services description				Data may improve park visitor numbers. Better preparedness/information for people living near or visiting parks.			Park visitor enjoyment and recreation, park specific. Flood hazard/mitigation --.					
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness description							NPS is a customer and user of the data, therefore our visitors/customers would also benefit. NPS generally doesn't collect data. Extremely useful for resource management. Extremely useful for cultural resource management. Better data = improved decisions.					
Improved customer experience	Minor	Unable to provide		Major	Unable to provide		Major	Annual dollars saved/realized	$8,140			
Improved customer experience description							New data with increased resolution is very desirable for our needs and services. 5 hrs/week * 4.5 weeks/mo.					

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Societal Benefits	**Benefits**	**Benefits**	**Benefits**	**Benefits**
Education or outreach	Moderate	Moderate	Moderate	
Education or outreach description		Improved understanding of bathy environment	Better data for natural resources assessments and information for general public	
Environmental	Moderate	Major	Major	
Environmental description		Better protection of natural and cultural resources	Improved resource management	
Public safety, including life and property	Minor	Major	Moderate	
Public safety, including life and property description		More informed public	Preservation of cultural and natural resources, as well as improved public safety at NPS units	

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps	Yes	Yes	Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Natural and Cultural Resources Protection in National Parks



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Custom description	Custom description
Sub Area Requirements	NPS	NPS	States with NPS lands	States with NPS lands out to the 30 m depth

MCA Description	Response
Mission Critical Activity	Infrastructure architecture to support mission critical remote sensing tasks service-wide; Monitoring of modeling of coastal erosion and inundation; water resources mapping/surveying, coastal hazard and climate change, facilities management, etc.; Preservation and Protection of Natural and Cultural Resources
MCA Title	Natural and Cultural Resources Protection in National Parks
MCA ID	1161
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: National Park Service (NPS)
Sub-Agency or Division	National Park Service
Organization Mission	The National Park Service preserves unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations. The Park Service cooperates with partners to extend the benefits of cultural and natural resource conservation and outdoor recreation throughout this country and the world.
Program Name	Remote Sensing support to all service-wide programs integrating 3D elevation data into their models. This includes cultural, ocean and coastal management, geologic resources and visitor resource protection to name a few; Inventory and Monitoring Program; Resource Stewardship and Science
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 14 - Cultural Resources Preservation and Management
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Features in archeological digs, rocks to compute rock fall areas, hydrological structures

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	Order 1
Update Frequency	2-3 years	6-10 years	2-3 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 2 meters	Up to 1 meter	Less than 50 cm
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed			To the fall line	
How far down the beach profile needed	Below MLLW		To MLLW	
Tide correction requirement			No requirement for tide correction	MHW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Required	Highly desirable
DEM	Required	Required	Highly desirable	Required
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	Required
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Not required	Nice to have	Highly desirable
Bathymetric Attributed Grid (BAG)		Highly desirable	Not required	Nice to have

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Required
Tide Predictions			Highly desirable	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	Required
Ground control/ground truthing	Highly desirable	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Required
Nautical and/or navigation charts			Nice to have	Not required
Acoustic imagery of the seafloor			Not required	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Required
Underwater videography			Not required	Nice to have
Bottom texture			Not required	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Required	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Required	Highly desirable
Routes			Not required	Not required
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Not required	Not required
Floating observation/navigation systems			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Highly desirable	Required	
Land use/land cover	Highly desirable	Nice to have	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have
Estuaries			Nice to have	Highly desirable
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Various LiDAR products available are being used to support mission critical activity. It ranges from QL2 to QL0, with most in the QL2 range.	Best available	Best available	Best available
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI	Yes	Yes	Yes	Yes
Open Topography	Yes			
NOAA nautical charts			Yes	
USACE navigation charts				Yes
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes		Yes	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	Kansas, Nebraska, Minnesota, Indiana, and Iowa; MSDIS (Missouri), GeoStor (Arkansas), Iowa State University GISU, Kansas DASC, Minnesota geospatial commons, OGRIP (Ohio), in.gov/gis, and others		Any available state clearinghouses	
Other	Yes		Yes	
Other description	Locally collected		Data obtained from academic partners	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	Major	Major
Cost savings/cost reduction	Major	I don't know	Major	Major
Cost avoidance	Major	I don't know	Major	Major
Increased revenues	I don't know	I don't know	I don't know	I don't know
Mission-driven performance improvements	Major	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	I don't know
Improved response or timeliness	Major	Major	Moderate	Moderate
Improved customer experience	Moderate	Moderate	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	I don't know
Environmental	Major	Major	Moderate	Moderate
Public safety, including life and property	Major	Moderate	Moderate	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$98,048	Moderate	Annual dollars saved/realized	$14,472	Major	Annual dollars saved/realized	$21,949	Major	Unable to provide	
Time savings description	Access unreachable areas; up to 8 hours per field visit for wilderness areas; Improved visualization of terrain can help avoid visits to inspect areas for cultural resources that have been previously impacted, or help target areas to inspect. Less time correcting data errors. Depends on the current projects, although project planning will always be important; Improved modeling will results in better ability to protect cultural resources. Depends on the current projects, although all involve some kind of manipulation; Less time finding data and more time using it. Updating current models with new methodologies, better data sharing options, integration with mapping products; automation of models and map production; Improved modeling will results in better ability to protect cultural resources. Projects rarely involve compliance; Improved data and modeling can help avoid unnecessary field reviews for compliance.			As the national coordinator, I would need to discuss with our Coastal and Ocean Resource group to quantify this. ; Instead of multiple field visits to collect side scan sonar, could use bathymetric data.			Need to coordinate with Water Resources Division. Project dependent, but this is a reasonable amount; some months more than others. Depends on the projects.					
Cost savings/cost reduction	Major	Annual dollars saved/realized	$100,000	Moderate	Annual dollars saved/realized	$30,000	Moderate	Annual dollars saved/realized	$30,000	Major	Unable to provide	
Cost savings/cost reduction description	Improved project planning to avoid field trips or reduce field time. Decrease need for contracting for collection; no funding available for data acquisition, so any savings is critical. Improved data can help plan projects to avoid cultural sites resulting in less excavation and therefore saving $ needed to curate archeological materials recovered.						Working internally on current cost models. Don't use materials in projects.					
Cost avoidance	Major	Annual dollars saved/realized	$80,000	Major	Annual dollars saved/realized	$70,500	Major	Annual dollars saved/realized	$30,000	Moderate	Unable to provide	
Cost avoidance description	Event driven estimates, application development to support impacted areas; Can help planners design projects that will least likely result in impacts to resources; depends on current projects and responses to disasters. Improved project planning to avoid field trips or reduce field time. Save in application costs, human capital savings; Less processing time; depends on current projects, although any time saved in data processing is critical. Information will impact infrastructure updates in NPS, difficult to quantify at the moment. Less processing time; depends on current projects.			This accounts for infrastructure that might be lost in the case of an event and is on the low end of what it would cost to replace something of that scale. This is an approximation. This is an approximation that accounts for redoing work if issues are found.			Working internally on current cost models. Depends on the projects.					
Increased revenues	Minor	Annual dollars saved/realized	$15,000	I don't know	Unable to provide		None			I don't know	Unable to provide	
Increased revenues description	Infrastructure mapping, efficiency in vegetation mapping for habitat management. We do not harvest or extract materials.						Not part of mission.					
Mission-driven performance improvements	Major	Annual percent improvement	30%	Minor	Annual percent improvement	15%	Major	Annual percent improvement	18%	Major	Unable to provide	

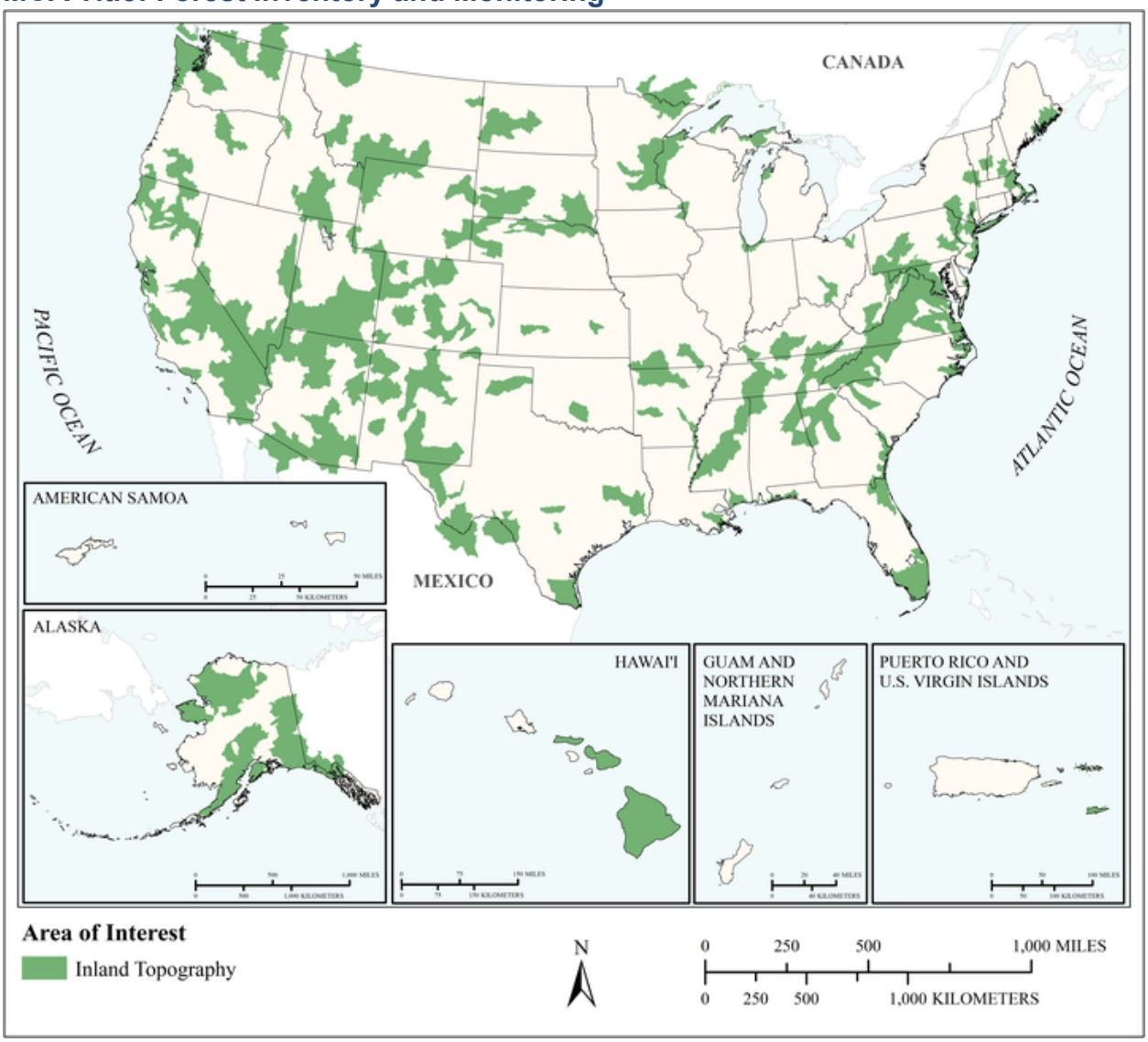
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Mission-driven performance improvements description	Better data results accomplished with less costly field time ; improve training methods, improve decision making efforts, better quality products. Improve data products available for service-wide projects; Better ability to respond to project planning and modeling needs. Better ability to understand project areas and avoid damage to cultural resources; depends on the projects, difficult to quantify better decision making related to resources ; facilitate improvements with models.			Conservative percent; improvement having inland bathy with terrestrial in meeting resource monitoring and protection mission.			Opportunity to increase as leadership is educated on importance of 3D data on decision making. Decrease time creating products; Service-wide improvements in collaborative program development. Increase opportunities to Integrate into business models used in decision making and management directives.					
Other operational benefits	Major	Unable to provide		Minor	Unable to provide							
Other operational benefits description	Depends on the needs and projects. Cultural resource monitoring and management.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$1,809,000	Moderate	Annual dollars saved/realized	$8,321	Major	Annual dollars saved/realized	$2,412	I don't know	Unable to provide	
Value added to products or services description	Improved planning/research products.			Two full field days per month to have someone verify field data. One full field day per month in gathering data to use in product development.			Working internally on current cost models and business requirements.					
Improved response or timeliness	Major	Annual dollars saved/realized	$34,974	Moderate	Annual dollars saved/realized	$27,979	Major	Annual dollars saved/realized	$14,472	Major	Unable to provide	
Improved response or timeliness description	Better data to provide for disaster planning/response; data will assist in mapping product development, event based so difficult to quantify dollar amount. Improves available data needed for assessment of effects/compliance; don't have a good handle on time currently spent on these tasks. View upcoming improvements to plan trips. Better data for planning, modeling. Better data to provide for disaster planning/response; decrease time spent in data acquisition and product development, improve upon time spent in decision making mode. Better data to provide for disaster planning/response; impact fire map and forest management.			Ready to integrate with services and products without having to have analyst process. Time saved by not having to create DEM to match existing terrestrial for use in tools sharing hazard information.			Working internally on business requirements. Depends on the projects.					
Improved customer experience	Major	Annual dollars saved/realized	$13,748	Moderate	Annual dollars saved/realized	$13,748	Moderate	Annual dollars saved/realized	$4,824	Major	Unable to provide	
Improved customer experience description	We can provide better response time to customer needs when it is easier to get data; data acquisition in high bandwidth areas, integration with emerging technologies, general time allotted to accessing imagery. Less time redoing modeling to meet customer needs; metadata with products, interagency use and integration of products, 4 hours per week in support. Depends on the projects.			Ability to have data provided via one location per agency (or from DOI) to streamline integration with workflows. Integration with requested improvements from customers using consistent data. Products and services using agreed upon data set with known standards.			Working internally on current cost models and business requirements.					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Minor			Moderate		
Education or outreach description	Improved visuals for public outreach efforts; update decision makers using improved models			Will be able to develop tools to improve customer experience with NPS and our waterways			Working internally on business requirements					
Environmental	Moderate			Major			Major			Major		
Environmental description	Greatly improved discovery, protection, and preservation of cultural resources; improve mapping of wilderness areas for resource management, better decision making impacting event response			Integrate the inland bathy with terrestrial models to improve veg maps, habitat maps, infrastructure, etc.			Working internally on business requirements					

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Public safety, including life and property	Moderate	Minor	Moderate	Moderate
Public safety, including life and property description	Improved protection of cultural resources	Will aid in hazard prevention, in property replacement and management, etc.	Working internally on current cost models and business requirements	
Other				
Other benefits	Moderate			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes		Yes	
Viewshed maps	Yes	Yes	Yes	Yes
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes	Yes	Yes	Yes
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes		Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Forest Inventory and Monitoring



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Custom description			
Sub Area Requirements	HUC8s that cover NPS lands			

MCA Description	Response
Mission Critical Activity	Forest canopy modeling, hydrologic modeling
MCA Title	Forest Inventory and Monitoring
MCA ID	1328
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: National Park Service (NPS)
Sub-Agency or Division	Inventory and Monitoring
Organization Mission	Long-term monitoring of vital signs
Program Name	Inventory and Monitoring
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	BU 17 - Wildfire Management, Planning, and Response

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	200,000 sq mi - 2 million sq mi (e.g. large state, large multi-state region such as the Great Basin, standard Federal region, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Trees, shrubs, and coarse woody debris

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	6-10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Below MLLW			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Not required			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Various low density leaf off lidar datasets in the Great Lakes region and elsewhere			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes			
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Moderate			
Increased revenues	None			

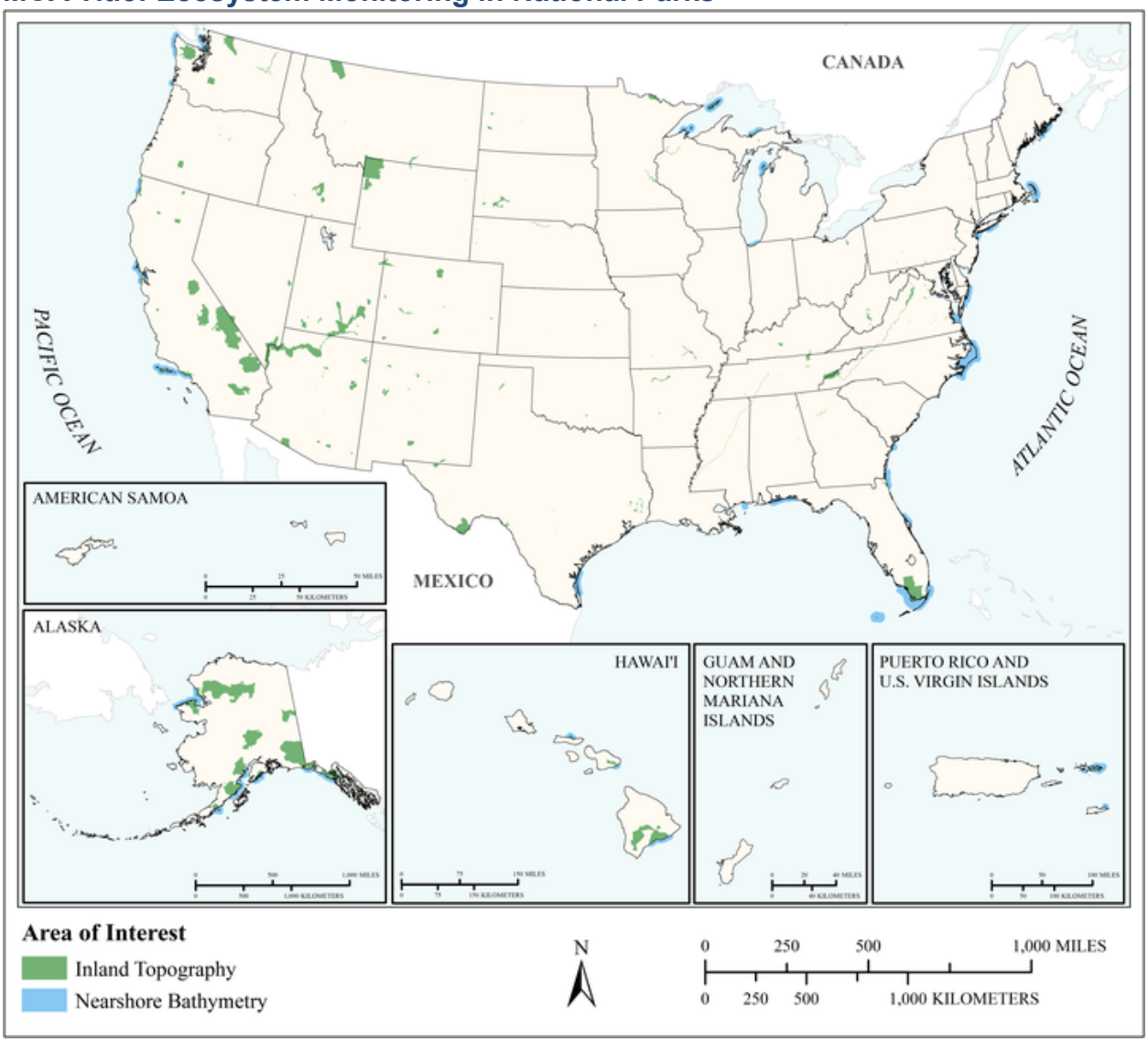
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	I don't know			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$135,072									
Time savings description	Less people in field. Fewer field visits. Less processing time.											
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Annual dollars saved/realized	$96,000									
Cost avoidance description	No need to purchase additional software.											
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Ecosystem Monitoring in National Parks



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies		Nearshore areas along the coast (including the Great Lakes) of Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	
Sub Area Requirements	NPS		NPS	

MCA Description	Response
Mission Critical Activity	Monitoring the condition on key ecosystem health indicators on National Parks. Elevation data, and bathymetry in particular are needed for sea level rise analysis, flood extent modeling, and change detection at coastal structures.
MCA Title	Ecosystem Monitoring in National Parks
MCA ID	22381
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: National Park Service (NPS)
Sub-Agency or Division	Inventory and Monitoring
Organization Mission	In 32 Inventory and Monitoring networks across the country, we gather and analyze information on specific park natural resources—the plants, animals, and ecosystems that can indicate the overall biological health of parks.
Program Name	National Park Service Inventory and Monitoring Vital Sign Monitoring
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Micro-topography - subtle changes in bare earth elevation that would indicate a change in elevation of approx. 25 cm across a surface the size of a large sedan. understory features such as shrubs (individual shrubs is desirable. Quantifying groups of shrubs as an estimator of understory density on the plot scale, approx 20m x 20m, is mission critical).

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL1B	
Update Frequency	6-10 years		6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need		Less than 50 cm	
Acceptable Vertical Error	Up to 10 cm		Less than 10 cm	
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Required			Highly desirable
Entire AOI under same environmental conditions	Highly desirable		Required			Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have		Highly desirable			Highly desirable
DEM for entire AOI needs to be seamless	Nice to have		Highly desirable			Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable		Highly desirable	
DTM	Highly desirable		Highly desirable	
DEM	Required		Required	
Raw point cloud data	Highly desirable		Highly desirable	
Classified point cloud	Required		Required	
Edited/cube XYZ			Not required	
Full waveform	Not required		Not required	
Bathymetric Attributed Grid (BAG)			Not required	
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have		Not required	
Ground control/ground truthing	Highly desirable		Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable		Nice to have	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required		Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Not required		Highly desirable	
Land use/land cover	Not required		Nice to have	
Wetlands	Not required		Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	
Inland surface water features	Not required		Nice to have	
Bridges/culverts	Not required			
Landmark features	Not required		Nice to have	
Cultural resources	Not required		Nice to have	
Coastal and riverine structures	Not required		Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Highest quality topo data for AOI - Generally QL2 for surveys conducted circa 2011 or later and QL3 or less for surveys conducted before 2011		Best available	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	MS - MARIS and MS DEQ TX - TNRIS as well as other similar state repositories			
Data that meet my needs are not available				

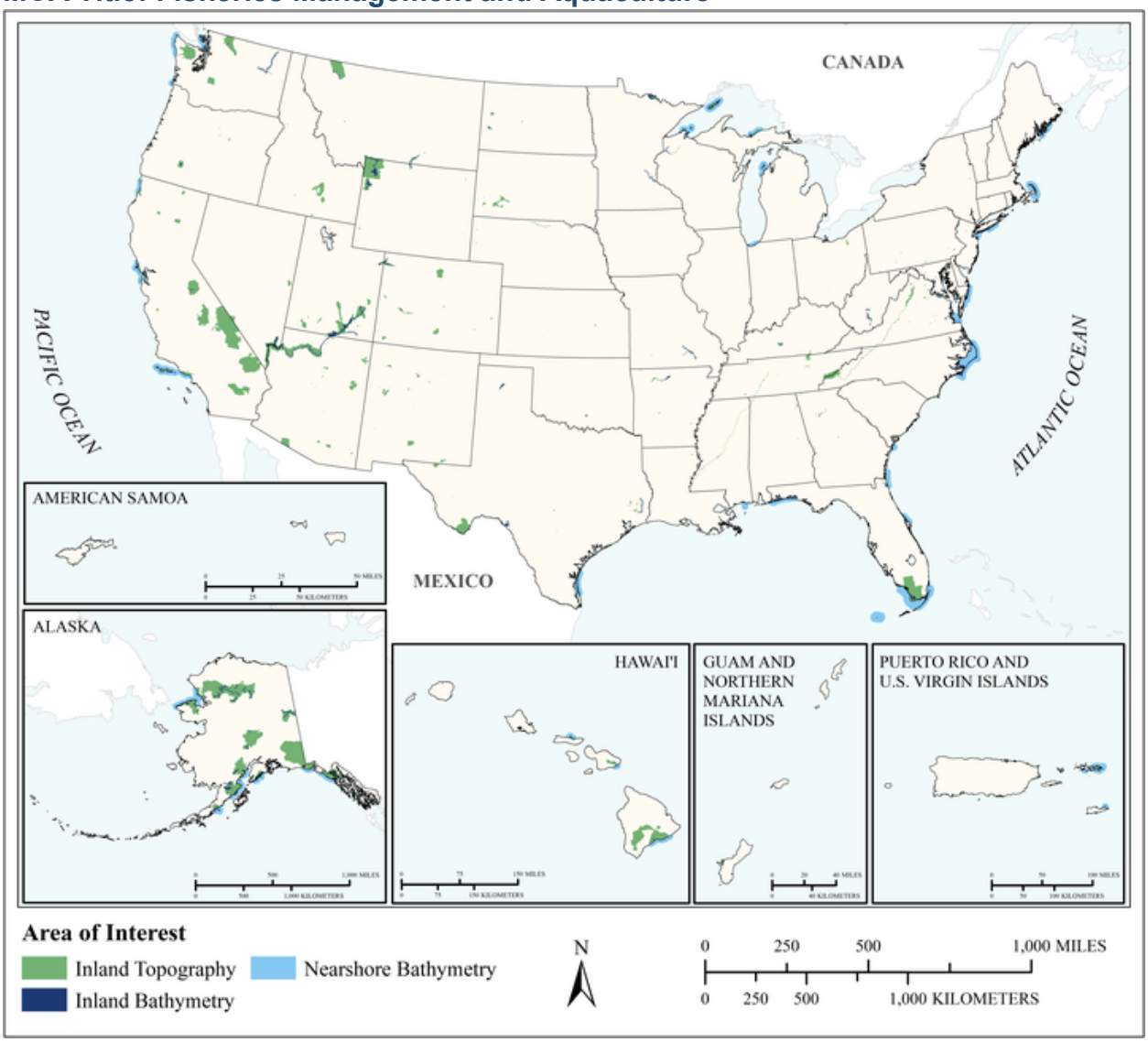
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major		Moderate	
Cost savings/cost reduction	Major		Moderate	
Cost avoidance	Major		Moderate	
Increased revenues	I don't know		I don't know	
Mission-driven performance improvements	Major		Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Moderate	
Improved response or timeliness	I don't know		Minor	
Improved customer experience	Major		Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Moderate	
Environmental	I don't know		Moderate	
Public safety, including life and property	I don't know		I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$459,637				Moderate	Annual dollars saved/realized	$36,783			
Time savings description	High resolution elevation data has been and will continue to be invaluable in planning and distributing field activities. Survey timing is critical, but field activities related to coastal geomorphological monitoring could be reduced to 10% of current effort. It's hard to quantify hours saved in this category . . . I'll say that all the listed efficiency parameters are dramatically qualitatively improved by accurate, high resolution elevation data.											
Cost savings/cost reduction	Moderate	Unable to provide					Moderate	Unable to provide				
Cost avoidance	Major	Annual dollars saved/realized	$457,317				Major	Unable to provide				
Cost avoidance description	We do not have the tools nor the expertise to perform the tasks listed as examples of data processing. Useful for defining avoidance areas, such as steep slopes, for field activities.											
Increased revenues	None						None					
Mission-driven performance improvements	Moderate	Unable to provide					Major	Unable to provide				
Mission-driven performance improvements description	All interpretation of field-based results from GULN resource monitoring activities (terrestrial birds and vegetation, coastal geomorphology, amphibians and reptiles, and water quality) benefit from the context that that is provided by high resolution elevation data. Efficiencies gained in planning field operations.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide					Moderate	Unable to provide				
Value added to products or services description	Shoreline extraction and topographic profiles derived from high-res. elevation datasets has potential to allow for more systematic, comparable measurements of change. Builds broader context for discrete sampling unit results and can improve capacity to interpolate conditions of between-plot areas.											
Improved response or timeliness	None						Minor	Unable to provide				
Improved customer experience	Moderate	Unable to provide					Moderate	Unable to provide				
Improved customer experience description	If field measures are consistent with 3D topo data measures, customers are more confident in results.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know						Moderate					
Environmental	I don't know						I don't know					
Public safety, including life and property	I don't know						I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes		Yes	
Hillshades				
Slope maps	Yes		Yes	
Aspect maps	Yes		Yes	
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes		Yes	
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Nearshore areas along the coast (including the Great Lakes) of Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	
Sub Area Requirements	NPS	NPS	NPS	

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60703
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: National Park Service (NPS)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL1B	
Update Frequency	4-5 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have		Required	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Required		Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	
Classified point cloud	Highly desirable	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	
Ground control/ground truthing	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Required	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Nice to have	
Wetlands	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	
Cost savings/cost reduction	Major	Moderate	Major	
Cost avoidance	Major	Moderate	Moderate	
Increased revenues	Moderate	Moderate	Minor	
Mission-driven performance improvements	Major	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	

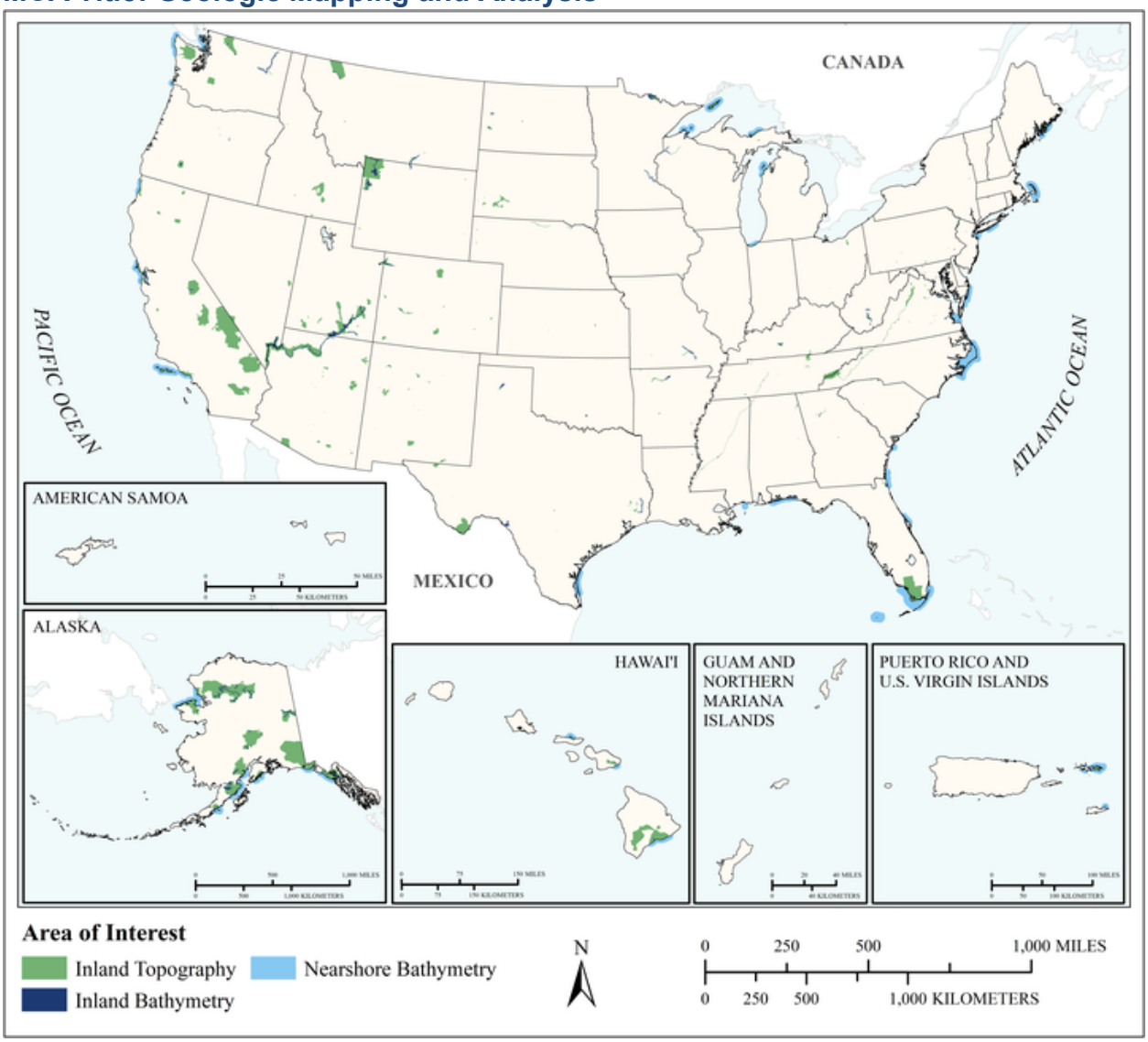
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Major	Major	
Improved customer experience	Major	Major	Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Moderate	
Environmental	Major	Major	Major	
Public safety, including life and property	Major	Minor	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		None			Moderate	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,280,630		Annual dollars saved/ realized	$2,506,776		Annual dollars saved/ realized	$5,971,069			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,390,816		Annual dollars saved/ realized	$1,140,933		Annual dollars saved/ realized	$875,873			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate					
Environmental	Major			Major			Major					
Public safety, including life and property	Moderate			Moderate			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps	Yes	Yes	Yes	
Cross sections	Yes		Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geologic Mapping and Analysis



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Nearshore areas along the coast (including the Great Lakes) of Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	
Sub Area Requirements	NPS	NPS	NPS	

MCA Description	Response
Mission Critical Activity	Geologic hazard and active geologic process technical assistance. Geologic mapping and analysis. Landslide and rockfall mapping, monitoring, and analysis. Identification of geomorphologic units. Landslide hazard mapping and risk assessment. Fluvial process mapping, and analysis.
MCA Title	Geologic Mapping and Analysis
MCA ID	22224
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: National Park Service (NPS)
Sub-Agency or Division	Natural Resource Stewardship and Science, Geologic Resources Division
Organization Mission	"...to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations." The Natural Resource Stewardship and Science Directorate of the NPS, in collaboration with NPS regions, parks, and programs, provides Servicewide natural resource leadership and support through coordinated and strategic approaches, grounded in a conservation ethic of science, critical analysis, knowledge synthesis, and informed decision making.
Program Name	Geologic Resources Division, Active Processes and Hazards
Total Annual Program Budget	$700,000
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Landslides and rockfall. Several cubic meters of geomorphic change.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Highly desirable
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	
Update Frequency	4-5 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 50 cm	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MSL	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Nice to have		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Highly desirable	Nice to have	
Full waveform	Highly desirable	Highly desirable	Nice to have	
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Nice to have	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Highly desirable	Highly desirable	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions				
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Required	Required	Nice to have	
Land use/land cover	Nice to have	Nice to have	Nice to have	
Wetlands	Nice to have	Nice to have	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Nice to have	
Inland surface water features	Nice to have	Nice to have	Nice to have	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL1 lidar data for the very small number of National Park units that have it. To my knowledge there is only the first run of QL1 lidar, so I am not using multi-temporal yet, but that is the next important step for change detection.	Inland bathymetry data are not available	In the absence of any data, I use whatever quality level is available. Most of the time there is no data availability.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	
NCEI	Yes		Yes	
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		

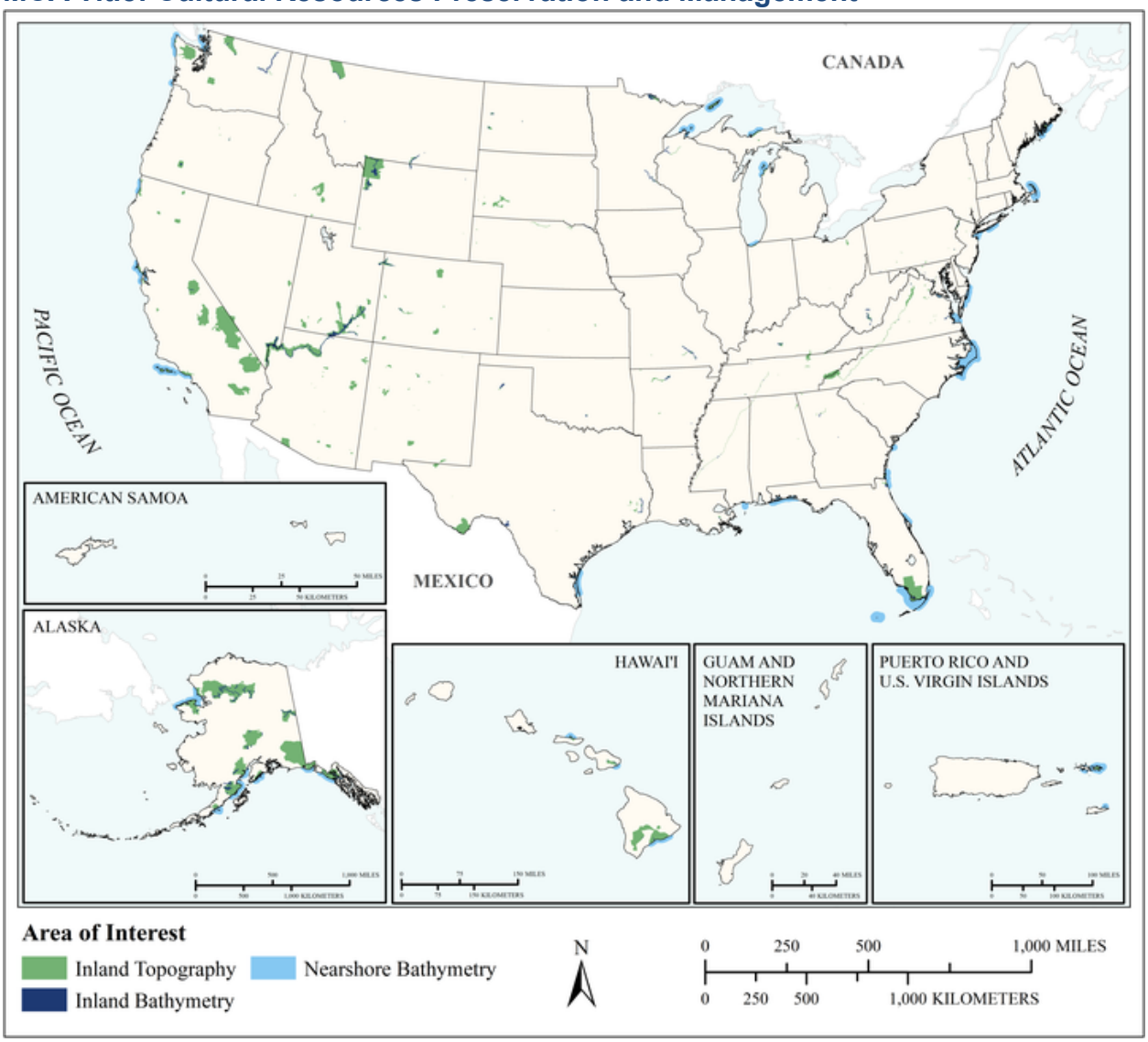
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Inland bathy data not available	Major	
Cost savings/cost reduction	Major	Inland bathy data not available	Moderate	
Cost avoidance	Major	Inland bathy data not available	Minor	
Increased revenues	I don't know	Inland bathy data not available	I don't know	
Mission-driven performance improvements	Major	Inland bathy data not available	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	Moderate	
Improved response or timeliness	Moderate	Inland bathy data not available	I don't know	
Improved customer experience	Minor	Inland bathy data not available	I don't know	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available	Moderate	
Environmental	Moderate	Inland bathy data not available	Moderate	
Public safety, including life and property	Moderate	Inland bathy data not available	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$19,899	Moderate	Annual dollars saved/realized	$2,412	Moderate	Annual dollars saved/realized	$2,110			
Time savings description	Some monthly analysis would not require travel.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$50,000	Moderate	Annual dollars saved/realized	$30,000	I don't know	Unable to provide				
Cost avoidance	Major	Annual dollars saved/realized	$10,000	I don't know	Unable to provide		Moderate	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Annual percent improvement	17%	Moderate	Annual percent improvement	13%	Moderate	Unable to provide				
Other operational benefits				Moderate	Unable to provide		Moderate	Unable to provide				
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Annual dollars saved/realized	$6,030	I don't know	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Annual dollars saved/realized	$9,648	Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Annual dollars saved/realized	$2,412	Major	Unable to provide		Moderate	Unable to provide				
Other customer service benefits	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Major			Moderate			Moderate					
Other												
Other benefits	Major			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Nearshore areas along the coast (including the Great Lakes) of Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	
Sub Area Requirements	NPS	NPS	NPS	

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60704
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: National Park Service (NPS)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	
Update Frequency	4-5 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Nice to have		Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Required	Highly desirable	Nice to have	
DEM	Required	Required	Required	
Raw point cloud data	Not required	Not required	Not required	
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Required	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Nice to have	
Wetlands	Nice to have	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Nice to have	Highly desirable	Nice to have	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Moderate	Minor	Minor	
Increased revenues	Minor	Minor	None	
Mission-driven performance improvements	Moderate	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	

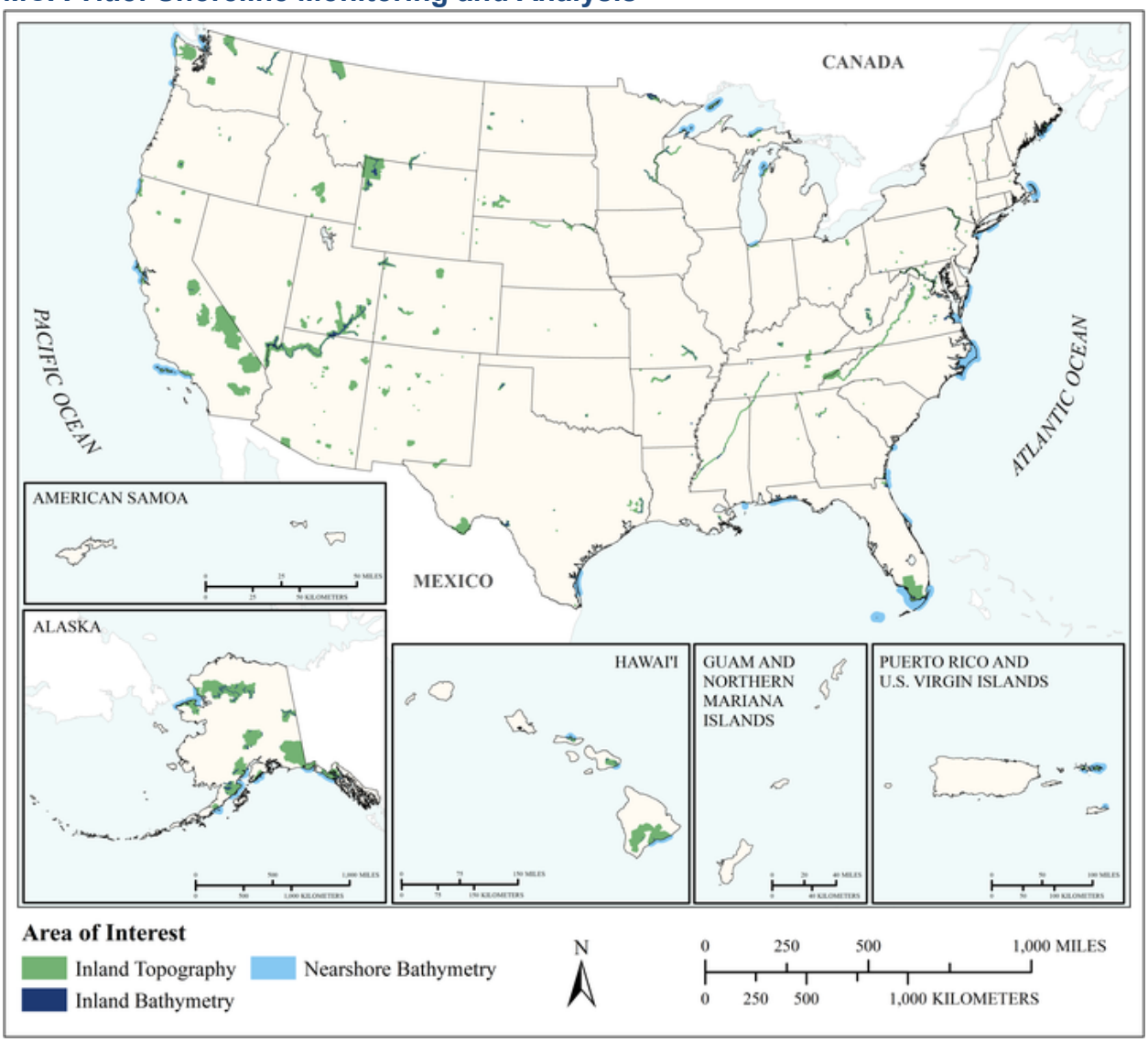
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Major	Minor	
Improved customer experience	Moderate	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	
Environmental	Moderate	Moderate	Minor	
Public safety, including life and property	Minor	Moderate	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Minor	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$584,951		Annual dollars saved/ realized	$401,938		Annual dollars saved/ realized	$325,908			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$100,385									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Minor					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Minor			Minor			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Shoreline Monitoring and Analysis



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Custom description	Custom description	Nearshore areas along the coast (including the Great Lakes) of Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	
Sub Area Requirements	NPS lands and 3 km surrounding	NPS lands and 3 km surrounding	NPS	

MCA Description	Response
Mission Critical Activity	Provide strategic planning, technical assistance and climate adaptation coordination to coastal parks. Shoreline monitoring/predicting, coastal geomorphologic change measurement. We use elevation data for coastal analysis. We use it to look at potential inundation areas, potential hazards to infrastructure and potential impact to cultural resources. We use it map cultural resources, for instance finding things like trails that may be hard to see from air photos. We use it determine watershed boundaries
MCA Title	Shoreline Monitoring and Analysis
MCA ID	1318
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: National Park Service (NPS)
Sub-Agency or Division	National Park Service
Organization Mission	The National Park Service preserves unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world, and inspiration of this and future generations.
Program Name	Climate Change Response Program;
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 14 - Cultural Resources Preservation and Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Nice to have
Other	Required
Other description	Tidal datums; Accurate Datum reference

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Trails, ruins, monuments, graves, signs; Survey control marks; archeological sites, shoreline protection structures,, Shoreline protection structures, archeological sites,

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL1B	QL0B	
Update Frequency	4-5 years	4-5 years	Annually and certain events.	
Event type(s)			Event driven only	
Quality Level and/or update frequency variability across AOI	Frequency requirements depend on the rate of change for an area		Mapping seagrass areas annually, other areas event driven	
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Less than 50 cm	The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Less than 5 cm	Up to 30 cm	Up to 20 cm	
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MHW	
Cross sections and/or transects meet needs	Partial		Partial	
Cross section/transect requirement	It varies, we do cross sections in some parks, accuracy and density needs depend on habitat type.		Depends on the purpose	

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have

Hydrologic Processing Required	Response
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required	Nice to have		Not required	Nice to have
Entire AOI under same environmental conditions	Nice to have	Not required	Nice to have		Not required	Highly desirable
Other	Highly desirable					
Other description	Seamless bathy-topo					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Highly desirable	Highly desirable	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Required	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Required	
Sea ice conditions			Highly desirable	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Required	
Floating observation/navigation systems			Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Nice to have	Required	
Wetlands	Required	Required	Required	
Estuaries			Required	
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Required	Required	
Cultural resources	Required	Required	Required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	I'm using a combination of USGS 1 arc second, 1/3 arc second, and 1/9 arc second data. In addition to different lidar products acquired from various sources at various dates	Best available	LiDAR elevations for land surface accurate to 1m horizontally, 15cm vertically. Nearshore and offshore oceanic bathymetry - 2m horizontal, 20cm vertical. Shallow estuarine bathymetry - 2m horizontal, 20cm vertical	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts		Yes		
USGS Inland Waters server		Yes		
USGS data series				
Marine Minerals Program GIS				

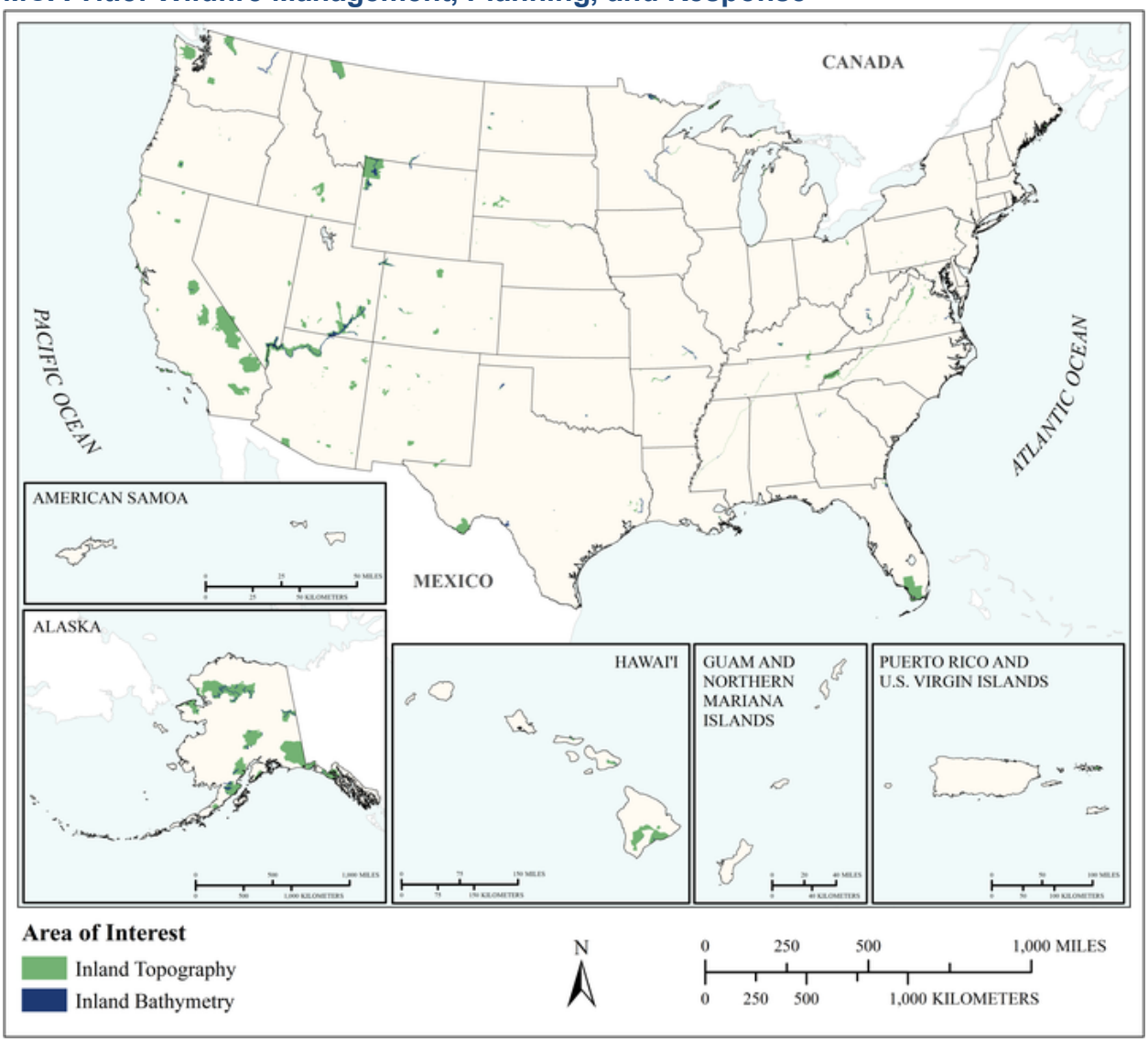
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State Repositories				
State repositories used				
Other	Yes		Yes	
Other description	Partners (USGS, URI Environmental Data Center		USGS, USGS post-Sandy survey	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know	Major	
Cost savings/cost reduction	Moderate	I don't know	Major	
Cost avoidance	Major	I don't know	Moderate	
Increased revenues	None	I don't know	I don't know	
Mission-driven performance improvements	Major	I don't know	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know	Major	
Improved response or timeliness	Moderate	I don't know	Moderate	
Improved customer experience	Major	I don't know	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	I don't know	Moderate	
Environmental	Major	I don't know	Major	
Public safety, including life and property	Moderate	I don't know	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Minor	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Minor	Unable to provide		Major	Unable to provide				
Increased revenues	None			None			Major	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Other operational benefits	Major	Unable to provide										
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate					
Education or outreach description							Education and/or outreach tends to be about a decade behind current technology					
Environmental	Moderate			Moderate			Moderate					
Public safety, including life and property	Moderate			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies		
Sub Area Requirements	NPS	NPS		

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60705
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: National Park Service (NPS)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	4-5 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Required			Required	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Required		
Classified point cloud	Highly desirable	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Nice to have		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Not required		
Land use/land cover	Highly desirable	Required		
Wetlands	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts	Nice to have	Required		
Landmark features	Nice to have	Required		
Cultural resources	Nice to have	Required		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major		
Cost savings/cost reduction	Moderate	Major		
Cost avoidance	Major	Major		
Increased revenues	Minor	Major		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		

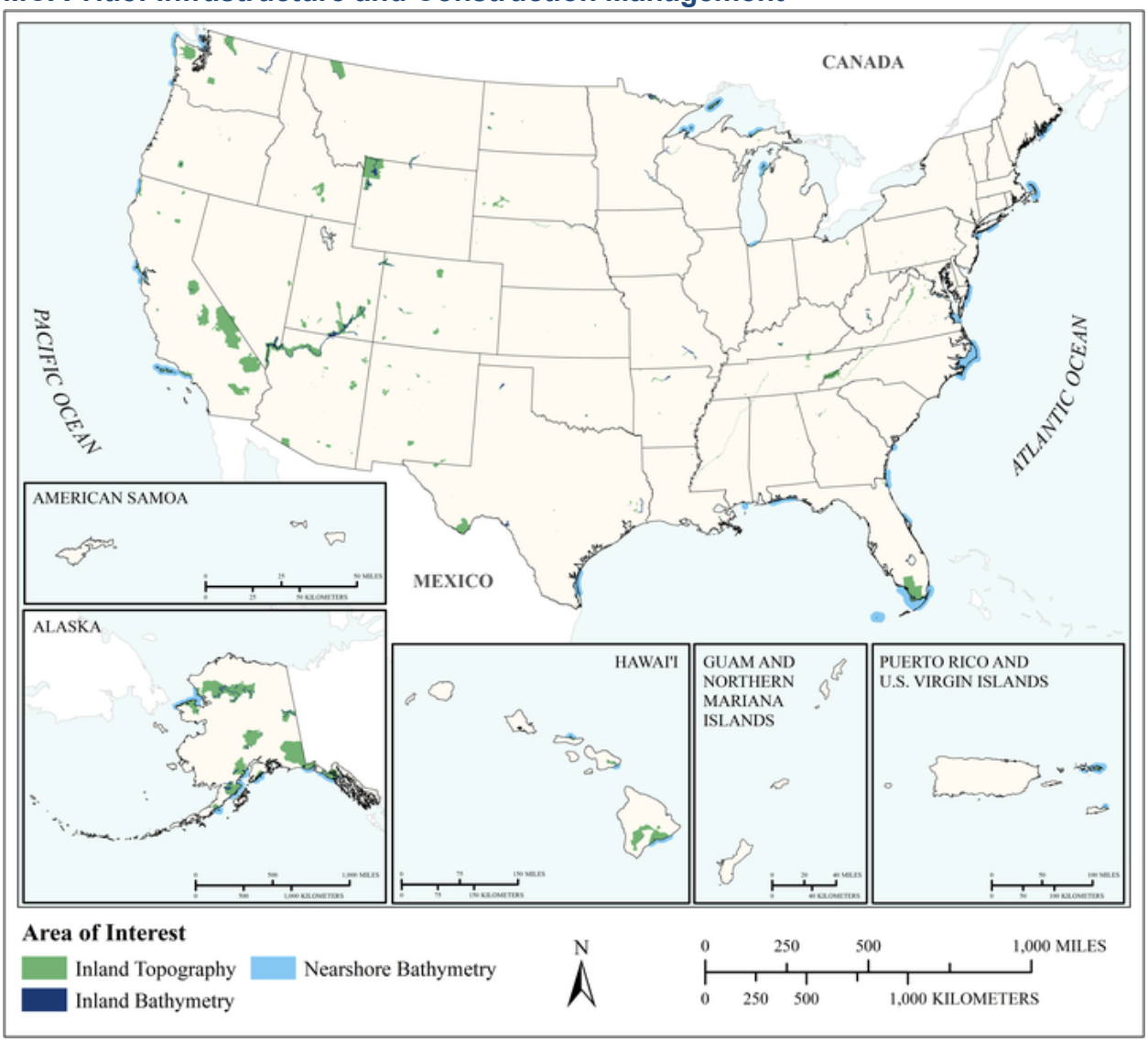
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Major		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Minor	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,152,023									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								
Environmental	Major			Major								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Nearshore areas along the coast (including the Great Lakes) of Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	
Sub Area Requirements	NPS	NPS	NPS	

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change.
MCA Title	Infrastructure and Construction Management
MCA ID	60706
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: National Park Service (NPS)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable

Inland Bathy Feature Size Requirements	Response
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Major	Moderate	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Moderate	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	

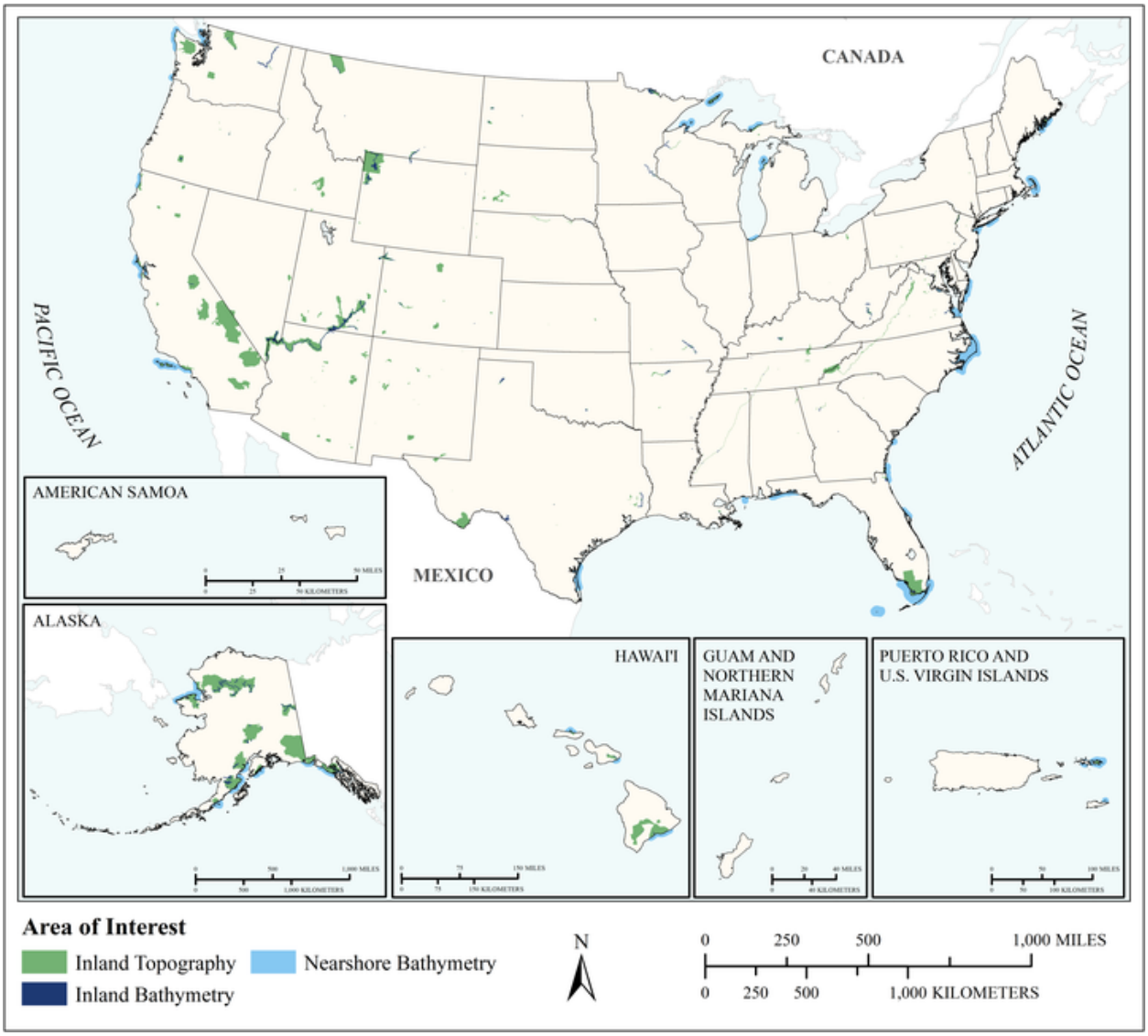
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Moderate	Minor	
Improved customer experience	Moderate	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	
Environmental	Moderate	Minor	Minor	
Public safety, including life and property	Moderate	Moderate	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor					
Environmental	Moderate			Minor			Moderate					
Public safety, including life and property	Major			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Recreation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Nearshore areas along the coast (including the Great Lakes) of Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	
Sub Area Requirements	NPS	NPS	NPS	

MCA Description	Response
Mission Critical Activity	Planning and development of recreational facilities such as rafting, boating, swimming, diving, and fishing areas; ski slopes; and golf courses. Location- based products and services such as maps and guides. Tourism. Trail and vista site planning. Orienteering.
MCA Title	Recreation
MCA ID	60707
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: National Park Service (NPS)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 27 - Recreation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	
Update Frequency	4-5 years	4-5 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Highly desirable		Not required	Not required
Entire AOI under same environmental conditions	Required	Not required	Highly desirable		Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Not required
DEM for entire AOI needs to be seamless	Required	Nice to have	Nice to have		Nice to have	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Nice to have	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Not required	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	
Full waveform	Not required	Nice to have	Not required	
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Not required	Nice to have	Not required	
Ground control/ground truthing	Nice to have	Nice to have	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Required	Not required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Not required	Highly desirable	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Highly desirable	
Boundaries			Not required	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Not required	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Not required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	
Cost savings/cost reduction	Moderate	Minor	Minor	
Cost avoidance	Major	Minor	Minor	
Increased revenues	None	Minor	Minor	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Minor	Minor	

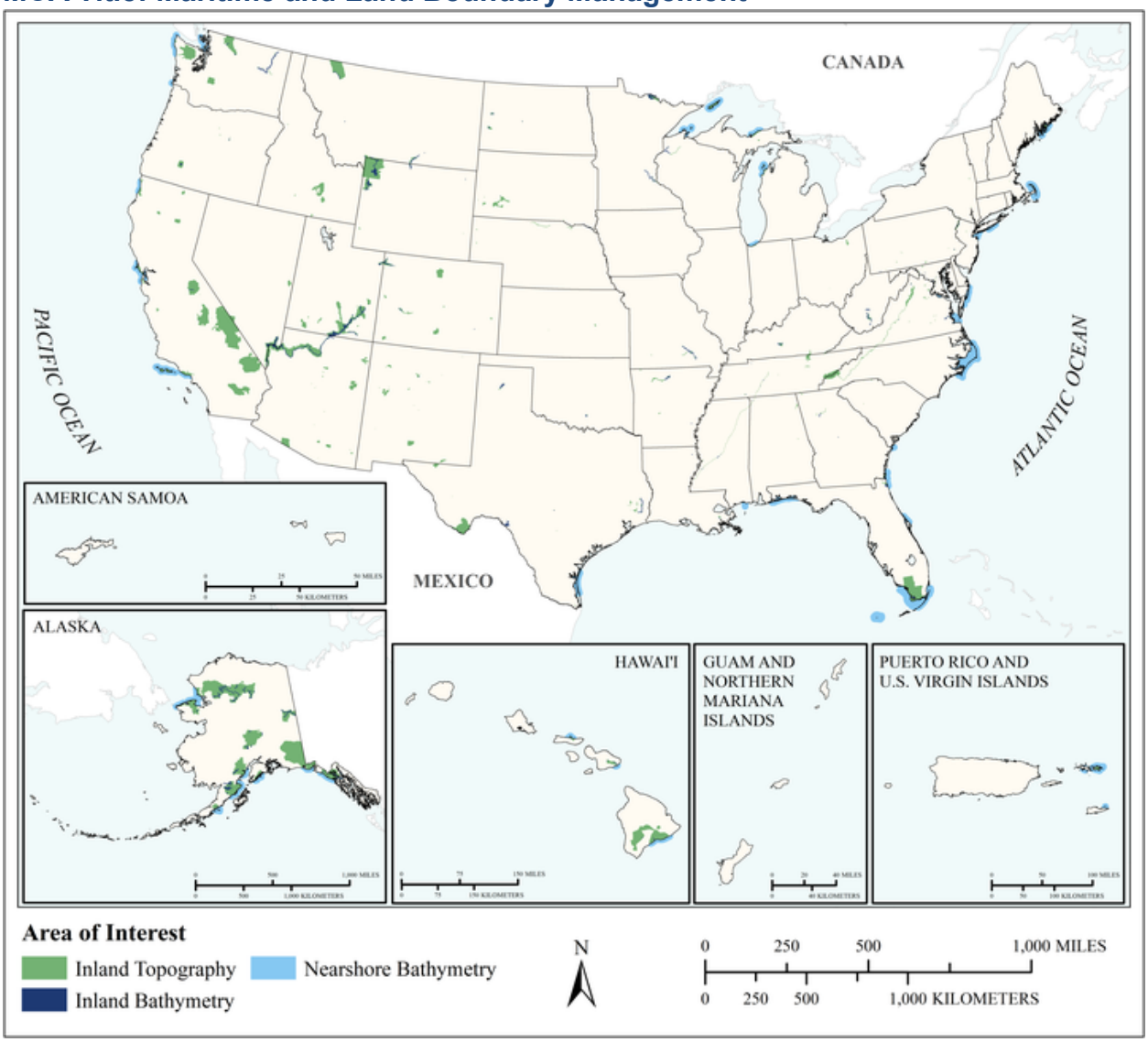
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Minor	Minor	
Improved customer experience	Moderate	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	
Environmental	Major	Minor	Minor	
Public safety, including life and property	Major	Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	None			Moderate	Unable to provide		Moderate	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$287,471		Annual dollars saved/ realized	$173,122						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major					
Environmental	Moderate			Major			Major					
Public safety, including life and property	Moderate			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Maritime and Land Boundary Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	Nearshore areas along the coast (including the Great Lakes) of Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies	
Sub Area Requirements	NPS	NPS	NPS	

MCA Description	Response
Mission Critical Activity	Delimitation of legal and other coastal boundaries, inland boundaries, and ordinary high water lines (OHWL).
MCA Title	Maritime and Land Boundary Management
MCA ID	60708
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: National Park Service (NPS)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 30 - Maritime and Land Boundary Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	
Update Frequency	4-5 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Highly desirable	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have		Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	
DTM	Required	Required	Required	
DEM	Highly desirable	Required	Required	
Raw point cloud data	Nice to have	Highly desirable	Required	
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Required	Not required	
Ground control/ground truthing	Highly desirable	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Required	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Required	Required	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate	None	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Moderate	Minor	Minor	
Increased revenues	None	Moderate	None	
Mission-driven performance improvements	Major	Minor	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Minor	Minor	
Improved customer experience	Major	Minor	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	
Environmental	Major	Moderate	Minor	
Public safety, including life and property	Minor	Minor	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,798,230		Annual dollars saved/ realized	$739,422						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,894,525		Annual dollars saved/ realized	$73,889						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Minor			Major			Major					
Public safety, including life and property	Minor			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

Nuclear Regulatory Commission (NRC)

The NRC licenses and regulates the Nation's civilian use of radioactive materials to provide reasonable assurance of adequate protection of public health and safety and to promote the common defense and security and to protect the environment. NRC's regulatory mission covers three main areas:

- Reactors: Commercial reactors for generating electric power and research and test reactors used for research, testing, and training.
- Materials: Uses of nuclear materials in medical, industrial, and academic settings and facilities that produce nuclear fuel.
- Waste: Transportation, storage, and disposal of nuclear materials and waste, and decommissioning of nuclear facilities from service.

The NRC's overall responsibility is to protect public health and safety. Its main regulatory functions are to:

- Establish standards and regulations;
- Issue licenses for nuclear facilities and users of nuclear materials; and
- Inspect facilities and users of nuclear materials to ensure compliance with the requirements.

These regulatory functions relate to both nuclear power plants and other uses of nuclear materials — such as nuclear medicine programs at hospitals, academic activities at educational institutions, and research. They also relate to such industrial applications as gauges, irradiators, and other devices that contain radioactive material.

The NRC is responsible for regulating domestic activities related to radiation protection and nuclear safety for nuclear facilities and for promoting the common defense and security, and to protect the environment related to the uses of radioactive materials. The NRC issues licenses and oversees licensees for civilian uses of radioactive materials, including commercial nuclear power reactors; research and test reactors; licensed reactor operators; uranium recovery sites; major fuel cycle facilities; research, medical, industrial, government, and academic materials licensees; and independent spent fuel storage installations.

For new reactor facilities, the NRC reviews applications submitted by prospective licensees, and (when appropriate) issues standard design certifications, early site permits, limited work authorizations, construction permits, operating licenses, and combined licenses. For new reactors and other proposed facilities, NRC staff use topographic data in a variety of review areas for the evaluation and independent confirmatory analysis of information submitted by an applicant with an application for a power plant or other applicable facility. NRC recognizes that enhanced elevation data will bring potential improvements to its Mission Critical Activities.

NRC currently uses applicant/licensee provided lidar or survey data, augmented with publicly available data from USGS, NOAA, USACE, and other sources. Licensees may also use publicly available data when submitting a package for review.

High-level summary of elevation data requirements

NRC expressed a preference for nationwide Quality Level 2 (QL2) inland topography updated every 10 years for evaluation of seismic hazards at proposed and existing nuclear facilities. For evaluation of external flood hazards at these sites, NRC expressed a preference for QL2 inland topography, QL2B inland bathymetry, QL1B nearshore bathymetry, and Order 2 offshore bathymetry. The data accuracy and update frequency requirements are primarily project and site specific with a baseline of every 4-5 years

and higher accuracy data needed at specific sites. Data updates are needed when there are flood events that change erosion, sediment, etc. and/or when there are land use changes or changes to site conditions. Coastal zone management requires QL1 inland topography, QL1B inland and nearshore bathymetry, and Order 1a offshore bathymetry. To model the effects of sea level rise, QL0 inland topography, QL1B inland and nearshore bathymetry, and Order 1a offshore bathymetry is required. Infrastructure and construction management requires QL0 inland topography, QL0B inland bathymetry, and QL1B nearshore bathymetry, all updated every 4-5 years.

High-level summary of benefits that would come from higher resolution elevation data

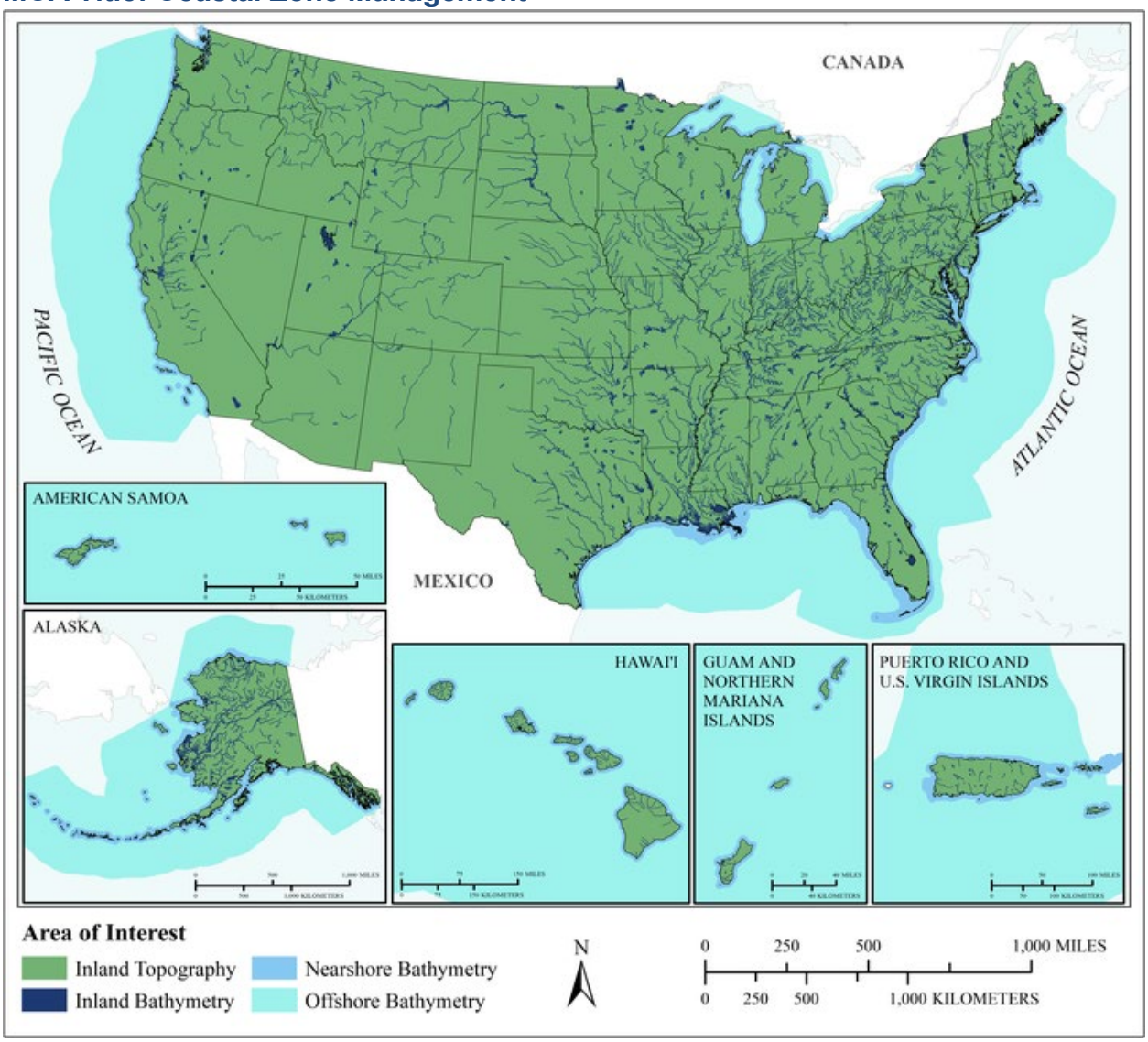
Future annual benefits of having more accurate or current topographic data for evaluation of seismic hazards are minor to moderate. Future annual benefits of having more accurate or current elevation data for evaluation of external flood hazards are moderate to major. Coastal zone management, sea level rise and subsidence, and infrastructure and construction management would experience major future benefits from improved elevation data in the form of significant time and cost savings and overall mission-driven performance improvements. Benefits to NRC would include efficiency in confirmatory modeling and review of submitted analyses, better understanding of uncertainties in flood hazards, avoided loss of property due to natural hazards or disaster events, improved mission compliance, and faster reviews of external flood hazard and risk.

NRC has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 03 – Coastal Zone Management	Nuclear Regulatory Commission (NRC)	60668	Coastal Zone Management	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Nearshore Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Offshore Bathy	Order 1a	6-10 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
BU 10 – Geologic Assessment	Nuclear Regulatory Commission (NRC)	21636	Evaluate Geologic Hazards at Proposed and Existing Nuclear Facilities	Inland Topo	QL2	>10 years	Unable to quantify	Unable to quantify	None	Minor	Moderate
BU 15 – Flood Risk Management	Nuclear Regulatory Commission (NRC)	21490	Evaluate External Flood Hazard and Risk at Proposed and Existing Nuclear Facilities	Inland Topo	QL2	4-5 years	Unable to quantify	Unable to quantify	None	Moderate	Major
				Inland Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	None	Moderate	Major
				Nearshore Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	None	Moderate	Major
				Offshore Bathy	Order 2	Event driven	Unable to quantify	Unable to quantify	None	Moderate	Major
BU 16 – Sea Level Rise and Subsidence	Nuclear Regulatory Commission (NRC)	60669	Sea Level Rise and Subsidence	Inland Topo	QL0	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
				Offshore Bathy	Order 1a	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Moderate
BU 22 – Infrastructure Management	Nuclear Regulatory Commission (NRC)	60670	Infrastructure and Construction Management	Inland Topo	QL0	4-5 years	Unable to quantify	Unable to quantify	Minor	Moderate	Major
				Inland Bathy	QL0B	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Moderate
				Nearshore Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate

MCA Title: Coastal Zone Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Analysis of coastal erosion and inundation. Hurricane storm surge and wind damage modeling and assessment. Coastal hazard modeling and mapping. Coastal hazard mitigation. Tsunami modeling. Land use and environmental planning. Coastal resiliency. Oil spill modeling. Littoral zone management including dunes and beaches.
MCA Title	Coastal Zone Management
MCA ID	60668
Organization Type	Federal Agencies and Commissions
Organization Name	Nuclear Regulatory Commission (NRC)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	Order 1a
Update Frequency	4-5 years and certain events.	4-5 years and certain events.	4-5 years and certain events.	6-10 years and certain events.
Event type(s)	As needed in response to risk changes, not necessarily coincident.	As needed in response to risk changes, not necessarily coincident.	As needed in response to risk changes, not necessarily coincident.	As needed in response to risk changes, not necessarily coincident.
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Highly desirable	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Nice to have
Tide/wave heights			Highly desirable	Nice to have
Sea ice conditions			Not required	Nice to have
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Required	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Moderate
Cost savings/cost reduction	Major	Moderate	Major	Moderate
Cost avoidance	Major	Moderate	Major	Minor
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Moderate	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Major	Moderate

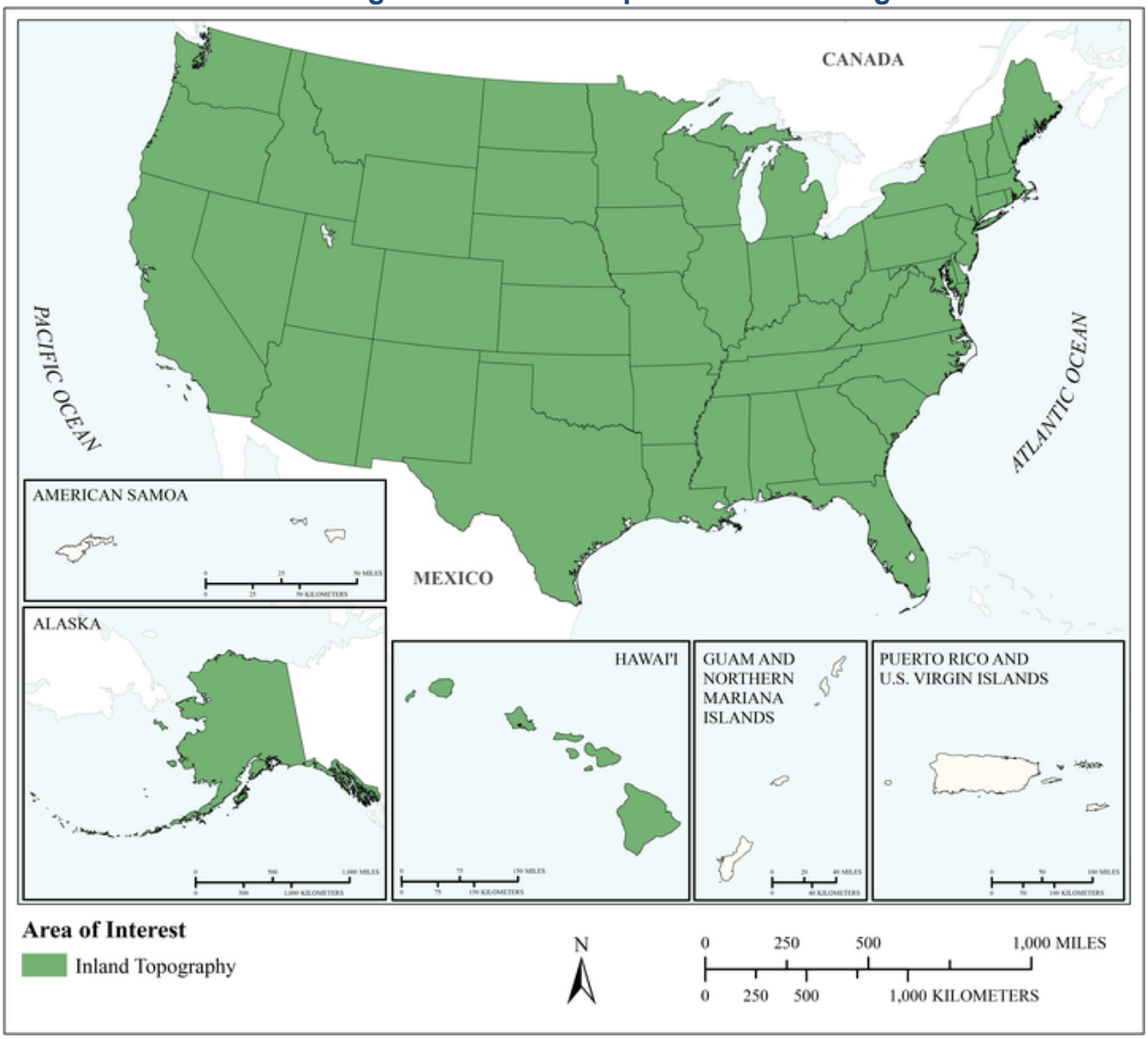
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Moderate	Moderate	Minor
Improved customer experience	Major	Moderate	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Minor
Environmental	Major	Moderate	Major	Moderate
Public safety, including life and property	Major	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	None			None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major			Minor		
Environmental	Major			Major			Major			Moderate		
Public safety, including life and property	Major			Major			Major			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			
Curvature maps	Yes	Yes	Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Evaluate Geologic Hazards at Proposed and Existing Nuclear Facilities



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Nationwide, inland areas			
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Perform and evaluate probabilistic seismic hazard analyses as they relate to siting of new facilities and risk informed regulation of existing facilities. These include commercial reactors for generating electric power; research and test reactors used for research, testing, and training; nuclear materials used in medical, industrial, and academic settings; facilities that produce nuclear fuel; transportation, storage, and disposal of nuclear materials and waste; and decommissioning of nuclear facilities from service. Because these facilities could be sited anywhere within the U.S., elevation data could be needed anywhere, including on smaller islands if nuclear medicine facilities are located there. However, the need for the smallest and/or unpopulated islands is unlikely.
MCA Title	Evaluate Geologic Hazards at Proposed and Existing Nuclear Facilities
MCA ID	21636
Organization Type	Federal Agencies and Commissions
Organization Name	Nuclear Regulatory Commission (NRC)
Sub-Agency or Division	
Organization Mission	The NRC licenses and regulates the Nation's civilian use of radioactive materials to provide reasonable assurance of adequate protection of public health and safety and to promote the common defense and security and to protect the environment.
Program Name	External Hazards Center of Expertise
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Extended linear features, topographic anomalies such as fault scarps and sinkholes.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Update Frequency	>10 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 40 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required			
DTM	Required			
DEM	Required			
Raw point cloud data	Not required			
Classified point cloud	Not required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Nice to have			
Wetlands	Nice to have			
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Applicant's lidar data or best available data for the site (e.g. USGS lidar, NOAA data, Scripps data)			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes			
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor			

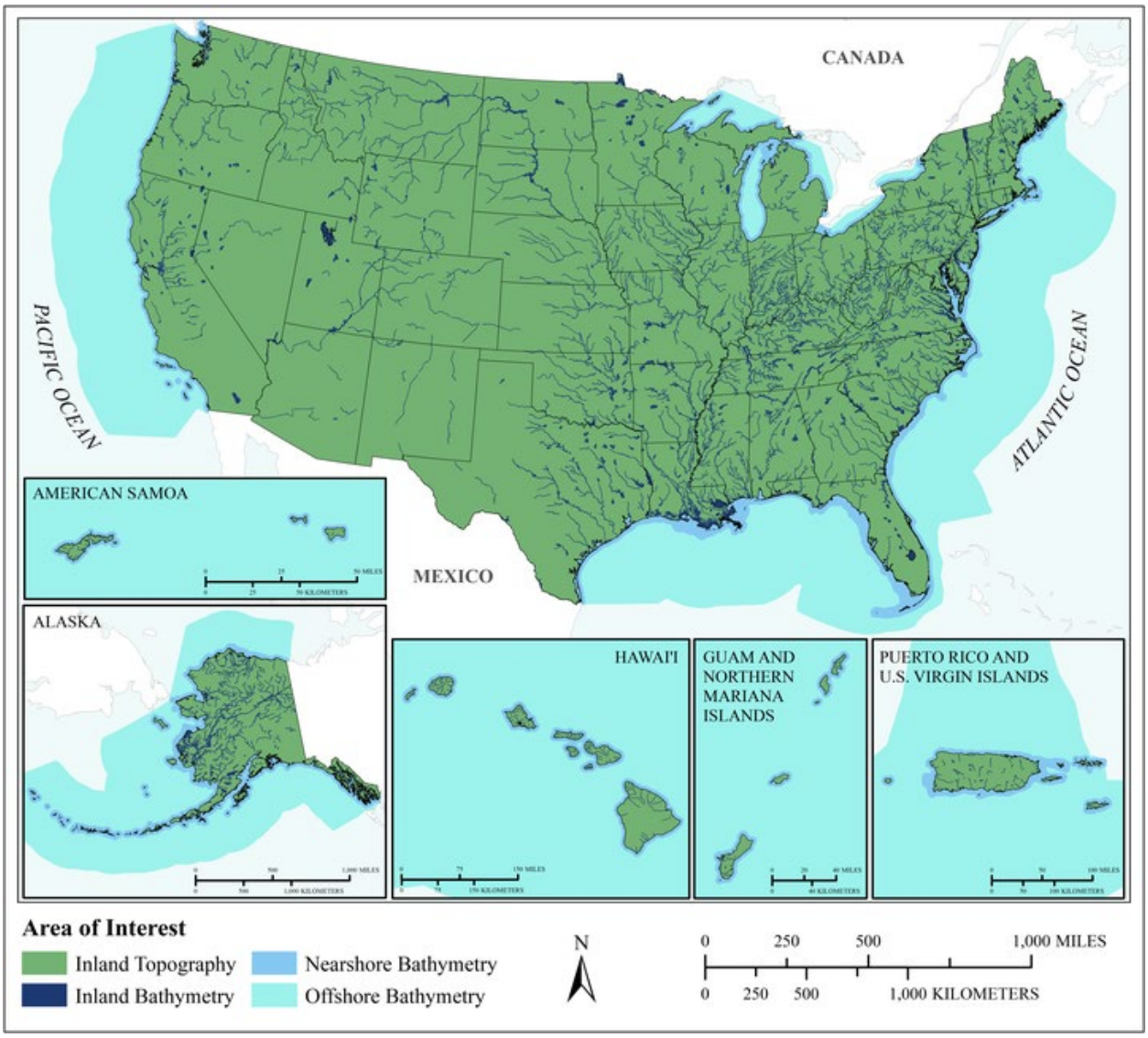
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	None			
Cost avoidance	I don't know			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None			
Improved response or timeliness	Minor			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None			
Environmental	None			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Time savings description	Depends on number of reactor applications/ regulatory activities undertaken.											
Cost savings/cost reduction	None											
Cost savings/cost reduction description	We don't perform these activities.											
Cost avoidance	None											
Increased revenues	None											
Mission-driven performance improvements	Minor	Unable to provide										
Other operational benefits	Minor	Unable to provide										
Other operational benefits description	Depends on regulatory workload.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None											
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None											
Environmental	Minor											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Evaluate External Flood Hazard and Risk at Proposed and Existing Nuclear Facilities



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	States and/or Territories	States and/or Territories	One or more national maritime boundaries	One or more national maritime boundaries
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Federal waters, State waters	Federal waters, State waters

MCA Description	Response
Mission Critical Activity	External Flood Hazard and Risk Analysis. Licensees' data are used if provided, confirmed with publicly available data as necessary. Applicants typically use public data as well, except for actual site development. Storm surge (wind driven) modeling (AdCIRC) extends far offshore.
MCA Title	Evaluate External Flood Hazard and Risk at Proposed and Existing Nuclear Facilities
MCA ID	21490
Organization Type	Federal Agencies and Commissions
Organization Name	Nuclear Regulatory Commission (NRC)
Sub-Agency or Division	
Organization Mission	The NRC licenses and regulates the Nation's civilian use of radioactive materials to provide reasonable assurance of adequate protection of public health and safety and to promote the common defense and security and to protect the environment.
Program Name	External Hazard Center of Expertise, External Flood Probabilistic Risk Analysis, Probabilistic Flood Hazard Analysis, External Flood Hazard Center of Expertise, External Flood Probabilistic Risk Assessment, Probabilistic Flood Hazard Research Assessment Program
Total Annual Program Budget	$1,000,000
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	200,000 sq mi - 2 million sq mi (e.g. large state, large multi-state region such as the Great Basin, standard Federal region, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Roads, curbs, industrial building, bridges, erosion control structures in rivers and on coasts, flood and storm surge control structures, including coastal control structures (jetties, submerged breakwaters).

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Nice to have
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL1B	Order 2
Update Frequency	4-5 years and certain events.	4-5 years and certain events.	4-5 years	Event driven only – Data need to coincide with a specific event.
Event type(s)	Flood events that change erosion, sediment, etc. Also land use changes or changes to site conditions.	As needed in response to risk changes, not necessarily coincident		As needed to characterize risk changes; not necessarily concurrent with an event
Quality Level and/or update frequency variability across AOI	At sites, require highest QL, lower for contributing drainage areas, more frequent at site if site changes			
Acceptable Horizontal Error	Up to 1 meter	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 2 meters	Greater than 20 meters
Acceptable Vertical Error	Up to 30 cm	Up to 30 cm	Up to 20 cm	Up to 2 meters
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			Any tide correction is acceptable, as long as it is defined	Any tide correction is acceptable, as long as it is defined
Cross sections and/or transects meet needs	Partial	Partial	Partial	Partial

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement	Cross sections are acceptable when resolution is not important, such as large scale hydrologic analysis, as opposed to routing of flood waters on site. Both require topographic information at different scales and would be specific to the analysis.	Where 1D modeling is acceptable, spaced to accurately describe significant floodplain & channel expansions, changes in bed slope, roughness and discharge; with delX<=0.15* bankfull depth/bed slope (Samuels 1989). Feature size sufficiently dense to accurately describe bed properties and changes. Vertical accuracy same as all inland bathymetry.	Away from the site AOI and beneath the water surface, detailed cross-shore transects with longshore transects to document variability acceptable (e.g. cross-shore every 1000').	Transects are acceptable in the offshore as our need for wave and current modeling is less affected by bathymetry in the deep water.

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	Nice to have
DTM	Required	Highly desirable	Nice to have	Nice to have
DEM	Required	Required	Required	Highly desirable
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Nice to have
Classified point cloud	Nice to have	Nice to have	Not required	
Edited/cube XYZ		Highly desirable	Nice to have	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Not required	Not required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Required
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Not required	Nice to have
Ground control/ground truthing	Highly desirable	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Highly desirable	Nice to have
Bottom type			Highly desirable	Nice to have
Submerged features			Highly desirable	Not required
Subbottom characteristics			Not required	Not required
Geologic and seismic data	Nice to have	Highly desirable	Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Required	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Not required	Not required
Boundaries			Not required	Not required
Routes			Nice to have	Not required
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Not required
Floating observation/navigation systems			Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Highly desirable	Highly desirable	Highly desirable	Not required
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Required	
Bridges/culverts	Highly desirable	Required		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Nice to have	Not required	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	At site, LIDAR and survey information from property owners, local and federal, Coarser watershed data from public sites. USGS topo maps, NOAA bathymetry maps/navigation charts.	Bathymetry from a variety of sources include publically available shapefiles, Corps surveys, REMA, surveys, licensee Surveys. QL2-QL3 common. Dates range, though most recent surveys are since 2012. NOAA bathymetry, charts, datasets.	NOAA NOS, USACE, USGS, county and local government surveys, Inland Navigation District surveys, water management district surveys, Types of data have included traditional sounding data, trackline surveys, Lidar surveys, and navigation channel survey data.	NOAA NOS, USACE, USGS. Types of data have included traditional sounding data, trackline surveys, and navigation channel survey data.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast			Yes	
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts				
USACE navigation charts		Yes		
USGS Inland Waters server		Yes		

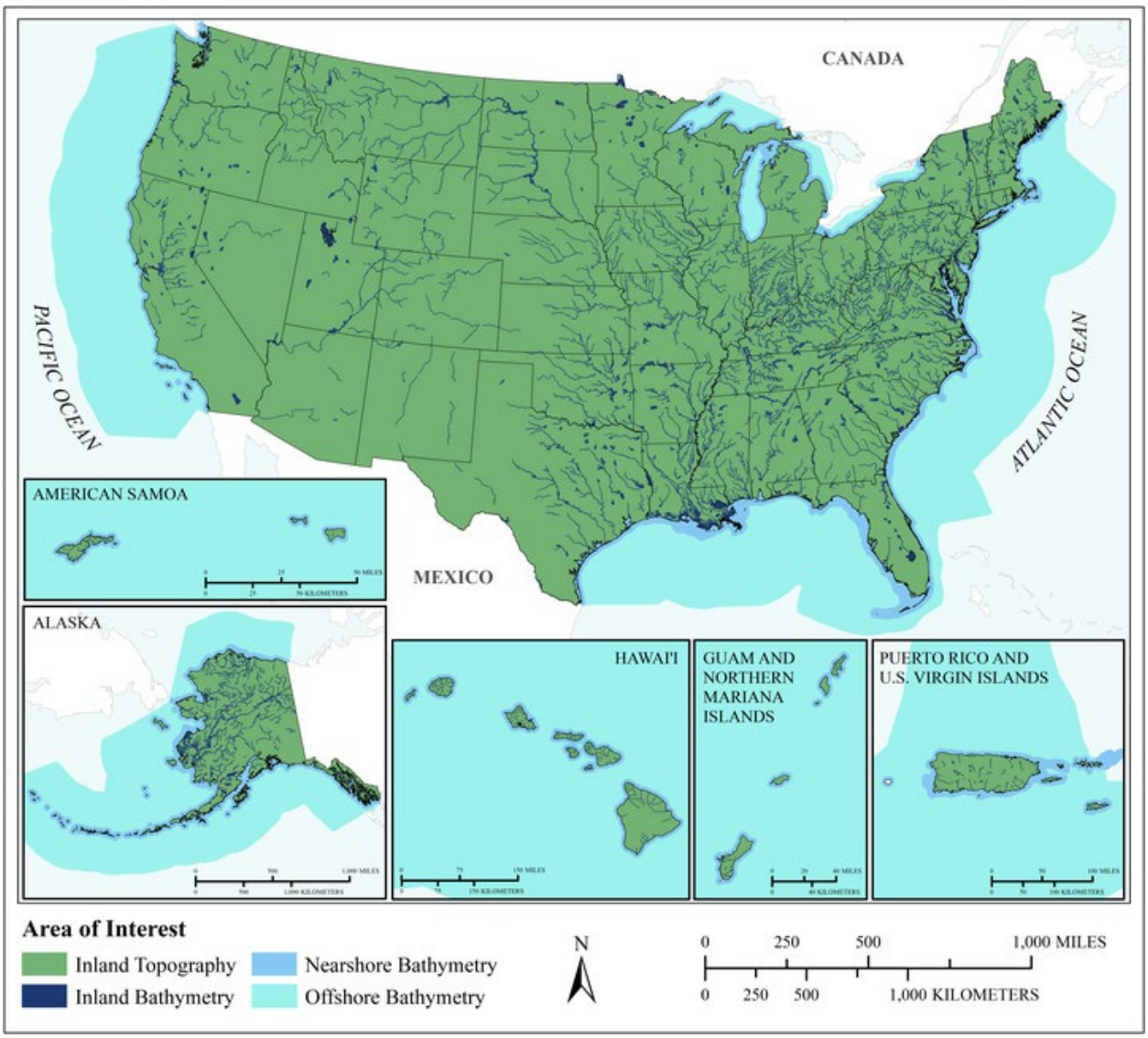
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	Site specific	Site specific	Site specific	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Major
Cost savings/cost reduction	Minor	Minor	Minor	Minor
Cost avoidance	Moderate	Moderate	Moderate	Moderate
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Moderate	None
Improved response or timeliness	Major	Major	Major	Major
Improved customer experience	Minor	Moderate	None	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	None	None	None
Environmental	Moderate	Moderate	Moderate	Moderate
Public safety, including life and property	Major	Major	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Time savings description	Efficiency in confirmatory modeling and review of submitted analyses. Efficiency in data manipulation in confirmatory modeling and review of submitted analyses. May indicate areas of concern for inspectors, reducing inspection/audit time. Save review time in license oversight.			May indicate areas of concern for inspectors, reducing inspection time. Efficiency in confirmatory modeling and review of submitting analyses. Efficiency in data manipulation in confirmatory modeling and review submitted analyses.			Efficiency in data manipulation for confirmatory modeling. Save review time. Efficiency of confirmatory modeling and model review. May indicate areas of concern for inspectors.					
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction description	No purchase of material.						No purchase of material.					
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost avoidance description	External flood hazard analysis for safety mission. No need for contracting or in-house support or resources.			External flood hazard analysis for safety mission. No need for contracting.			External flood hazard analysis for safety mission. No need for contracting or in-house support or resources.					
Increased revenues	None			None			None			None		
Increased revenues description	No revenues.			No revenues.			No revenues.					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements description	Model support for decision making. Use of probabilistic analysis for better realism, more details in models. Safety mission to understand external flood hazard risk.			Model support for decision-making. Use of probabilistic analysis for better realism, more details in models. Safety mission to understand external flood hazard risk.			Use of probabilistic analysis and detailed geographic data for better analyses. Model support for decision making. Safety mission to understand external flood hazard risk.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Value added to products or services description	Better understanding of uncertainties in flood hazards. No products or apps produced.			Better understanding of uncertainties in flood hazards. No products or apps produced.			Better understanding of uncertainties in flood hazards. No products or apps produced.			Better understanding of uncertainties in flood hazards.		
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness description	Responders are mostly local. Recovery staff generally use coarse data. Faster reviews of external flood hazard and risk.			Responders are mostly local. Faster reviews.			Faster reviews of external flood hazard and risk.					
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience description	Increased confidence in realism of flood analyses.						Increased confidence in realism in flood analyses.					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None			None			None		
Environmental	Moderate			Moderate			Moderate			Moderate		
Environmental description	EIS applications			EIS applications			EIS applications					
Public safety, including life and property	Major			Major			Major			Major		
Public safety, including life and property description	Safety mission for external hazards			Safety mission for external flood hazards			Safety mission for external hazards					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes		Yes	
Viewshed maps				
Hydrologic Flow Direction Grids	Yes		Yes	
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60669
Organization Type	Federal Agencies and Commissions
Organization Name	Nuclear Regulatory Commission (NRC)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL1B	QL1B	Order 1a
Update Frequency	4-5 years and certain events.	4-5 years and certain events.	2-3 years and certain events.	6-10 years and certain events.
Event type(s)	As needed in response to risk changes, not necessarily coincident.	As needed in response to risk changes, not necessarily coincident.	As needed in response to risk changes, not necessarily coincident.	As needed in response to risk changes, not necessarily coincident.
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Required	Nice to have	Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required	Nice to have	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Required	Required	Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	Nice to have
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Required
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Not required	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Not required
Water column properties - Biological			Nice to have	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Moderate
Cost savings/cost reduction	Major	Moderate	Major	Moderate
Cost avoidance	Major	Major	Major	Moderate
Increased revenues	None	Minor	Minor	None
Mission-driven performance improvements	Major	Major	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major

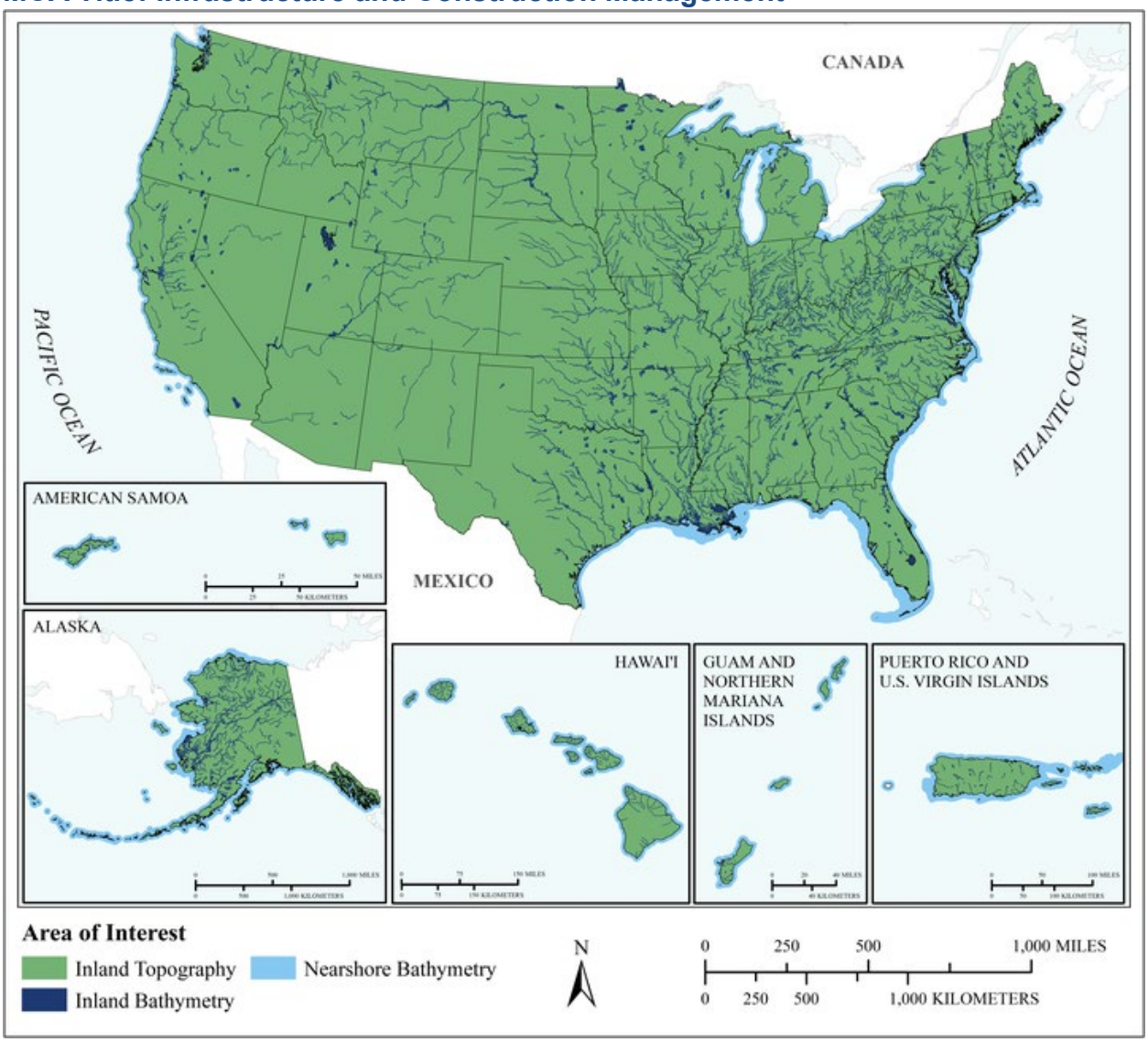
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Moderate	Moderate	Moderate
Improved customer experience	Moderate	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Moderate
Environmental	Major	Moderate	Major	Moderate
Public safety, including life and property	Major	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major			Major		
Environmental	Moderate			Major			Major			Major		
Public safety, including life and property	Moderate			Major			Minor			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness		Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	

MCA Description	Response
Mission Critical Activity	Marine construction. Bridge design and construction. Engineering and construction of dams, levees, dikes, reservoirs, and coastal structures. Shipyard and port construction. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change. Unable to provide most benefits due to irregularity of flood analyses. Program costs are very rough estimates. Use of the term "required" is not appropriate for NRC. Please assume for those questions, NRC means "preferred". Requirements are site-specific and risk-informed. Estimated annual budget does not include costs or cost savings of business uses for elevation data outside of those described above. That is to say that those costs do not include costs for facility construction or oversight such as new plants, plant decommissioning of fuel cycle facilities.
MCA Title	Infrastructure and Construction Management
MCA ID	60670
Organization Type	Federal Agencies and Commissions
Organization Name	Nuclear Regulatory Commission (NRC)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 24 - Health and Human Services
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL1B	
Update Frequency	4-5 years and certain events.	4-5 years and certain events.	4-5 years and certain events.	
Event type(s)	As needed in response to risk changes, not necessarily coincident.	As needed in response to risk changes, not necessarily coincident.	As needed in response to risk changes, not necessarily coincident.	
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Nice to have		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Major	Moderate	Minor	
Cost avoidance	Major	Moderate	Minor	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Moderate	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Moderate	Minor	
Improved customer experience	Moderate	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	
Environmental	Moderate	Minor	Minor	
Public safety, including life and property	Moderate	Moderate	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor					
Environmental	Moderate			Minor			Moderate					
Public safety, including life and property	Major			Moderate			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes	Yes	
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Natural Resources Conservation Service (NRCS)

NRCS delivers conservation solutions so agricultural producers can protect natural resources and feed a growing world. NRCS helps private landowners improve the health of their operations while protecting our natural resources for the future and works to ensure the long-term sustainability of American agriculture.

NRCS oversees the following natural resources conservation programs designed to help people reduce soil erosion, enhance water supplies, improve water quality, increase wildlife habitat, and reduce damages caused by floods and other natural disasters. Lidar data support all of these activities which enact conservation on the ground.

Financial Assistance Programs

- Conservation Stewardship Program (CSP) - helps owners and operators of agricultural lands maintain conservation stewardship and implement and maintain additional needed conservation practices. The conservation benefits gained will keep farms and ranches more sustainable and profitable and increase the benefits provided to all Americans through improved natural resources.
- Conservation Innovation Grants (CIG) - intended to stimulate the development and adoption of innovative conservation approaches and technologies while leveraging federal investment in environmental enhancement and protection, in conjunction with agricultural production. Includes the CSP.
- Environmental Quality Incentives Program (EQIP) - provides technical and financial help to farm and forest landowners for conservation practices that protect soil and water quality. Grassed waterways, stream fencing, critical area planting, terraces, manure management systems including storage structures and barnyard runoff protection, and many other conservation practices are eligible for EQIP.
- Emergency Watershed Protection Program (EWP) - EWP is intended to take emergency measures to safeguard lives and property after a natural occurrence has caused a sudden impairment of the watershed. Through EWP, NRCS may purchase easements on any floodplain lands that have a history of repeated flooding.
- Regional Conservation Partnership Program (RCPP) - uses partnerships to multiply conservation investments and reach goals on a regional or watershed scale, promoting coordination between partners to deliver assistance to producers and landowners.

Easement Programs

- Agricultural Conservation Easement Program (ACEP) - ACEP provides financial and technical assistance to help conserve agricultural lands and restore wetlands. Under the Agricultural Land Easements component, NRCS helps state and local governments, American Indian tribes, and non-governmental organizations protect working agricultural lands and limit non-agricultural uses of the land. Under the Wetlands Reserve Easements component, NRCS helps to restore, protect and enhance wetlands that have been altered for agriculture.
- National Water Quality Initiative - committed to improving impaired waterways throughout the nation. NRCS will help farmers and forest landowners in the selected watersheds to begin needed conservation practices to reduce sediment and nutrients entering the waterway.

Technical Assistance

- Conservation Technical Assistance (CTA) - through CTA, NRCS assists landowners and land users, communities, units of state and local government, tribes, and other federal agencies in planning and implementing conservation systems.
- Conservation Reserve Program (CRP) - CRP can reduce erosion, increase wildlife habitat, improve water quality, and increase forestland. Landowners sets aside cropland with annual rental payments based on amount bid. Tree planting, wildlife ponds, grass cover, and other environmental practices are eligible practices. This program is administered by FSA and NRCS provides technical assistance.
- Conservation Compliance - in order to participate in USDA farm programs, federal law requires that all persons that produce agriculture commodities must protect their highly erodible cropland from excessive erosion. In addition, anyone participating in USDA farm programs must certify that they have not produced crops on converted wetlands and did not convert a wetland.

Importance of elevation data to NRCS

Statewide lidar data is a huge benefit to NRCS field planners. A comment that often comes from states that do not yet have statewide lidar coverage is how amazed and impressed at all the possibilities that can come from data usage for conservation planning.

Soil surveys in the U.S. have the greatest need to be improved and remodeled. Just as older USGS quad maps were demonstrated to no longer serve our needs, all U.S. soils surveys would drastically improve agency goals if they were modeled nationwide using lidar. All spatial decisions that are made are as good as the worst dataset used. Soils Surveys are one of the least accurate and yet most used dataset across many USDA agencies. Alignment of agency policies with new lidar data use and applications will allow NRCS to move forward with better data driven decision processes.

The Soil Science Division (SSD) produces and maintains Coastal Zone Soil Survey maps containing high resolution (≤ 1:12,000 mapping scale) soil spatial and tabular data used for fisheries management and aquaculture and coastal zone management. SSD also provides data interfaces containing interpretation reports that process said data into plain language interpretations targeted at coastal managers including aquaculture producers and coastal zone managers. Inland and nearshore bathymetry are needed for identification of subaqueous soils on Coastal Zone Soil Survey maps.

High-level summary of elevation data requirements

NRCS requires nationwide Quality Level 2 (QL2) inland topography updated every 4-5 years and QL2B inland bathymetry updated every 6-10 years for planning, design, engineering, and technical assistance. For Coastal Zone Soil Survey mapping, QL2 inland topography is needed every 6-10 years and QL3B inland bathymetry updated every 10 years is required for coastal areas up to the 20 feet in elevation. QL3B nearshore bathymetry is required nationwide every 4-5 years.

High-level summary of benefits that would come from higher resolution elevation data

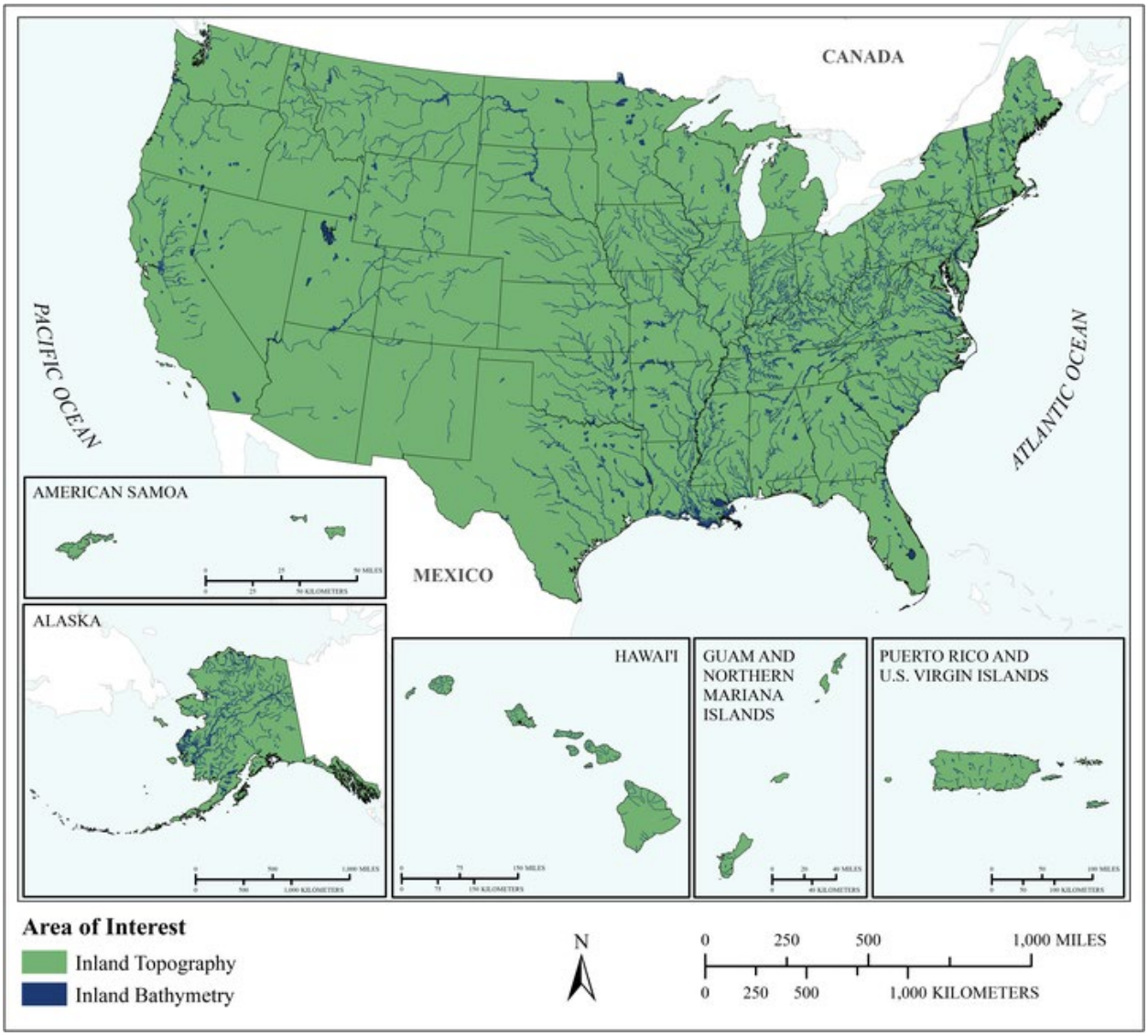
Major benefits that come from improved elevation data include significant hours saved from faster and/or avoided field visits, more efficient modeling and reviews, reduced or avoided data manipulation, in-office project planning or monitoring, and improved accuracy of products or services. Other benefits include cost avoidance from data processing and data errors avoided and overall increased program effectiveness.

NRCS has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 06 – Natural Resource Management	USDA: Natural Resources Conservation Service (NRCS)	22128	Natural Resources Conservation Planning, Design, Engineering, and Technical Assistance	Inland Topo	QL2	4-5 years	$5,044,474	$1,020,517	Moderate	Major	Moderate
				Inland Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	None	None	None
BU 09 – Fisheries Management and Aquaculture	USDA: Natural Resources Conservation Service (NRCS)	11474	Coastal Zone Soil Survey Mapping	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	I don't know
				Inland Bathy	QL3B	>10 years	Unable to quantify	Unable to quantify	Moderate	Major	I don't know
				Nearshore Bathy	QL3B	4-5 years	$10,824	Unable to quantify	Moderate	Major	I don't know

MCA Title: Natural Resources Conservation Planning, Design, Engineering, and Technical Assistance



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	States and/or Territories	States and/or Territories		
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		

MCA Description	Response
Mission Critical Activity	Natural Resource Conservation: Implement conservation to protect soils, water, wetlands, grazing lands, forests, and other related natural resources on non-federal land. This includes site inventory and analysis which involves mapping of stream channels, soils, wetlands, and highly erodible lands, among other characteristics related to the soil, as well as modeling of biological and ecological systems for the purposes of designing conservation practices. It also includes planning and design of agricultural systems that benefit natural resource conservation and address individual issues to include water quality and quantity, energy conservation, and erosion control and impacts from slope and surface drainage networks on agronomic and structural practices. The goal is to support sustained, productive, working farms and ranches that optimize natural resource benefits, enhance and sustain the quality and quantity of water resources, and protect sensitive environmental features. Technical Assistance: Provide technical GIS assistance to users as well as GIS datasets that aid farmers and NRCS field staff. Lidar and updated imagery are large pieces of that pie. Lidar data is used by soil scientists, wetland specialists, engineers, and field office staff for planning and by various state office staff including biologists, range scientists, program support staff, archeologists, agronomists, and water resources engineers. NRCS also supports many other activities that impact the health of our natural resources to include assessment of blue carbon stocks, aquatic and terrestrial species habitat management; environmental management; forest health assessment; prescribed burning; assessment of rangeland health; climate monitoring and modeling; and snow survey, monitoring, modeling, and forecasting. Additional Business Uses for NRCS programs include BU 01 - Water Supply and Quality, BU 02 - Riverine Ecosystem Management, BU 04 - Forest Resources Management, BU 07 - Wildlife and Habitat Management, BU 10 - Geologic Assessment and Hazard Mitigation, BU 14 - Cultural Resources Preservation and Management, and BU 15 – Flood Risk Management.
MCA Title	Natural Resources Conservation Planning, Design, Engineering, and Technical Assistance
MCA ID	22128
Organization Type	Federal Agencies and Commissions
Organization Name	USDA: Natural Resources Conservation Service (NRCS)
Sub-Agency or Division	
Organization Mission	Provide products and services that enable people to be good stewards of the Nation's soil, water, and related natural resources on non-Federal lands. Science and technology are the critical foundation for effective conservation. NRCS experts from many disciplines come together to help landowners conserve natural resources in efficient, smart, and sustainable ways. Whether developed in a laboratory or on the land, NRCS science and technology helps landowners make the right decisions for every natural resource concern.

Program Name	Financial Assistance Programs Conservation Stewardship Program (CSP) - helps owners and operators of agricultural lands maintain conservation stewardship and implement and maintain additional needed conservation practices. The conservation benefits gained will keep farms and ranches more sustainable and profitable and increase the benefits provided to all Americans through improved natural resources. Conservation Innovation Grants (CIG) - intended to stimulate the development and adoption of innovative conservation approaches and technologies while leveraging Federal investment in environmental enhancement and protection, in conjunction with agricultural production. Includes the Conservation Stewardship Program. Environmental Quality Incentives Program (EQIP) - provides technical and financial help to farm and forest landowners for conservation practices that protect soil and water quality. Grassed waterways, stream fencing, critical area planting, terraces, manure management systems including storage structures and barnyard runoff protection, and many other conservation practices are eligible for EQIP. Emergency Watershed Protection Program (EWP) - EWP is intended to take emergency measures to safeguard lives and property after a natural occurrence has caused a sudden impairment of the watershed. Through EWP, NRCS may purchase easements on any floodplain lands that have a history of repeated flooding. Regional Conservation Partnership Program (RCPP) - uses partnerships to multiply conservation investments and reach goals on a regional or watershed scale, promoting coordination between partners to deliver assistance to producers and landowners. Easement Programs Agricultural Conservation Easement Program (ACEP) - ACEP provides financial and technical assistance to help conserve agricultural lands and restore wetlands. Under the Agricultural Land Easements component, NRCS helps state and local governments, Indian tribes, and non-governmental organizations protect working agricultural lands and limit non-agricultural uses of the land. Under the Wetlands Reserve Easements component, NRCS helps to restore, protect and enhance wetlands that have been altered for agriculture. National Water Quality Initiative - committed to improving impaired waterways throughout the nation. NRCS will help farmers and forest landowners in the selected watersheds to begin needed conservation practices to reduce sediment and nutrients entering the waterway. Technical Assistance Conservation Technical Assistance (CTA) - Through Conservation Technical Assistance, NRCS assists landowners and land users, communities, units of state and local government, Tribes, and other Federal agencies in planning and implementing conservation systems. Conservation Reserve Program (CRP) - CRP can reduce erosion, increase wildlife habitat, improve water quality, and increase forestland. Landowners sets aside cropland with annual rental payments based on amount bid. Tree planting, wildlife ponds, grass cover, and other environmental practices are eligible practices. This program is administered by FSA and NRCS provides technical assistance. Conservation Compliance - In order to participate in USDA farm programs, Federal law requires that all persons that produce agriculture commodities must protect their highly erodible cropland from excessive erosion. In addition, anyone participating in USDA farm programs must certify that they have not produced crops on converted wetlands and did

	not convert a wetland. Additional Business Uses for NRCS are BU 01 – Water Supply and Quality, BU 02 – Riverine Ecosystem Management, BU 04 – Forest Resources Management, BU 07 – Wildlife and Habitat Management, BU 10 – Geologic Assessment and Hazard Mitigation, BU 14 – Cultural Resources Preservation and Management, and BU 15 – Flood Risk Management.
Total Annual Program Budget	$9,450,000,000
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 08 - Agriculture and Precision Farming
Tertiary Business Use	BU 05 - Rangeland Management

What Needs to be Measured in 3D	**Response**
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required
Other	Required
Other description	Corrected surface flow of water derived from HydroDEM

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Archeological features, acequias (water ditches), gullies, grade stabilization structures, terraces, floodwater control berms, dams and their watersheds, vegetation structures on range land, survey monuments, individual trees, field borders, sinkholes, edge of water, trails, culverts, individual potholes, or wetlands.

Inland Bathy Feature Size Requirements	**Response**
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Required
51 - 100 ft	Not required
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Required
2.1 – 5 acres	Not required

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Not required
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	4-5 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	Remote, uninhabited islands don't need as high a quality level. Higher update frequency needed for flood plains and areas with urban sprawl.			
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Not required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Required		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Nice to have	Nice to have		
Wetlands	Highly desirable	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	NRCS has a copy of the US Elevation Inventory that is QL3 or better to create a best available elevation products and services and web services to support agency mission critical applications. Areas with more than one dataset to choose from we go with the most current and highest quality level. If a state has >=QL3 then we are helping fund the update or refresh to QL2 or better for all agricultural lands in the USA and US Territories.	NRCS uses data available from the NOAA digital coast. NRCS soil science has requirements for mapping subaqueous soils and is using what data are available in the public domain		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes		
NCEI	Yes			
Open Topography				
NOAA nautical charts				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Best available			
Other	Yes	Yes		
Other description	Internal file servers	No		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	None		
Cost savings/cost reduction	Major	None		
Cost avoidance	Major	None		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate		
Environmental	Major	Moderate		
Public safety, including life and property	Moderate	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$4,324,475	Major	Unable to provide							
Time savings description	More alternative solutions can be quickly modeled and developed. Field staff can complete planning and only travel to the field for final design work. Improved hydrologic enforcement would save time on the design of practices and practice alternatives, beyond the savings already in place from QL2 and QL3 Lidar currently in use. Consistent model and outputs resulting in more defensible and verifiable proposals. Improved ability to target areas for conservation. Reduced field visits and travel time to field from improved hydrologic enforcement in data, ability to do more erosion determination and soils maps evaluation in office. Reduced field work for dam assessment and rehabilitation projects. Compliance Determinations (HEL/Wetlands). Improved preliminary engineering design and cost estimates. Improved Drainage Area determinations (slope/flow length/CN/Design Q). Less time spent burning in culverts. Aggregation of all conservation practice design efficiency gains. Less of a shot gun approach to conservation more targeted to specific location where real need exists. Consistency will reduce variation across states. Avoiding edge matching, adjustments, reprojections, etc every time a new area is completed.											
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction description	Less human time cost to collect GPS survey data and time saved means ability to do more sites in the same time-frame. Determinate project feasibility sooner. Construction projects are more appropriately sized and save in building materials. Lidar improves accuracy of proposal, can mean increase or decrease costs, not only less. Ease of developing alternative solutions.											
Cost avoidance	Major	Annual dollars saved/realized	$720,000	Major	Unable to provide							
Cost avoidance description	Systematic hydro enforcement would save staff time spent on ad-hoc hydro enforcement. Reduction of conversion from in-field surveys to AutoCad drawings. Flood mapping improvements and mitigation. Planning of flood-control infrastructure maintenance or removal. Flood protection improvements for property below dams. Conservation planning is not the deterministic factor in many of the example areas. Consistency across state. Avoid repeat field trips for verification using questionable data sources.											
Increased revenues	Moderate	Unable to provide		Major	Unable to provide							

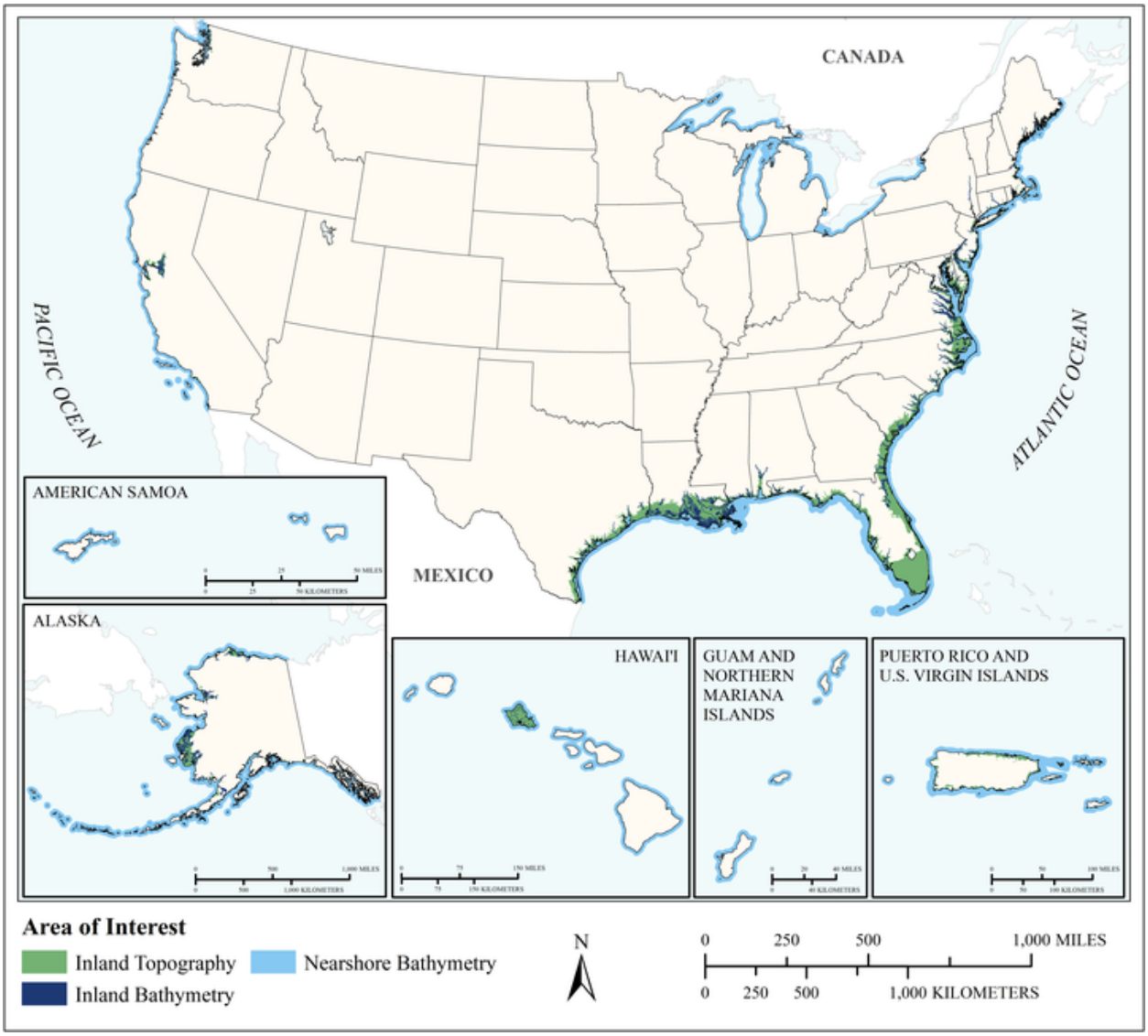
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Mission-driven performance improvements	Major	Annual percent improvement	22%	Major	Unable to provide							
Mission-driven performance improvements description	EQIP or CStwP ranking improves selection of participant and projects. More accurate deliverables so less repeat field work. Improved accuracy of elevation derivatives. EQIP or CStwP ranking improves selection of participant and projects. Ability to assess erosion potential on fields. This can help pinpoint areas for conservation. Faster return on outputs and subsequently overall faster turnaround time for projects. Develop multiple plans for each participant.											
Other operational benefits	Moderate	Unable to provide										
Other operational benefits description	Personal Safety of Employees. Precision Conservation. Reduced risk from in-field activities such as ATV usage and potential hazards such as wildlife bites or heat related illness. More focus efforts in needed location instead of volunteered by customer. Precision farming approach.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$681,028	None								
Value added to products or services description	Precision farming available to all customers. 2nd generation DEMs will allow for detection of landscape change. DSM will allow rangeland managers to plan for brush control. Project trip planning, timber harvest opportunities, etc. Dam Breach Analysis/Hazard Classification/Inundation Mapping. Improved details and quality of conservation planning maps and practice design schematics. Accurate flood mapping trickles through all level of conservation planning. Better target conservation to mitigate flooding".											
Improved response or timeliness	Major	Annual dollars saved/realized	$3,015	None								
Improved response or timeliness description	HEL and Wetland determinations can be completed at a quicker pace with offsite methods. Engineering plans provided to conservation planning staff. Maintaining data cycle keeps Lidar data up to date for all map products and schematics. Local/recent changes are modeled by local surveys with total station GPS. Better target conservation to mitigate potential flooding. Where to develop wetland retention ponds. Improved Dam Breach Analysis and Hazard Classification mapping. More communication tools for use with customers and tools that are easier to understand. Improved data accuracy for Emergency Watershed Planning by maintaining currentness through new datasets. Instant access to high quality data, cloud based - crowd sourcing support. Emergency watershed response baseline data for comparison.											
Improved customer experience	Major	Annual dollars saved/realized	$336,474	None								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved customer experience description	Improved land classification from one agency reduces workload in another agency and improves accountability. Customers commonly express interest and approval in high quality data and topographic views of their operations. HEL determination less questionable and removes human error and inexperience. EQIP ranking can be deigned with real conservation benefits. Consistency across multiple agencies. Accurate topographic data is definitely much easier to access now.			
Societal Benefits	**Benefits**	**Benefits**	**Benefits**	**Benefits**
Education or outreach	Moderate	None		
Education or outreach description	Improved and current Lidar data provides accurate and timely views of topography and increases the public confidence. Reach-out to constituents with sound scientific findings. improves buy-in. Some university partners may also be using the data in their research.			
Environmental	Major	None		
Environmental description	Better models for soil and water conservation help environmental health. More buy-in from the public ultimately leads to better conservation practice selection. State agencies may be using the data in their reviews. Earlier planning on erosion, increases water quality/quantity. Improved soil survey data. Appropriate modeling of conservation practices related to soil and water conservation and their installation helps mitigate the severity of floods, conserves soils for agricultural productivity and growth, improves soil mapping, and could help improve management of nutrients and reduce loads. More Conservation on the ground with efficiency improvements.			
Public safety, including life and property	Moderate	None		
Public safety, including life and property description	Improved dam breach analysis and emergency action plans. Appropriate modeling of conservation practices related to soil and water conservation and their installation helps mitigate the severity of floods, conserves soils for agricultural productivity and growth, improves soil mapping, and could help improve management of nutrients and reduce loads.			

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Coastal Zone Soil Survey Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Custom description	Custom description	States and/or Territories	
Sub Area Requirements	Up to 20-foot elevation along coastal areas	Up to 20-foot elevation along coastal areas	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	

MCA Description	Response
Mission Critical Activity	Fisheries Management and Aquaculture and Coastal Zone Management. The Soil Science Division (SSD) produces and maintains Coastal Zone Soil Survey maps containing high resolution (<= 1:12,000 mapping scale) soil spatial and tabular data. SSD also provides data interfaces containing interpretation reports that process said data into plain language interpretations targeted at coastal managers including aquaculture producers and coastal zone managers. An additional Business Use for this MCA is BU 08 – Agriculture and Precision Farming.
MCA Title	Coastal Zone Soil Survey Mapping
MCA ID	11474
Organization Type	Federal Agencies and Commissions
Organization Name	USDA: Natural Resources Conservation Service (NRCS)
Sub-Agency or Division	Soil Science Division
Organization Mission	The Soil Science Division has been delegated the following tasks assigned to the Secretary of Agriculture: 1) Make an inventory of the soil resources of the United States; 2) Keep the inventory current to meet contemporary needs; 3) Interpret the information and make it available in a useful form; and 4) Provide technical assistance and promote the use of soil survey for a wide range of community planning and resource development issues related to both non-farm and farm uses.
Program Name	Sustainable Aquaculture
Total Annual Program Budget	$5,000,000
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Small rock outcrops, boulders, aquaculture cages

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Not required

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL3B	QL3B	
Update Frequency	6-10 years	>10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	Quality levels may vary based on land use management and topographic dynamics as pertain to event driven change like coastal erosion		Depending on user needs, quality level may be higher than 3B. 3B is likely the minimum for our needs.	
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter	Less than 50 cm	
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	
How far onshore needed			1 kilometer inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			NAVD88	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Required		Nice to have	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Required		Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Required		Highly desirable	Not required
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Required		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	
DTM	Nice to have	Nice to have	Nice to have	
DEM	Required	Required	Required	
Raw point cloud data	Not required	Not required	Not required	
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Not required	
Full waveform	Not required	Not required	Not required	
Bathymetric Attributed Grid (BAG)		Not required	Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Not required	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Not required	Nice to have	Nice to have	
Ground control/ground truthing	Not required	Not required	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Highly desirable	Required	
Underwater videography			Nice to have	
Bottom texture				
Bottom type			Nice to have	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Nice to have	Nice to have	
Land use/land cover	Highly desirable	Nice to have	Nice to have	
Wetlands	Required	Highly desirable	Nice to have	
Estuaries			Nice to have	
Inland surface water features	Required	Highly desirable	Nice to have	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	NRCS has a copy of the US Elevation Inventory that is QL3 or better to create a best available elevation products and services and web services to support agency mission critical applications. Areas with more than one dataset to choose from we go with the most current and highest quality level. If a state has >=QL3 then we are helping fund the update or refresh to QL2 or better for all agricultural lands in the USA and US Territories.	NRCS uses data available from the NOAA digital coast. NRCS soil science has requirements for mapping subaqueous soils and is using what data are available in the public domain	NRCS uses data available from the NOAA digital coast. NRCS soil science has requirements for mapping subaqueous soils and is using what data are available in the public domain	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Digital Coast	Yes	Yes	Yes	
NCEI		Yes	Yes	
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	USDA-NRCS-NGCS web services			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	
Cost savings/cost reduction	Major	I don't know	Major	
Cost avoidance	Major	I don't know	Major	
Increased revenues	I don't know	I don't know	I don't know	
Mission-driven performance improvements	Major	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	
Improved response or timeliness	Major	I don't know	Major	
Improved customer experience	Major	Major	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	I don't know	Major	
Environmental	Major	Major	Major	
Public safety, including life and property	Major	I don't know	I don't know	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Annual dollars saved/realized	$4,824			
Time savings description							20 hours/week x 8 weeks to make bathymetry using singlebeam fathometer. Topobathy DEMs have much higher resolution than singlebeam with wide tracklines.					
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Major	Annual dollars saved/realized	$6,000			
Cost savings/cost reduction description							160 hours x $18/hour pay x 2 staff to run fathometer tracklines.					
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide				
Increased revenues description							Inasmuch as coastal zone soil survey is used to identify optimal aquaculture lease areas.					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Annual percent improvement	200%			
Mission-driven performance improvements description							100% of staff time can be devoted to coring and other related soil observation activities, instead of 50% used for creating fathometer bathymetry. All staff time can be devoted to the activities involving our expertise, rather than spent creating low resolution fathometer bathymetry.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Value added to products or services description	Spatial accuracy of soil survey maps using 3D inland topographic data is vastly improved.						Spatial accuracy of maps is definitely higher using 3D inland bathymetry vs low res singlebeam.					
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate					
Environmental	Major			Major			Major					
Public safety, including life and property	I don't know			I don't know			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps	Yes	Yes	Yes	
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes	Yes	
Other (please specify)	Yes			
Other description	Topographic Wetness Index			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

National Renewable Energy Laboratory (NREL)

NREL advances the science and engineering of energy efficiency, sustainable transportation, and renewable power technologies and provides the knowledge to integrate and optimize energy systems. NREL develops energy solutions through innovation, analysis, and partnerships. NREL collaborates with private industry, government agencies, state and local government, research institutions, and nonprofits. NREL was designated a national laboratory by President George Bush on September 16, 1991. The organization began more than two decades before under NREL's predecessor, the Solar Energy Research Institute (SERI). SERI was created in 1977 with the goal of creating energy independence.

NREL uses elevation data for renewable energy resource assessment and siting and electricity grid assessment. Elevation data are needed as input to models for resource assessments, cost analysis, and national energy portfolio assessments. Topographic data are needed for siting wind energy, and to determine placement of solar panels (slope and aspect are important factors). NREL also uses lidar from the DHS HSIP data layer for identification of rooftop potential for solar. Bathymetry is needed for wind and hydrokinetic potential. For wind, depth information is important for identifying anchor technologies. In addition to using elevation data for analysis, NREL also includes topography as an information layer in its web apps. NREL products are used by industry, researchers, planners, developers, and government. Federal and local governments use NREL data to inform policy-making regarding renewable targets. Utilities use NREL data to estimate photovoltaic output and to calculate rebates and renewable credits based on rooftop potential versus actual outputs.

NREL noted that one of the biggest values to data provided by the federal government (e.g., NOAA, USGS) is its representation as an authoritative source, with broad adoption leading to consistent and reliable data used across different analyses by different groups.

NREL requires nationwide Quality Level 4 (QL4) inland topography, QL4B inland and nearshore bathymetry, and Order 1 offshore bathymetry all updated every 2-3 years.

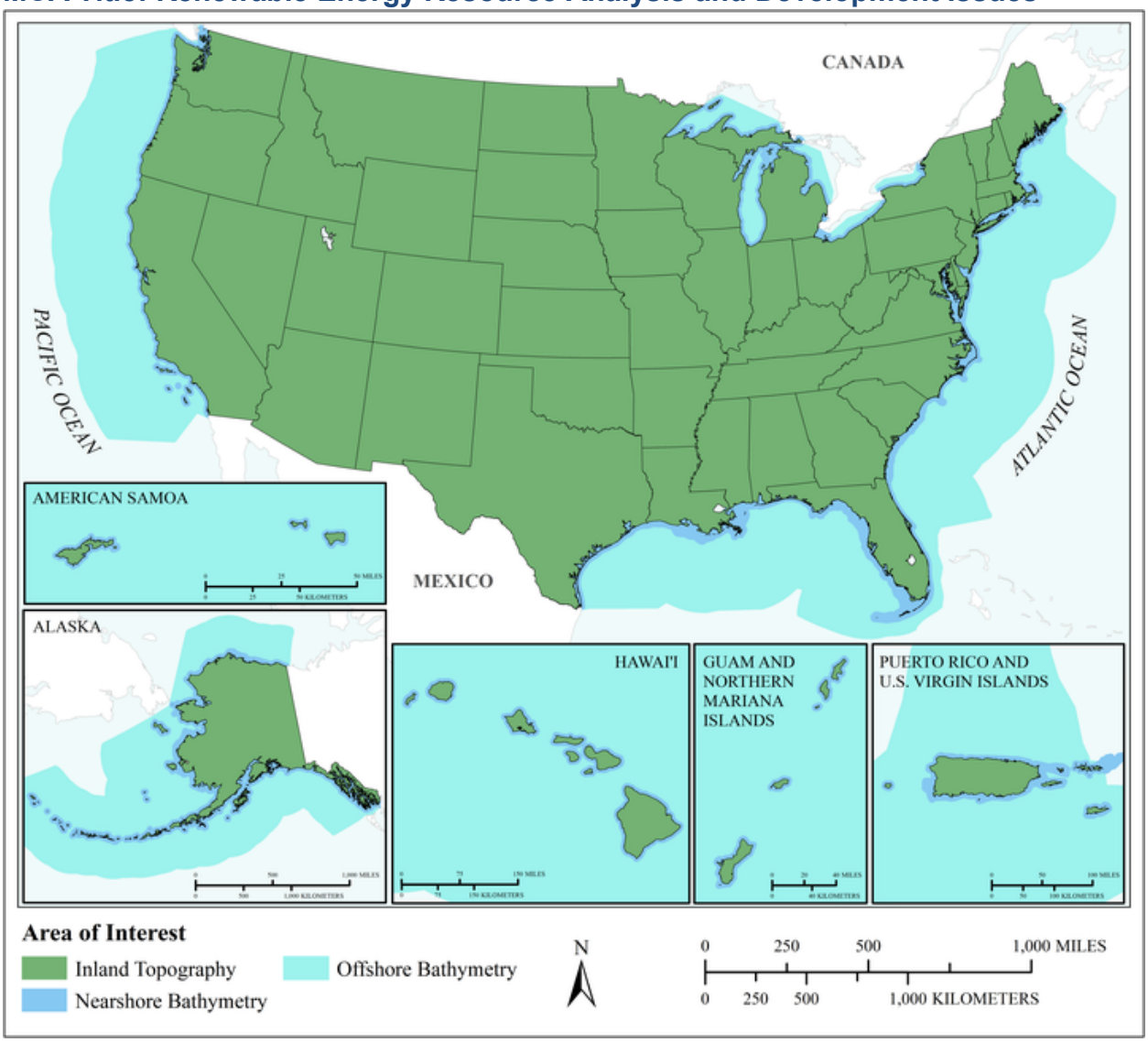
Future benefits from more accurate elevation data include major time savings due to reduced data manipulation and data errors, increased program effectiveness and decision making, and improved accuracy of products and services.

NREL has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 12 – Renewable Energy Resources	DoE: Office of Energy Efficiency and Renewable Energy (EERE)	22500	Renewable Energy Resource Analysis and Development Issues	Inland Topo	(a) QL4 (b) QL5	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Minor
				Nearshore Bathy	QL4B	2-3 years	Unable to quantify	Unable to quantify	None	None	None
				Offshore Bathy	Order 1	2-3 years	Unable to quantify	Unable to quantify	None	None	None

MCA Title: Renewable Energy Resource Analysis and Development Issues



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	Area split by varying quality level or update frequency		All study waters	All study waters
Sub Area Requirements	All study lands			

MCA Description	Response
Mission Critical Activity	Renewable energy resource assessment and siting; electricity grid assessment. Elevation data are needed as input to models for resource assessments, for economic and technical potential analysis needed to assess the costs and issues around renewable energy vs. conventional energy for a given area, and for national energy portfolio assessments. Topographic data are needed for siting wind energy (ridgelines are better than valleys), and to help lay out solar panels (slope and aspect are important factors). NREL also uses lidar from the DHS HSIP data layer for identification of rooftop potential for solar. Bathymetry is needed for wind and hydrokinetic potential. For wind, depth information is important for identifying anchor technologies. In addition to using elevation data for analysis, NREL also includes topography as an information layer in its web apps. NREL products are used by industry, researchers, planners, developers, and government. Federal and local governments use NREL data to inform policy-making regarding renewable targets. Utilities use NREL data to estimate photovoltaic output, and to calculate rebates and renewable credits based on rooftop potential vs. actuals.
MCA Title	Renewable Energy Resource Analysis and Development Issues
MCA ID	22500
Organization Type	Federal Agencies and Commissions
Organization Name	DoE: Office of Energy Efficiency and Renewable Energy (EERE)
Sub-Agency or Division	National Renewable Energy Laboratory
Organization Mission	NREL advances the science and engineering of energy efficiency, sustainable transportation, and renewable power technologies and provides the knowledge to integrate and optimize energy systems.
Program Name	Geospatial Data Science is the name of our group, which supports multiple programs within the National Renewable Energy Laboratory. Broadly, I would term it as: Renewable resource assessment and development opportunity evaluation at distributed to utility application scales.
Total Annual Program Budget	$5,000,000
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)

General Geographic Area and Size	
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Buildings or large trees, impediments to cables, current cable locations, shipwrecks, etc.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL4 (b) QL5		QL4B	Order 1
Update Frequency	2-3 years		2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	IFSAR OK in most of Alaska, need lidar in cities			
Acceptable Horizontal Error	Up to 1 meter		Up to 1 meter	Up to 1 meter
Acceptable Vertical Error	Up to 1 meter		Up to 1 meter	Less than 1 meter
How far onshore needed			To Mean Higher High Water (MHHW)	
How far down the beach profile needed	To MHHW		To MHHW	
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs			Partial	
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Highly desirable	Highly desirable		Highly desirable
Entire AOI under same environmental conditions	Highly desirable		Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Highly desirable	Nice to have		Highly desirable
DEM for entire AOI needs to be seamless	Required		Required	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		Highly desirable	Nice to have
DTM	Required		Required	Required
DEM	Required		Required	Required
Raw point cloud data	Nice to have		Nice to have	Not required
Classified point cloud	Nice to have		Nice to have	
Edited/cube XYZ			Not required	Not required
Full waveform	Not required		Not required	Not required
Bathymetric Attributed Grid (BAG)			Not required	Not required
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have		Not required	Not required
Ground control/ground truthing	Nice to have		Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Not required
Nautical and/or navigation charts			Not required	Not required
Acoustic imagery of the seafloor			Not required	Not required
Aerial and/or satellite imagery	Required		Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Nice to have	Nice to have
Submerged features			Not required	Not required
Subbottom characteristics			Nice to have	Not required
Geologic and seismic data	Not required		Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Not required	Not required
Boundaries			Highly desirable	Highly desirable
Routes			Highly desirable	Nice to have
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Not required	Highly desirable
Shorelines – current, historic, change rates	Highly desirable		Nice to have	
Land use/land cover	Highly desirable		Required	Highly desirable
Wetlands	Highly desirable		Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Highly desirable		Required	
Bridges/culverts	Nice to have			
Landmark features	Nice to have		Not required	
Cultural resources	Nice to have		Not required	
Coastal and riverine structures	Nice to have		Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Miscellaneous LIDAR collected from a variety of sources HSIP and cities		Mostly NOAA Coastal Relief Model, NOAA global datasets (ETOPO1 and 2), and individually downloaded regional bathymetry datasets.	NOAA Coastal Relief Model, ETOPO1/2, and state downloaded datasets
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast			Yes	Yes
NCEI				Yes
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes		Yes	Yes
Other description	HSIP, Cities		State websites	State websites
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate		Minor	None

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	Major		None	None
Cost avoidance	None		None	None
Increased revenues	None		Minor	Minor
Mission-driven performance improvements	Major		Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major		Minor	Minor
Improved response or timeliness	None		Minor	Minor
Improved customer experience	None		Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate		Minor	Minor
Environmental	Major		Minor	Minor
Public safety, including life and property	Minor		None	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	None						Minor	Unable to provide		Minor	Unable to provide	
Cost avoidance	Moderate	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	None						None			I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements description	Without data, NREL research would not be possible.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	None						None			None		
Improved customer experience	Major	Unable to provide					Minor	Unable to provide		Minor	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						None			None		
Environmental	Moderate						None			None		
Public safety, including life and property	Minor						None			None		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes		Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

Oak Ridge National Laboratory (ORNL)

It is the overall mission of the U.S Department of Energy (DOE) to ensure America's security and prosperity by addressing its energy, environmental, and nuclear challenges through transformative science and technology solutions.

Specific goals associated with the DOE's mission include catalyzing the timely, material, and efficient transformation of the nation's energy system and securing U.S. leadership in clean energy technologies; maintaining a vibrant U.S. effort in science and engineering as a cornerstone of our economic prosperity and providing clear leadership in strategic areas; and enhancing nuclear security through defense, nonproliferation, and environmental efforts.

The ORNL, located on DOE's Oak Ridge Reservation (ORR) in Oak Ridge, Tennessee, is one of the world's leading scientific research centers with historic competencies in energy, life sciences, neutron sciences, and advanced materials, with future research missions in the areas of national security and high-performance computing (e.g., the LandScan USA program supports the Homeland Infrastructure Foundation-Level Data (HIFLD) Subcommittee).

To support LandScan USA, extraction of building footprints, heights, and characteristics are required to model populations at risk for emergency response and evacuation planning and execution. This program involves the study and modeling of buildings, nighttime and daytime population distributions, and seasonal and special events distributions, as well as intercensal population growth areas nationwide – all used for emergency response and evacuation planning and execution. Specifically, high-resolution lidar data is used to extract details of buildings (i.e., building sizes, shapes, heights, volumes, and roof types) for building characterization and to model population allocations and temporal occupancies. Higher resolution lidar yields higher accuracy of models used for emergency response plans. With lidar, ORNL can model two cities for the price of one, enhancing the value of HIFLD. Additionally, potentially millions of Americans could benefit when accurate LandScan USA data are used for emergency response plans that are executed efficiently in times of national emergency. Quality Level 1 (QL1) lidar every 2-3 years is required for urban areas and QL2 lidar every 4-5 years is required elsewhere in the U.S. ORNL also requires cross sections or transects for bathymetry along the nearshore coastal areas of the U.S. every 2-3 years, and QL0B inland bathymetry every 2-3 years of its reservation for environmental monitoring and remediation as well as emergency management and response and recovery. This includes dispersion modeling, flood analysis, and mapping. Future benefits from more accurate elevation data include improved response or timeliness, improved customer experience, and major public safety benefits, which could be in the billions in an actual national emergency.

In cities, DOE also uses QL1 lidar data to support its Visual-Solar Project which aims to accurately model, catalog, and analyze solar energy resources on the nation's rooftops. A function of the Visual-Solar project is its ability to model Building Integrated Photovoltaic (BIPV) resources on a city/county scale. DOE views the ability to quantify this potential energy source as an important step in increasing the penetration of solar energy into the U.S. electrical generation portfolio. Lidar is used to create high-resolution Digital Surface Models (DSMs), building footprints, and vegetation density products. The use of lidar is especially key in supporting efforts to quantify the impact vegetation has on BIPV potential.

Within the DOE Oak Ridge Office (ORO), the Emergency Management Team (EMT) interfaces with DOE Headquarters, DOE contractors, members of state and local organizations, and others, and provides emergency management planning to support the ORO response to possible emergency events, including (but not limited to) those involving adversaries, those caused by accidents, and those induced by "natural" causes, such as severe weather. The EMT also manages the Oak Ridge Operations Center, as well as the Emergency Operations Center, which activates during emergency events. Specifically, the core mission of

the EMT is to establish and coordinate ORR emergency management policies, programs, guidance, and implement procedures as required by DOE regulations. In carrying out its mission functions, the EMT maintains inter-operational coordination with ORR's Infrastructure and Construction Management and Site Facility Management groups.

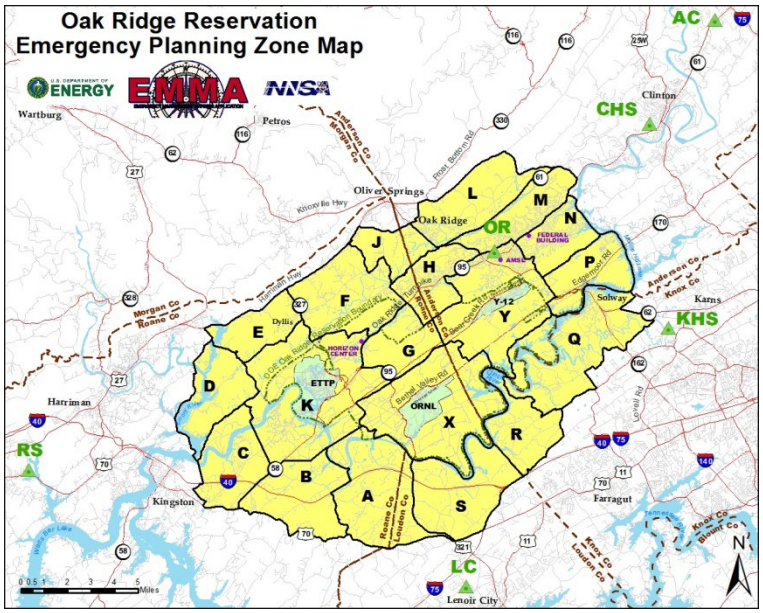


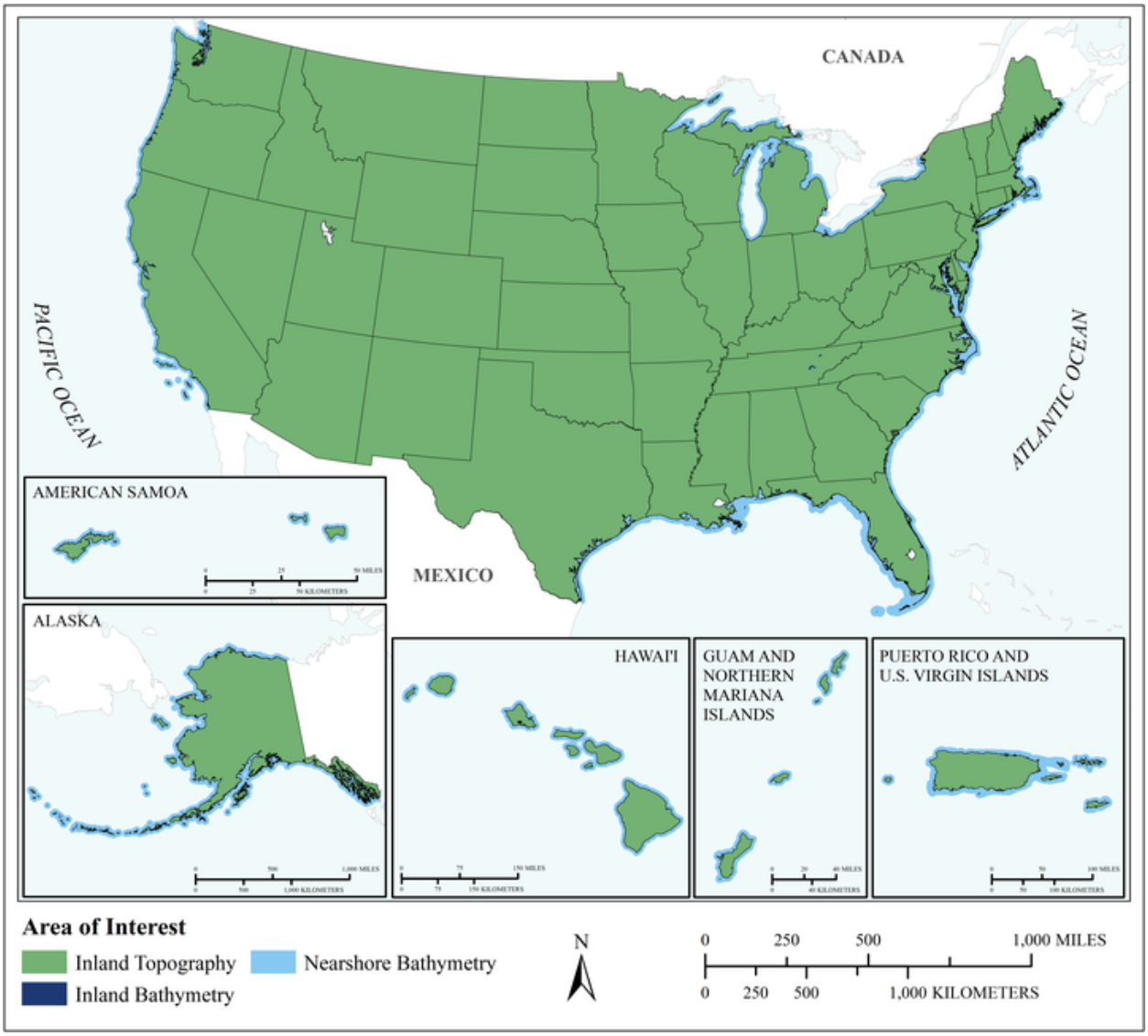
Figure 1. Zoning for evacuation plans in the event of a hazardous release.

ORNL has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 18 – Homeland Security	DoE: Oak Ridge National Laboratory (ORLN)	21573	Basic and Applied Research and Development in GeoComputation/ Site-Wide Environmental Monitoring	Inland Topo	(a) QL1 (b) QL2	(a) 2-3 years (b) 4-5 years	$501,809 to $503,618	$2,000,000,000	Minor	Moderate	Major
				Inland Bathy	QL0B	2-3 years	$603 to $1,206	Unable to quantify	Minor	Moderate	Moderate
				Nearshore Bathy	Cross sections and/or transects meet needs	2-3 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor

MCA Title: Basic and Applied Research and Development in GeoComputation/Site-Wide Environmental Monitoring



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Area split by varying quality level or update frequency	Custom description	States and/or Territories	
Sub Area Requirements	All U.S. land	2 kilometer buffer around Anderson and Roane Counties, TN	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	

MCA Description	Response
Mission Critical Activity	Population Distribution & Dynamics, High Performance GeoComputing, Critical Infrastructure Modeling, Resiliency, and Data Development. ORNL requires elevation data of urban areas to extract building footprints, heights, and characteristics to model populations at risk for emergency response and evacuation planning and execution. The data allows for the study and modeling of buildings, nighttime and daytime population distributions, and seasonal and special event distributions, as well as intercensal population growth areas nationwide. Operational activities on the ORNL reservation include environmental monitoring and remediation as well as emergency management and response and recovery. This includes dispersion modeling, flood analysis, and mapping.
MCA Title	Basic and Applied Research and Development in GeoComputation/Site-Wide Environmental Monitoring
MCA ID	21573
Organization Type	Federal Agencies and Commissions
Organization Name	DoE: Oak Ridge National Laboratory (ORLN)
Sub-Agency or Division	Computational Sciences and Engineering Division (CSED) Facilities and Operations (F&O)
Organization Mission	Basic and Applied Research and Development in GeoComputation and Facility Operations
Program Name	LandScan Population Distribution
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	CONUS
Smallest 3D features needed	Structures > 42 Sq. M.
Description of smallest 3D features	Size equal to a single-wide mobile home (18 ft. by 90 ft.)

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL1 (b) QL2	QL0B	Cross sections and/or transects meet needs	
Update Frequency	(a) 2-3 years (b) 4-5 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI	QL1 data is needed in urban areas and the Urban/Suburban/Rural interface needs more frequent update (annual to 2-3 years), elsewhere QL2 data every 4-5 years would be adequate. No way to map these interface areas now and they change over time			
Acceptable Horizontal Error	Up to 40 cm	Less than 50 cm	Less than 50 cm	
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm	Up to 60 cm	
How far onshore needed			To the fall line	
How far down the beach profile needed	Not applicable		To MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs		Partial	Yes	
Cross section/transect requirement		I don't know	I don't know	

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required

Hydrologic Processing Required	Response
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Not required		Not required	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required		Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Nice to have	Nice to have	Nice to have	
Raw point cloud data	Highly desirable	Not required	Highly desirable	
Classified point cloud	Required	Not required	Highly desirable	
Edited/cube XYZ		Not required	Not required	
Full waveform	Highly desirable	Not required	Nice to have	
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Not required	Highly desirable	
Ground control/ground truthing	Highly desirable	Nice to have	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Highly desirable	Not required	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Not required	
Submerged features			Not required	
Subbottom characteristics			Not required	
Geologic and seismic data	Not required	Not required	Not required	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Highly desirable	
Routes			Highly desirable	
Offshore cadastral			Highly desirable	
Lease areas			Highly desirable	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Nice to have	Nice to have	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Nice to have	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available	Best available is self-collected ~20 year old sonar	Best available	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Varies from State to State.			
Other		Yes		
Other description		Self-collected		
Data that meet my needs are not available				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Minor	Minor	
Cost savings/cost reduction	Moderate	Minor	Minor	
Cost avoidance	Moderate	Minor	Minor	
Increased revenues	Moderate	Minor	Minor	
Mission-driven performance improvements	Major	Moderate	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Minor	
Improved response or timeliness	Moderate	Minor	Minor	
Improved customer experience	Major	Minor	Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	
Environmental	Moderate	Moderate	Minor	
Public safety, including life and property	Moderate	Moderate	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Annual dollars saved/realized	$1,809 to $3,618	Minor	Annual dollars saved/realized	$603 to $1,206	Minor	Unable to provide				
Time savings description	Singularly this would be the greatest benefit and hardest to quantify. Typically devoted 5-10 hours monthly to modeling for verification and validation.			Likely minimal but difficult to quantify. Typically devoted 20-40 hours annually to modeling for verification and validation.								
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$500,000	Minor	Unable to provide		None					
Cost savings/cost reduction description	We do not currently spend funds to acquire data. ORNL can model two cities for the price of one with lidar.			Historical data for costs not available.								
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Increased revenues	None			None			None					
Mission-driven performance improvements	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Improved response or timeliness	Major	Annual dollars saved/realized	$2,000,000,000	Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness description	Actual benefits to the public could be in the $ billions in an actual national emergency.											
Improved customer experience	Major	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor					
Environmental	Moderate			Moderate			Minor					
Public safety, including life and property	Major			Moderate			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Office of Surface Mining Reclamation and Enforcement (OSMRE)

The mission of OSMRE is to carry out the requirements of the Surface Mining Control and Reclamation Act (SMCRA) in cooperation with states and tribes. Its primary objectives are to ensure that coal mines are operated in a manner that protects citizens and the environment during mining and assures that the land is restored to beneficial use following mining, and to mitigate the effects of past mining by aggressively pursuing reclamation of abandoned coal mines.

OSMRE is responsible for establishing a nationwide program to protect society and the environment from the adverse effects of surface coal mining operations, under which OSMRE is charged with balancing the nation's need for continued domestic coal production with protection of the environment. OSMRE was created in 1977 when Congress enacted the Surface Mining Control and Reclamation Act. OSMRE works with states and tribes to ensure that citizens and the environment are protected during coal mining and that the land is restored to beneficial use when mining is finished. OSMRE and its partners are also responsible for reclaiming and restoring lands and water degraded by mining operations before 1977.

- In regulating active coal mining, OSMRE maintains compliance at high levels and ensures that all mines are properly operated and promptly reclaimed to the standards established under the Act. OSMRE emphasizes prevention and ensures that long-term environmental problems do not occur. OSMRE ensures that the pre-mining productivity of the land is restored.
- In reclaiming abandoned mine lands, OSMRE aggressively pursues reclamation with a primary emphasis on correcting the most serious problems related to public health, safety, and the general welfare. OSMRE ensures maximum public benefit through the prompt and fair distribution of public funds.

In its beginning, OSMRE directly enforced mining laws and arranged cleanup of abandoned mine lands. Today, most coal states have developed their own programs to do those jobs themselves, as Congress envisioned. OSMRE focuses on overseeing the state programs and developing new tools to help the states and tribes get the job done. OSMRE also works with colleges and universities and other state and federal agencies to further the science of reclaiming mined lands and protecting the environment, including initiatives to promote planting more trees and establishing much-needed wildlife habitat. Each year, OSMRE trains hundreds of state and tribal professionals in a broad range of needed skills.

Elevation data are used for open mine volume computations, stockpile analysis, environmental impact assessment and site restoration, conservation engineering, soils and wetlands mapping and characterization, modeling of biological and ecological systems, erosion control, conservation of critical habitats, and geologic mapping and analysis. Specifically, OSMRE identifies, verifies, and quantifies the restoration of mining disturbed lands to approximate original contour and designs and controls mining-impacted waters. OSMRE assures that mining activity does not affect natural water resources, i.e. producing pollutants that will result in acid mine drainage or too many sediments, and assures that reclaimed mines provide suitable habitats for wildlife natively found in that region. OSMRE monitors surface coal mines as the open pit progresses (contemporaneous reclamation), as well as stockpiles of top soil to assure that there will be enough material to reclaim the site post-mining.

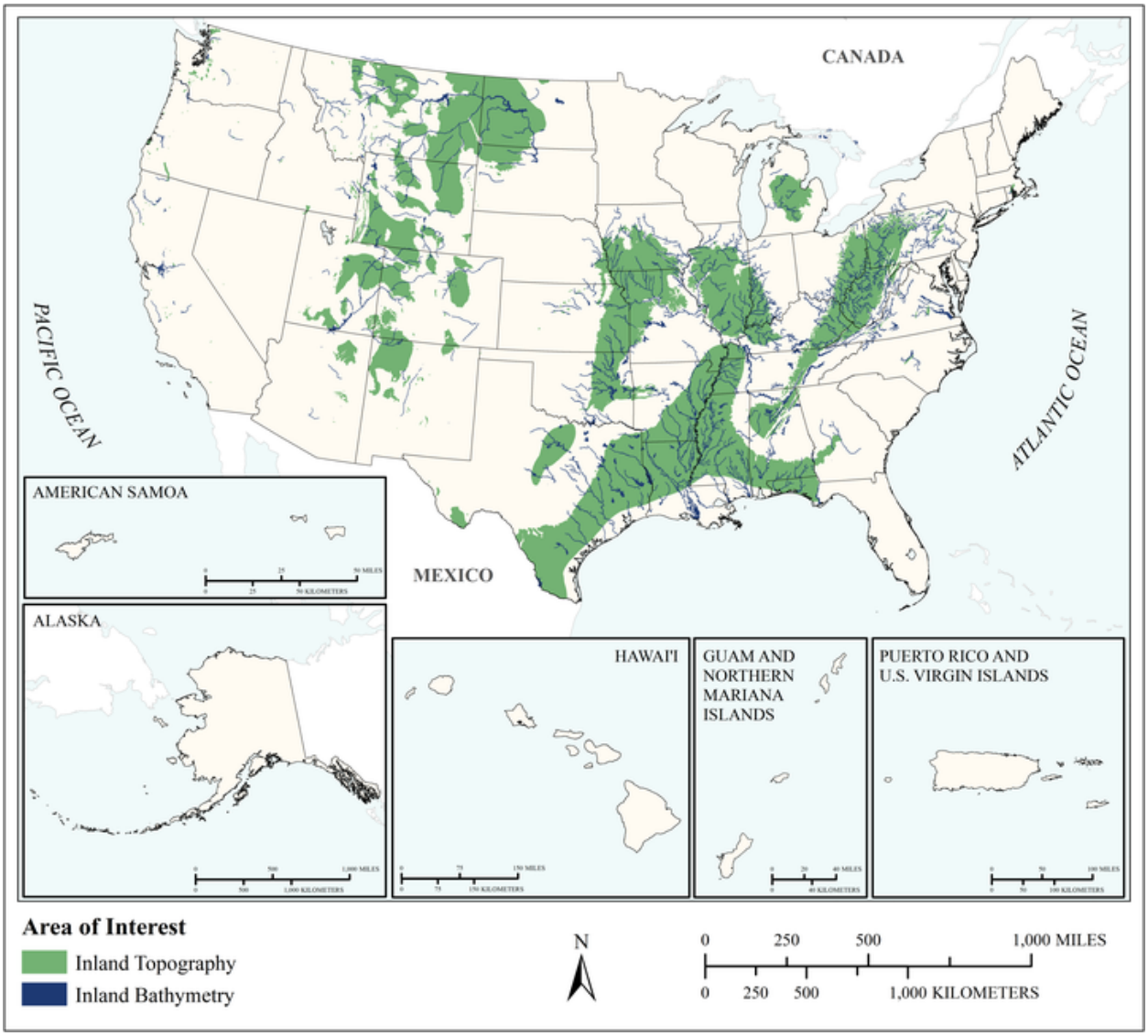
OSMRE expressed the need for nationwide Quality Level 1 (QL1) inland topography updated every 2-3 years unless an event (such as a landslide) occurred and nationwide QL2B inland bathymetry updated every 2-3 years for regulation and reclamation of mining activities. Future benefits of more accurate elevation data are major and would provide considerable time and cost savings.

OSMRE has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 11 – Geologic Resource Extraction	DoI: Office of Surface Mining Reclamation and Enforcement (OSMRE)	1389	Regulation and Reclamation of Surface Coal Mining Activities	Inland Topo	QL1	2-3 years	$285,020	$150,750	Moderate	Moderate	Major
				Inland Bathy	QL2B	2-3 years	$2,894 to $7,236	Unable to quantify	Major	Major	Major

MCA Title: Regulation and Reclamation of Surface Coal Mining Activities



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable		
Geographic Area Requirements	Custom description	Custom description		
Sub Area Requirements	U.S. coal fields	HUC8s that cover U.S. coal fields		

MCA Description	Response
Mission Critical Activity	Open mine volume computations. Stockpile analysis. Environmental impact assessment and site restoration. Identify/verify/quantify restoration of mining disturbed lands to approximate original contour (current and abandoned mines). Design and control of mining impacted waters. Assure that mining activity does not affect natural water resources, i.e. producing pollutants that will result in acid mine drainage or too many sediments. Assure that reclaimed mines provide suitable habitats for wildlife naively found in that region. Monitor surface coal mines as the open pit progresses and it is being reclaimed on the back end (contemporaneous reclamation), as well as monitor stock piles of top soil to assure that there will be enough material to reclaim the site post mining. Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Conservation of critical habitats. Geologic mapping and analysis. Environmental impact assessment and site restoration. Additional Business Uses include BU 01 – Water Supply and Quality, BU 06 – Natural Resources Conservation, and BU 07 – Wildlife and Habitat Management.
MCA Title	Regulation and Reclamation of Surface Coal Mining Activities
MCA ID	1389
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: Office of Surface Mining Reclamation and Enforcement (OSMRE)
Sub-Agency or Division	
Organization Mission	Our mission is to carry out the requirements of the Surface Mining Control and Reclamation Act (SMCRA) in cooperation with States and Tribes. Our primary objectives are to ensure that coal mines are operated in a manner that protects citizens and the environment during mining and assures that the land is restored to beneficial use following mining, and to mitigate the effects of past mining by aggressively pursuing reclamation of abandoned coal mines.
Program Name	Technical Transfer
Total Annual Program Budget	$100,000,000
Primary Business Use	BU 11 - Geologic Resource Mining and Extraction
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)

General Geographic Area and Size	
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	It varies based on project. May include mine subsidence depressions and cracks; springs; mining scars like contour benches and highwalls; mine waste piles and mine structures; collection and diversion ditches, ponds, and riprap channels. Individual trees/shrubs to determine vegetation re-establishment. Subsidence features - medium size and sub meter. Erosion features – rills.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B		
Update Frequency	2-3 years and certain events.	2-3 years		
Event type(s)	Landslide or subsidence for abandoned mines. For active mines, conditions and inspection requirements vary.			
Quality Level and/or update frequency variability across AOI	Depends on the requirements of the project or assessment.			
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		Depends on the size of the impoundment. 10ft spacing is maximum between cross sections.		

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Required			Required	
Other	Required	Required			Required	
Other description	Entire project (mine) area in same acquisition season	Entire project (mine) area in same acquisition season			Entire project (mine) area in same acquisition season	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Required	Required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Classified point cloud	Highly desirable	Required		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Required		
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Required	Required		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	DEM Lidar Photogrammetrically-derived models from UAS systems. Terrestrial ground LiDAR collected by our agency (5cm or better resolution) acquired at different times. National Map for data that we cannot acquire ourselves	Self-collected with small boats for specific sites as needed using a sonarmite and a GPS receiver (Trimble ProXRT - sub-decimeter).		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes		
NCEI	Yes			
Open Topography	Yes			
NOAA nautical charts				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Any available repositories through states in the SMCRA community, that is states with an active Title IV or Title V coal program (such as Pennsylvania, West Virginia, Kentucky, etc.).			
Other	Yes	Yes		
Other description	Agency collected UAS photos and derived model products using photogrammetry.	Self-collected		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	None	None		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Major	Major		
Improved customer experience	Major	Major		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major		
Environmental	Major	Major		
Public safety, including life and property	Major	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$205,020	Major	Annual dollars saved/realized	$2,894 to $7,236						
Time savings description	Drone acquisition. Data processing.			Drone acquisition. Data processing.								
Cost savings/cost reduction	Major	Annual dollars saved/realized	$80,000	Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description	Improved performance.			Man hours.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness	Major	Annual dollars saved/realized	$75,375	Major	Unable to provide							
Improved customer experience	Major	Annual dollars saved/realized	$75,375	Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major								
Education or outreach description	Training future users. We present our data analysis findings at school fairs and conferences.											
Environmental	Moderate			Major								
Environmental description	Accurate data used in environmental decision making process. Less time in the field would equate to less ground disturbance especially in areas with newer vegetation.											
Public safety, including life and property	Major			Major								
Public safety, including life and property description	Sharing safety concern areas with public. Less risk of accident / injury by reducing field time (inspections and data collection).											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

Pipeline and Hazardous Materials Safety Administration (PHMSA)

PHMSA is an agency under the U.S. Department of Transportation that regulates the pipeline transportation and the land, air, and sea transportation of hazardous materials.

PHMSA's mission is to protect people and the environment by advancing the safe transportation of energy and other hazardous materials that are essential to our daily lives. To do this, the agency establishes national policy, sets and enforces standards, educates, and conducts research to prevent incidents. PHMSA also prepares the public and first responders to reduce consequences if an incident does occur.

PHMSA's overall responsibility is to protect public health and safety. Its main regulatory functions are to:

- Establish standards and regulations;
- Issue licenses for transporting hazardous materials;
- Educate and train local pipeline safety operators, states, communities, and inspectors;
- Maintain pipeline safety and hazmat enforcement investigators; and
- Redistribute civil penalties to Hazardous Materials Emergency Preparedness grants for training emergency responders.

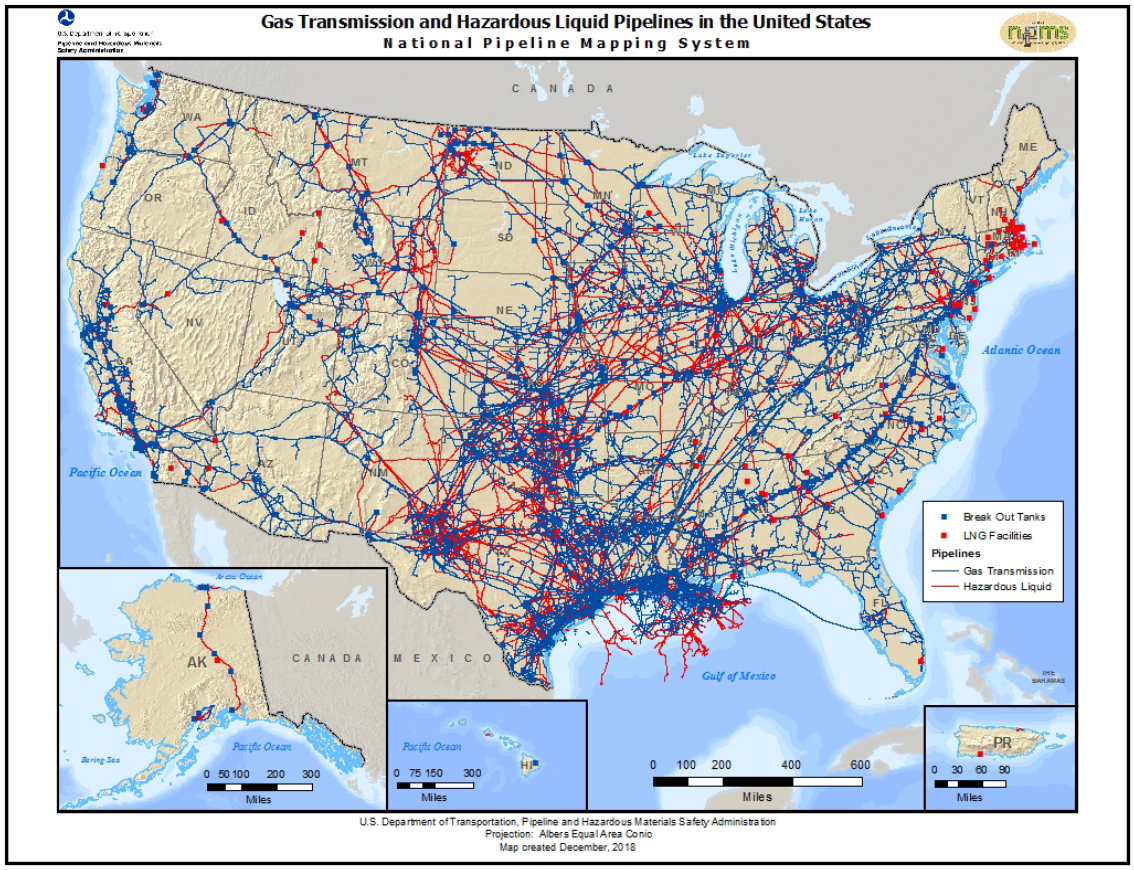


Figure 1. PHMSA-regulated Gas Transmission and Hazardous Liquid Pipelines.

Figure 1 represents the network of gas transmission and hazardous liquid pipelines regulated by PHMSA.

Importance of elevation data to PHMSA

PHMSA has an interest in applications of elevation data for pipeline spill analysis. PHMSA requires pipeline operators to perform the spill analysis. Though the agency does not directly benefit from elevation data in this regard, publicly available elevation data are useful for operators to comply with PHMSA regulations that protect the safety of communities around pipelines.

Having accurate shorelines for inland waterways and bodies, and (slightly less so) depths, would be helpful for us to analyzing pipeline safety and risk in waterways, and having high/low watermarks along coastlines and tidal headways in estuaries would help map new coastal Eco USAs. We also have an interest in analyzing river scouring, for which inland bathymetry may be helpful.

High-level summary of elevation data requirements

The pipeline safety division of PHMSA has identified a need for Quality Level 2 inland topography for the 48 conterminous states, Alaska, Hawai'i, and Puerto Rico updated every 10 years or more. Inland bathymetry data would be nice to have.

High-level summary of benefits that would come from higher resolution elevation data

PHMSA's currently realized benefits from available elevation data are minor. Future annual benefits to PHMSA from having its elevation data needs met as described above would also be minor for both topographic and bathymetric data. PHMSA's oil and gas operator stakeholders would also benefit from having enhanced topographic and bathymetric data available for modeling and analysis.

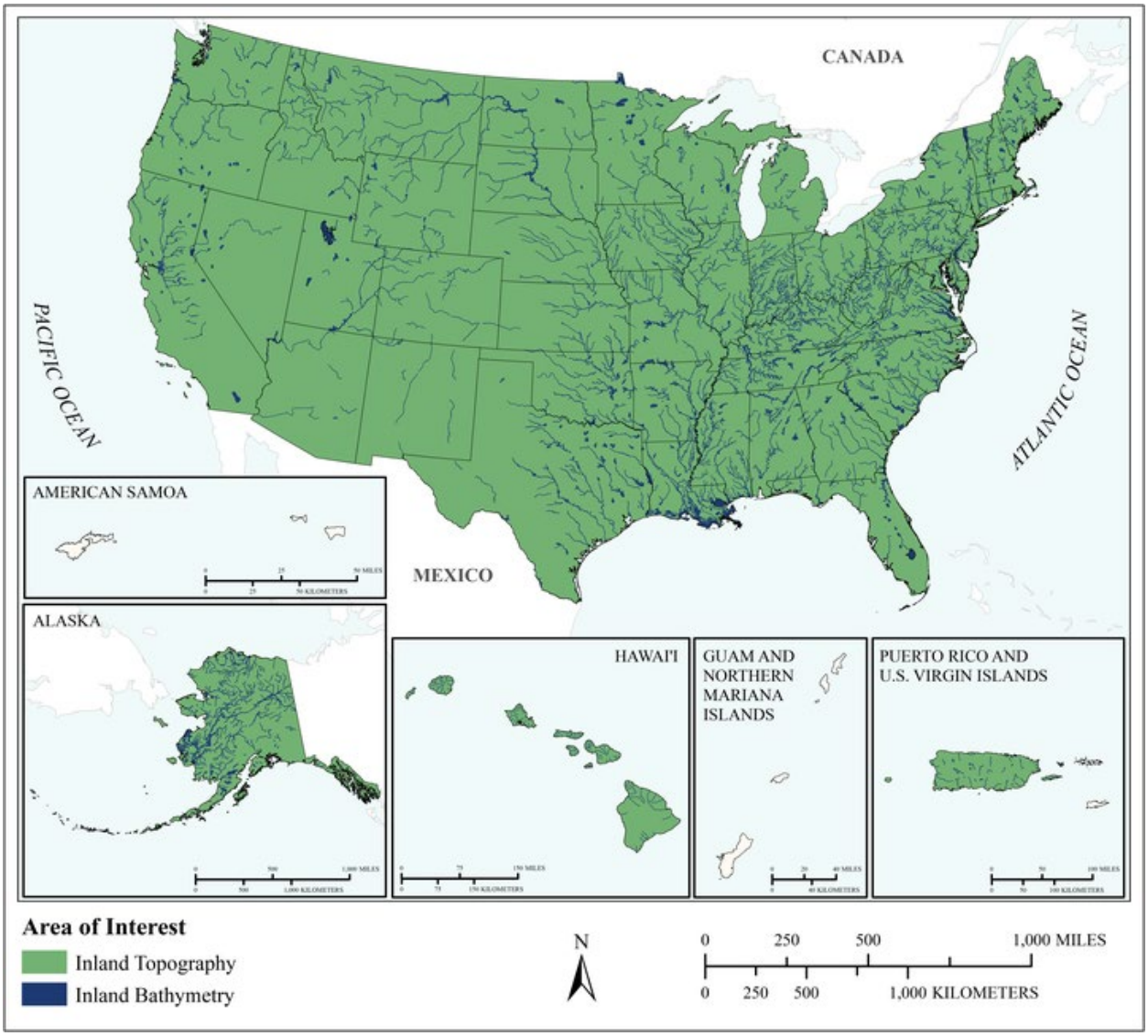
In the future, PHMSA's pipeline division could directly use elevation data to calculate precise distances of pipelines across the United States. Though not represented here, the hazardous materials division of PHMSA would benefit from elevation data for regulating safe navigation of vehicles transporting hazardous materials. The hazardous materials division would have similar benefits noted by the pipeline division's ability to model spills.

PHMSA has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 13 – Oil and Gas Resources	DoT: Pipeline and Hazardous Materials Safety Administration (PHMSA)	22506	Emergency Response and Risk Assessment for Gas and Liquid Pipelines	Inland Topo	QL2	>10 years	Unable to quantify	Unable to quantify	None	Minor	Minor
				Inland Bathy	Cross sections and/or transects meet needs	>10 years	Unable to quantify	Unable to quantify	None	Minor	Minor

MCA Title: Emergency Response and Risk Assessment for Gas and Liquid Pipelines



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Nice to have		
Geographic Area Requirements	Nationwide, inland areas	Nationwide, inland areas		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Emergency response and risk assessment for gas and liquid pipelines. Elevation data could be used to improve pipeline mileage calculations. PHMSA's stakeholders could benefit from bathymetry for undersea pipeline spill modeling. The hazardous materials group would also have similar requirements for elevation data. PHMSA's 500 stakeholders would also be interested in elevation data for modeling and analysis. An authoritative shoreline dataset would also be very helpful to PHMSA and its stakeholders. Having accurate shorelines for inland waterways and bodies, and (slightly less so) depths, would be helpful for us to analyzing pipeline safety and risk in waterways, and having high/low watermarks along coastlines and tidal headways in estuaries would help map new coastal Eco USAs. We also have an interest in analyzing river scouring, for which inland bathymetry may be helpful.
MCA Title	Emergency Response and Risk Assessment for Gas and Liquid Pipelines
MCA ID	22506
Organization Type	Federal Agencies and Commissions
Organization Name	DoT: Pipeline and Hazardous Materials Safety Administration (PHMSA)
Sub-Agency or Division	Pipeline and Hazardous Materials Safety Administration
Organization Mission	PHMSA's mission is to protect people and the environment by advancing the safe transportation of energy and other hazardous materials that are essential to our daily lives. To do this, the agency establishes national policy, sets and enforces standards, educates, and conducts research to prevent incidents. We also prepare the public and first responders to reduce consequences if an incident does occur.
Program Name	The activity spans multiple programs at PHMSA and also is a resource for state and local government pipeline safety programs. For the purpose of this survey, I am tying the activity to the National Pipeline Mapping System program, which is run by US DOT PHMSA.
Total Annual Program Budget	$2,600,000
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)

General Geographic Area and Size	
Description of smallest 3D features	A general idea of landscape elevation which will assist us in predicting spill dispersion when a release occurs. We do not perform extensive modeling: that is the pipeline operator's responsibility.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Not required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	Cross sections and/or transects meet needs		
Update Frequency	>10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 5 meters	Up to 5 meters		
Acceptable Vertical Error	Greater than 1 meter	Greater than 1 meter		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs		Yes		
Cross section/transect requirement		We don't have a specific standard in mind.		

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required

Hydrologic Processing Required	Response
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Not required	
Entire AOI under same environmental conditions	Not required	Not required			Not required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required	Not required			Not required	
DEM for entire AOI needs to be seamless	Not required	Not required			Not required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required		
DTM	Not required	Not required		
DEM	Highly desirable	Nice to have		
Raw point cloud data	Not required	Not required		
Classified point cloud	Not required	Not required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Not required	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required		
Ground control/ground truthing	Not required	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Not required	Not required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Not required		
Land use/land cover	Not required	Not required		
Wetlands	Not required	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have	Nice to have		
Bridges/culverts	Not required	Not required		
Landmark features	Not required	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We are not currently using any 3D data.	USGS hydrologic data		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server		Yes		
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	None		
Cost savings/cost reduction	None	None		
Cost avoidance	None	None		
Increased revenues	None	None		
Mission-driven performance improvements	None	Minor		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	Minor		
Improved response or timeliness	Minor	None		
Improved customer experience	None	None		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	None		
Environmental	Minor	Minor		
Public safety, including life and property	Minor	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Unable to provide		Minor	Unable to provide							
Time savings description	This would likely add time as we currently don't provide dispersion predictions.											
Cost savings/cost reduction	None			None								
Cost avoidance	Minor	Unable to provide		Minor	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Minor	Unable to provide		Minor	Unable to provide							
Other operational benefits	Minor	Unable to provide										
Other operational benefits description	Ability to better assist emergency responders. This would increase, not decrease, costs, as we don't currently provide this.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Minor	Unable to provide							
Improved response or timeliness	Minor	Unable to provide		Minor	Unable to provide							
Improved customer experience	Minor	Unable to provide		None								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None								
Environmental	Minor			Minor								
Public safety, including life and property	Minor			Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

Smithsonian Institution (SI)

The mission of the Smithsonian is the increase and diffusion of knowledge. The Smithsonian is the world's largest museum, education, and research complex, with 19 museums and the National Zoo—shaping the future by preserving our heritage, discovering new knowledge, and sharing our resources with the world. The Smithsonian Institution was established by an act of Congress in 1846 as an independent federal trust instrumentality, a unique public-private partnership that has proven its value as a cultural and scientific resource for more than 170 years. The federal commitment provides the foundation for the work the Institution does. The Smithsonian leverages federal funding to enrich the lives and education of the American people.

Elevation data are used to develop visualizations to help museum staff understand how built space is used by mapping facilities using BIM, GIS, and CADD. Elevation data are also used in the development of 3D visualizations to help the public understand the Earth they live on which includes understanding of continental-scale climate change impacts, ocean science and education, scientific earth and space research, data dissemination, and the development of training simulators. Earth datasets are used for analogue studies for the study of evolution on Mars.

Elevation data requirements include Quality Level 0 (QL0) inland topography updated every 2-3 years for facility mapping. The development of 3D visualizations requires QL1 inland topography updated every 6-10 years or after an event such as a natural disaster, QL0B inland bathymetry updated after an event, QL0B nearshore bathymetry updated every 4-5 years, and offshore bathymetry requirements are unclear but would need to be collected after an event such as natural disaster. Additional Business Uses generally require QL1 inland topography and QL1B inland and nearshore bathymetry updated every 4-5 years. Offshore requirements typically need Order 1a updated every 6-10 years.

Significant future benefits that would be received from improved elevation data include major time savings, mission-driven performance improvements, and data acquisition costs saved, including drone acquisition for facilities.

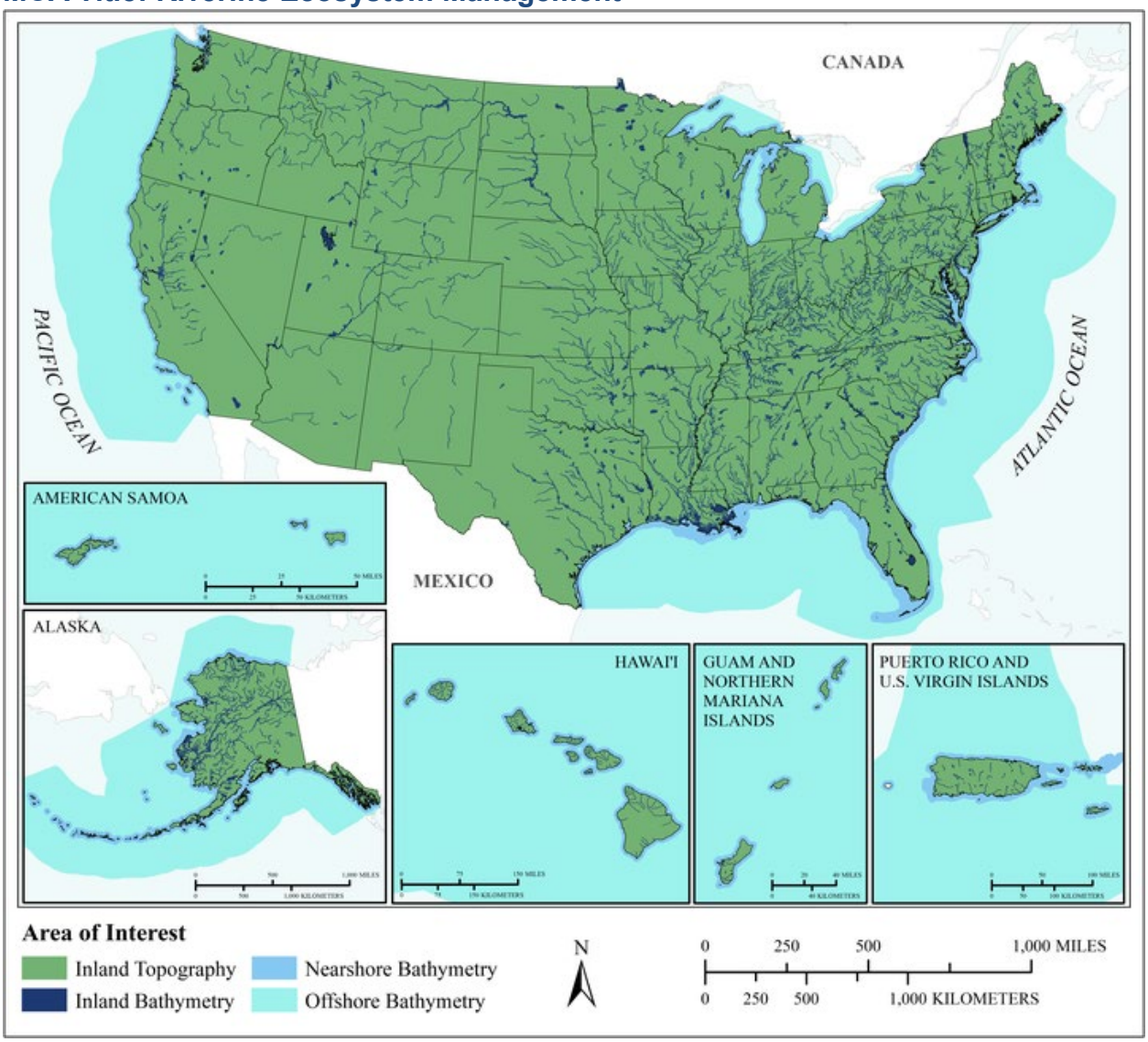
The Smithsonian has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 02 – Riverine Ecosystem Management	Smithsonian Institution (SI)	60671	Riverine Ecosystem Management	Inland Topo	QL1	6-10 years	$550	$32	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$293	$13	Major	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$1,141	$436	Moderate	Moderate	Moderate
				Offshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 03 – Coastal Zone Management	Smithsonian Institution (SI)	60672	Coastal Zone Management	Inland Topo	QL1	4-5 years	$13,141	$1,354	Major	Major	Major
				Inland Bathy	QL1B	4-5 years	$6,030	$2,091	Moderate	Major	Major
				Nearshore Bathy	QL1B	4-5 years	$2,132	$1,977	Major	Major	Major
				Offshore Bathy	Order 1a	6-10 years	$32,823	$5,240	Minor	Moderate	Moderate
BU 06 – Natural Resource Management	Smithsonian Institution (SI)	60673	Natural Resources Conservation	Inland Topo	QL1	4-5 years	$9,522	$13,395	Major	Major	Major
				Inland Bathy	QL1B	6-10 years	$1,516	$56	Major	Major	Major
				Nearshore Bathy	QL1B	6-10 years	$8	$2	Moderate	Major	Moderate
				Offshore Bathy	Order 2	4-5 years	Unable to quantify	Unable to quantify	Moderate	Major	Moderate
BU 07 – Wildlife and Habitat Management	Smithsonian Institution (SI)	60674	Wildlife and Habitat Management	Inland Topo	QL2	4-5 years	$440	$89	Moderate	Major	Moderate
				Inland Bathy	QL1B	4-5 years	$552	$249	Moderate	Major	Moderate
				Nearshore Bathy	QL0B	4-5 years	$18	Unable to quantify	Moderate	Major	Moderate
				Offshore Bathy	Order 1a	4-5 years	$434	$15	Moderate	Major	Major
BU 09 – Fisheries Management and Aquaculture	Smithsonian Institution (SI)	60675	Fisheries Management and Aquaculture	Inland Topo	QL2	4-5 years	$367	$399	Moderate	Major	Moderate
				Inland Bathy	QL2B	6-10 years	$719	$327	Major	Major	Moderate
				Nearshore Bathy	QL1B	4-5 years	$598	$87	Moderate	Major	Minor
				Offshore Bathy	Special Order	6-10 years	$17	$5	Moderate	Major	Minor
BU 14 – Cultural Resource Management	Smithsonian Institution (SI)	1153	Facilities Operations and Support	Inland Topo	QL0	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
BU 14 – Cultural Resource Management	Smithsonian Institution (SI)	60688	Cultural Resources Preservation and Management	Inland Topo	QL1	4-5 years	$167	$2	Moderate	Moderate	Minor
				Inland Bathy	QL0B	6-10 years	$115	Unable to quantify	Moderate	Moderate	Minor
				Nearshore Bathy	QL0B	4-5 years	$32	Unable to quantify	Minor	Moderate	Minor
				Offshore Bathy	Order 1a	6-10 years	$1,069	Unable to quantify	Minor	Moderate	Minor

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 16 – Sea Level Rise and Subsidence	Smithsonian Institution (SI)	60676	Sea Level Rise and Subsidence	Inland Topo	QL0	4-5 years	$18,931	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL1B	4-5 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Minor
				Offshore Bathy	Order 1a	6-10 years	Unable to quantify	Unable to quantify	Major	Major	Moderate
BU 23 – Urban and Regional Planning	Smithsonian Institution (SI)	60677	Urban and Regional Planning	Inland Topo	QL2	4-5 years	$96,750	$6,873	Moderate	Major	Major
				Inland Bathy	QL1B	6-10 years	$3,943	$2,992	Moderate	Moderate	Major
				Nearshore Bathy	QL1B	4-5 years	$2,088	$2,203	Moderate	Moderate	Moderate
BU 26 – Education and Basic Research	Smithsonian Institution (SI)	1323	Museum and Research Centers	Inland Topo	QL1	6-10 years	$1,889	$3,613	Moderate	I don't know	I don't know
				Inland Bathy	QL0B	Event driven	$494	Unable to quantify	Moderate	Moderate	I don't know
				Nearshore Bathy	QL0B	4-5 years	$74	$1	I don't know	I don't know	I don't know
				Offshore Bathy	I don't know	Event driven	$853	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60671
Organization Type	Federal Agencies and Commissions
Organization Name	Smithsonian Institution (SI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	6-10 years	4-5 years	2-3 years	I don't know
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	I don't know
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	I don't know
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	I don't know	Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required	I don't know	Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	I don't know	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required	I don't know	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know	I don't know	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	I don't know
DTM	Required	Highly desirable	Required	I don't know
DEM	Required	Required	Required	I don't know
Raw point cloud data	Nice to have	Nice to have	Nice to have	I don't know
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	I don't know
Full waveform	Nice to have	Nice to have	Highly desirable	I don't know
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	I don't know
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	I don't know
Tide Predictions			Not required	I don't know
Tidal Constituent And Residual Interpolation (TCARI)			Not required	I don't know
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	I don't know
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	I don't know
Nautical and/or navigation charts			Not required	I don't know
Acoustic imagery of the seafloor			Highly desirable	I don't know
Aerial and/or satellite imagery	Highly desirable	Required	Required	I don't know
Underwater videography			Not required	I don't know
Bottom texture			Highly desirable	I don't know
Bottom type			Required	I don't know
Submerged features			Highly desirable	I don't know
Subbottom characteristics			Highly desirable	I don't know
Geologic and seismic data	Nice to have	Not required	Not required	I don't know
Water column properties - Physical			Nice to have	I don't know
Water column properties - Chemical			Nice to have	I don't know
Water column properties - Biological			Nice to have	I don't know
Currents			Nice to have	I don't know
Tide/wave heights			Not required	I don't know
Sea ice conditions			Not required	I don't know
Habitat distribution and classification			Nice to have	I don't know
Boundaries			Not required	I don't know
Routes			Not required	I don't know
Offshore cadastral			Not required	I don't know
Lease areas			Not required	I don't know
Fixed obstructions			Not required	I don't know
Floating observation/navigation systems			Not required	I don't know
Shorelines – current, historic, change rates	Highly desirable	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	I don't know
Wetlands	Required	Required	Required	I don't know

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	I don't know
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	I don't know
Cost savings/cost reduction	Moderate	Moderate	Moderate	I don't know
Cost avoidance	Moderate	Minor	None	I don't know
Increased revenues	None	None	None	I don't know
Mission-driven performance improvements	Major	Minor	Minor	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	I don't know

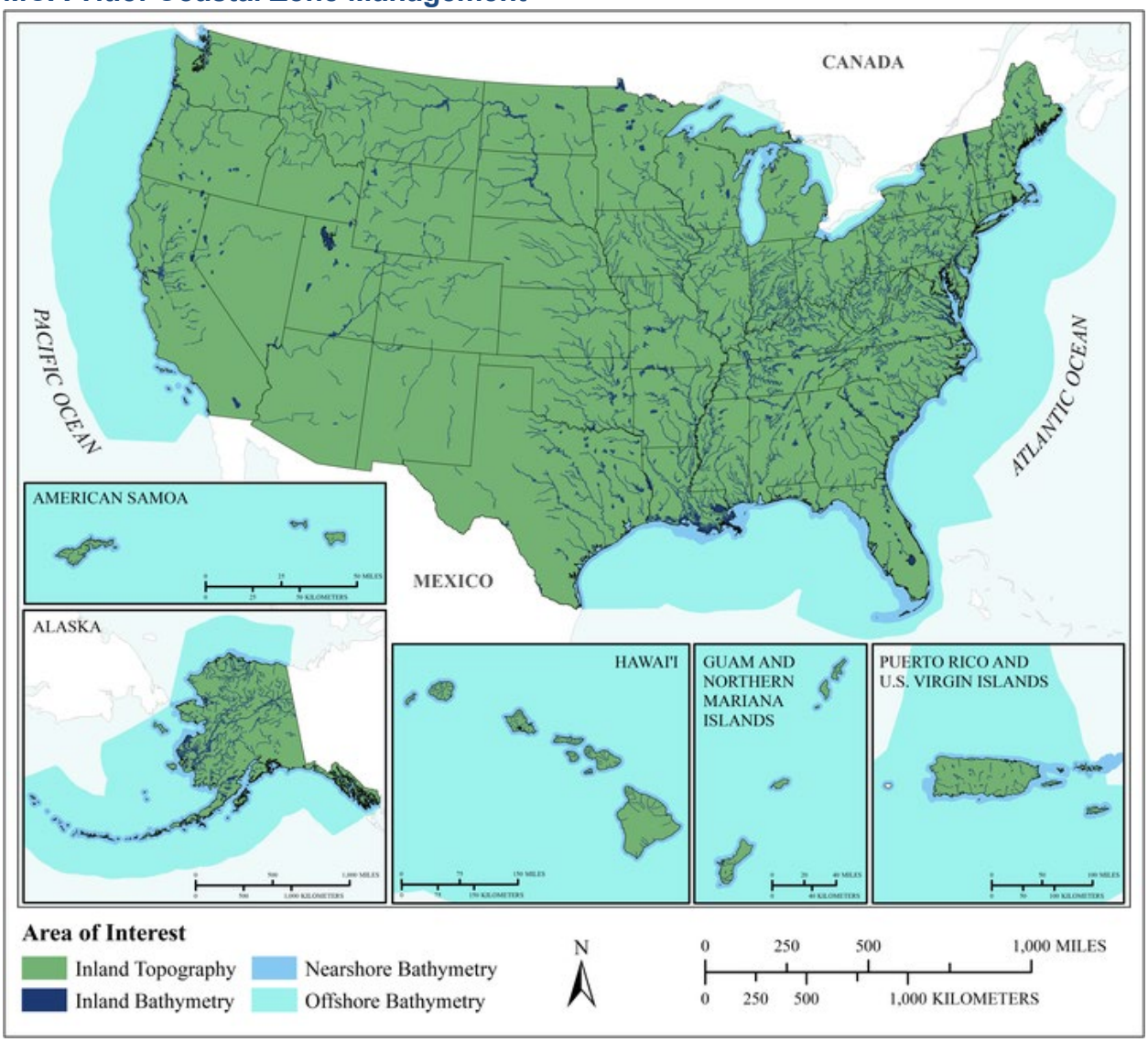
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Minor	Minor	I don't know
Improved customer experience	Major	Moderate	Minor	I don't know
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	I don't know
Environmental	Major	Major	Moderate	I don't know
Public safety, including life and property	Major	Moderate	Moderate	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$550		Annual dollars saved/ realized	$293		Annual dollars saved/ realized	$1,141			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		I don't know	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$32		Annual dollars saved/ realized	$13		Annual dollars saved/ realized	$436			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			I don't know		
Environmental	Major			Major			Moderate			I don't know		
Public safety, including life and property	Major			Major			Moderate			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Coastal Zone Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Analysis of coastal erosion and inundation. Hurricane storm surge and wind damage modeling and assessment. Coastal hazard modeling and mapping. Coastal hazard mitigation. Tsunami modeling. Land use and environmental planning. Coastal resiliency. Oil spill modeling. Littoral zone management including dunes and beaches.
MCA Title	Coastal Zone Management
MCA ID	60672
Organization Type	Federal Agencies and Commissions
Organization Name	Smithsonian Institution (SI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	Order 1a
Update Frequency	4-5 years	4-5 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Nice to have	Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Required	Highly desirable	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Highly desirable	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Highly desirable	Nice to have
Tide/wave heights			Highly desirable	Nice to have
Sea ice conditions			Not required	Nice to have
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Highly desirable	Required	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Moderate
Cost savings/cost reduction	Major	Moderate	Major	Moderate
Cost avoidance	Major	Moderate	Major	Minor
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Moderate	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Major	Moderate

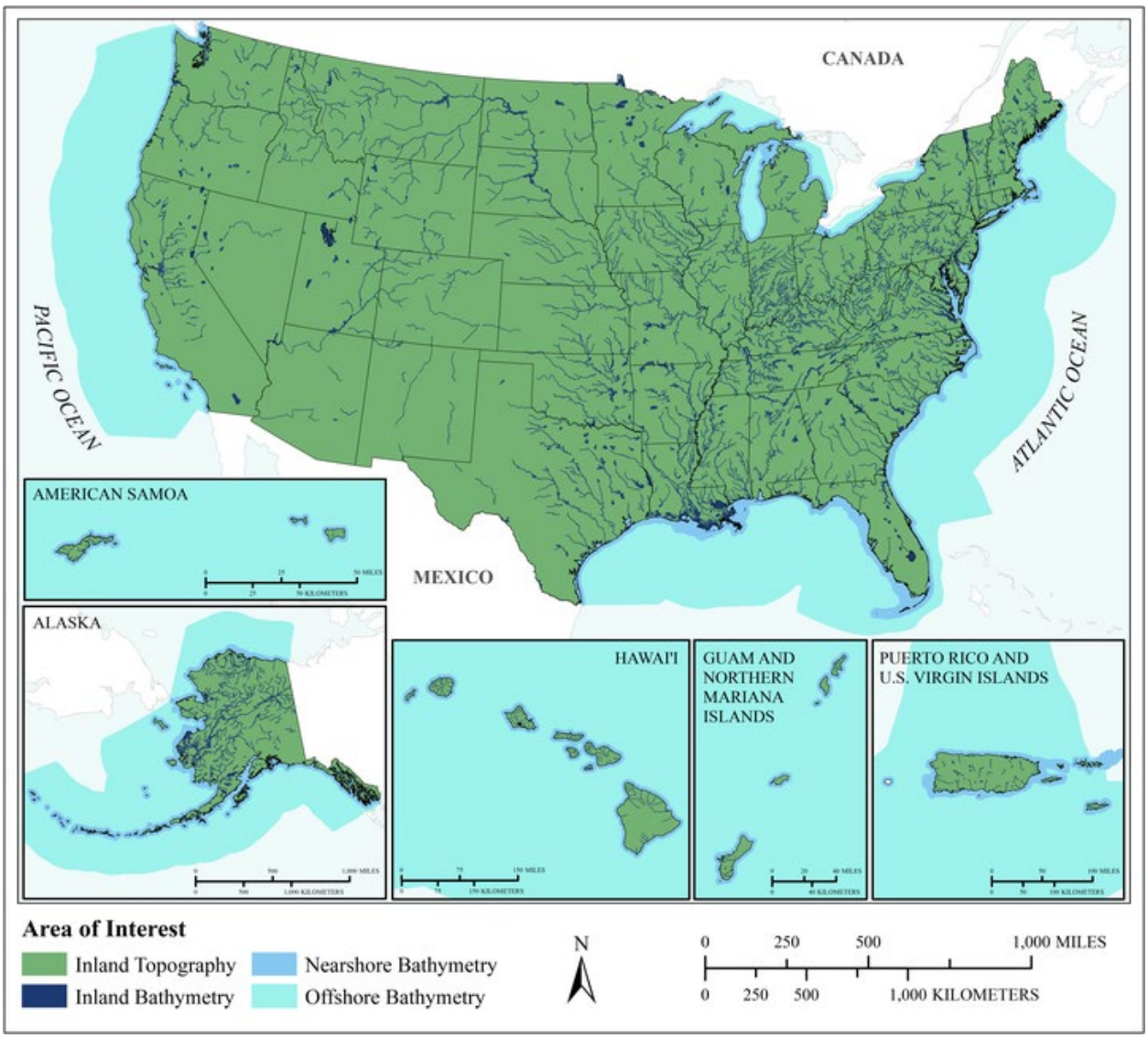
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Moderate	Moderate	Minor
Improved customer experience	Major	Moderate	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Minor
Environmental	Major	Moderate	Major	Moderate
Public safety, including life and property	Major	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	None			None			Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$13,141		Annual dollars saved/ realized	$6,030		Annual dollars saved/ realized	$2,132		Annual dollars saved/ realized	$32,823
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$1,354		Annual dollars saved/ realized	$2,091		Annual dollars saved/ realized	$1,977		Annual dollars saved/ realized	$5,240
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major			Minor		
Environmental	Major			Major			Major			Moderate		
Public safety, including life and property	Major			Major			Major			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			
Curvature maps	Yes	Yes	Yes	
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Natural Resources Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Conservation engineering. Soils and wetlands mapping and characterization. Modeling of biological and ecological systems. Erosion control. Rainfall penetration studies, impervious surfaces. Assessment of blue carbon stocks.
MCA Title	Natural Resources Conservation
MCA ID	60673
Organization Type	Federal Agencies and Commissions
Organization Name	Smithsonian Institution (SI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	QL1B	Order 2
Update Frequency	4-5 years	6-10 years	6-10 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 20 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Up to 2 meters
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable
Entire AOI under same environmental conditions	Required	Required	Required	Required	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Required	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Required	Highly desirable
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Highly desirable
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Nice to have	Highly desirable
Ground control/ground truthing	Required	Required	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Required
Acoustic imagery of the seafloor			Nice to have	Required
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Highly desirable
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	Highly desirable
Wetlands	Required	Required	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Major
Cost savings/cost reduction	Major	Moderate	Moderate	Major
Cost avoidance	Major	Moderate	Minor	Major
Increased revenues	Minor	Minor	None	Minor
Mission-driven performance improvements	Major	Major	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Minor	Major

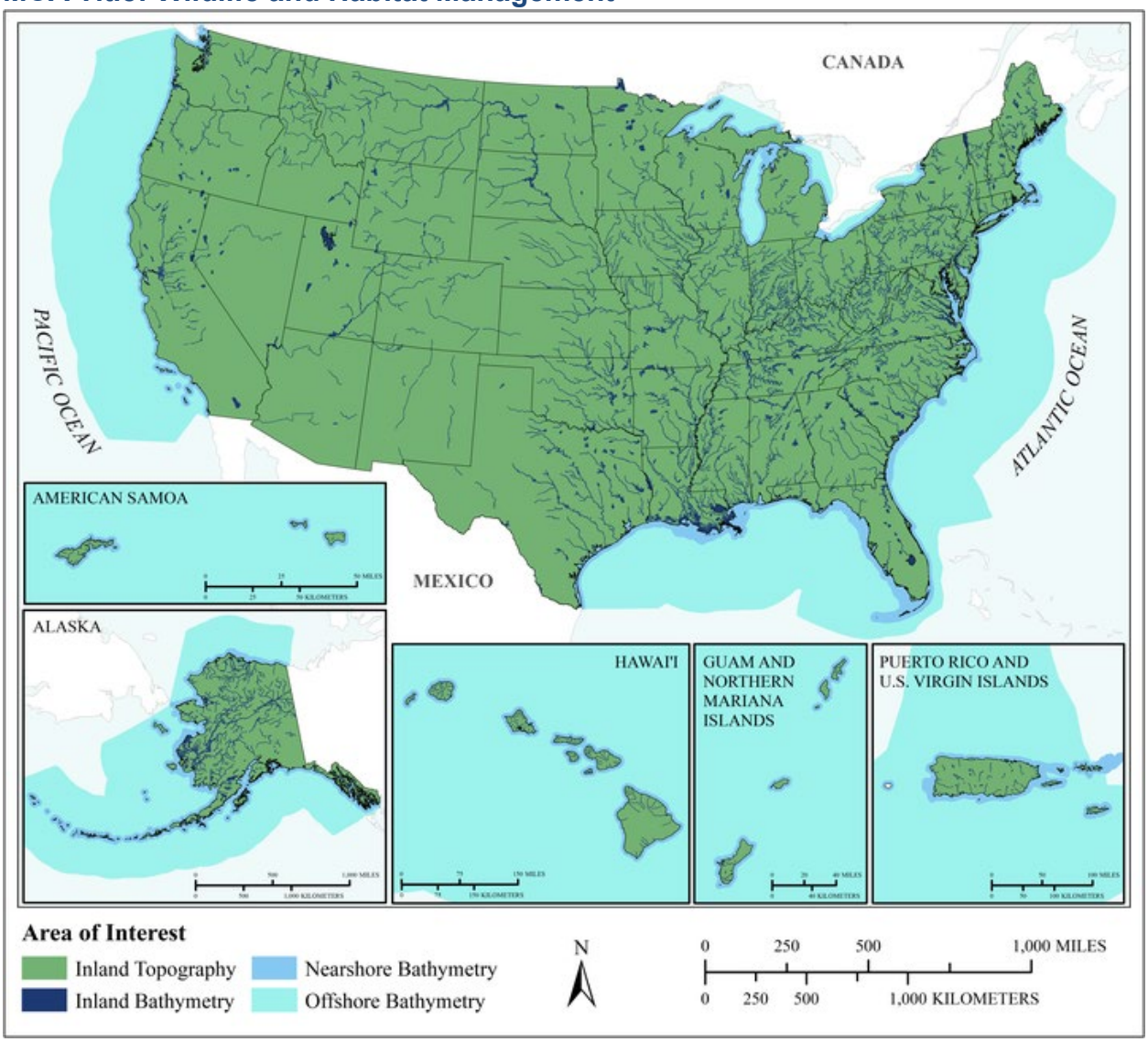
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Major	Major	Moderate	Moderate
Improved customer experience	Major	Moderate	Minor	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	Major
Environmental	Major	Major	Major	Major
Public safety, including life and property	Major	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		None			Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$9,522		Annual dollars saved/ realized	$1,516		Annual dollars saved/ realized	$8			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$13,395		Annual dollars saved/ realized	$56		Annual dollars saved/ realized	$2			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate			Moderate		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Major			Major			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes		Yes	
Curvature maps			Yes	
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes		Yes	
Viewshed maps	Yes	Yes	Yes	
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Conservation planning for wildlife refuges and marine sanctuaries. Conservation of critical habitats. Management of diverse migratory bird habitats, coral reef and coral communities, marine mammals, protected fish species, and trust resources.
MCA Title	Wildlife and Habitat Management
MCA ID	60674
Organization Type	Federal Agencies and Commissions
Organization Name	Smithsonian Institution (SI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL0B	Order 1a
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Highly desirable
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Not required	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Required
Aerial and/or satellite imagery	Required	Required	Highly desirable	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Highly desirable	Required
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Required
Boundaries			Highly desirable	Required
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Highly desirable
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Nice to have
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	Moderate
Cost savings/cost reduction	Major	Major	Moderate	Moderate
Cost avoidance	Major	Moderate	Moderate	Major
Increased revenues	None	Minor	None	None
Mission-driven performance improvements	Moderate	Moderate	Moderate	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	Moderate

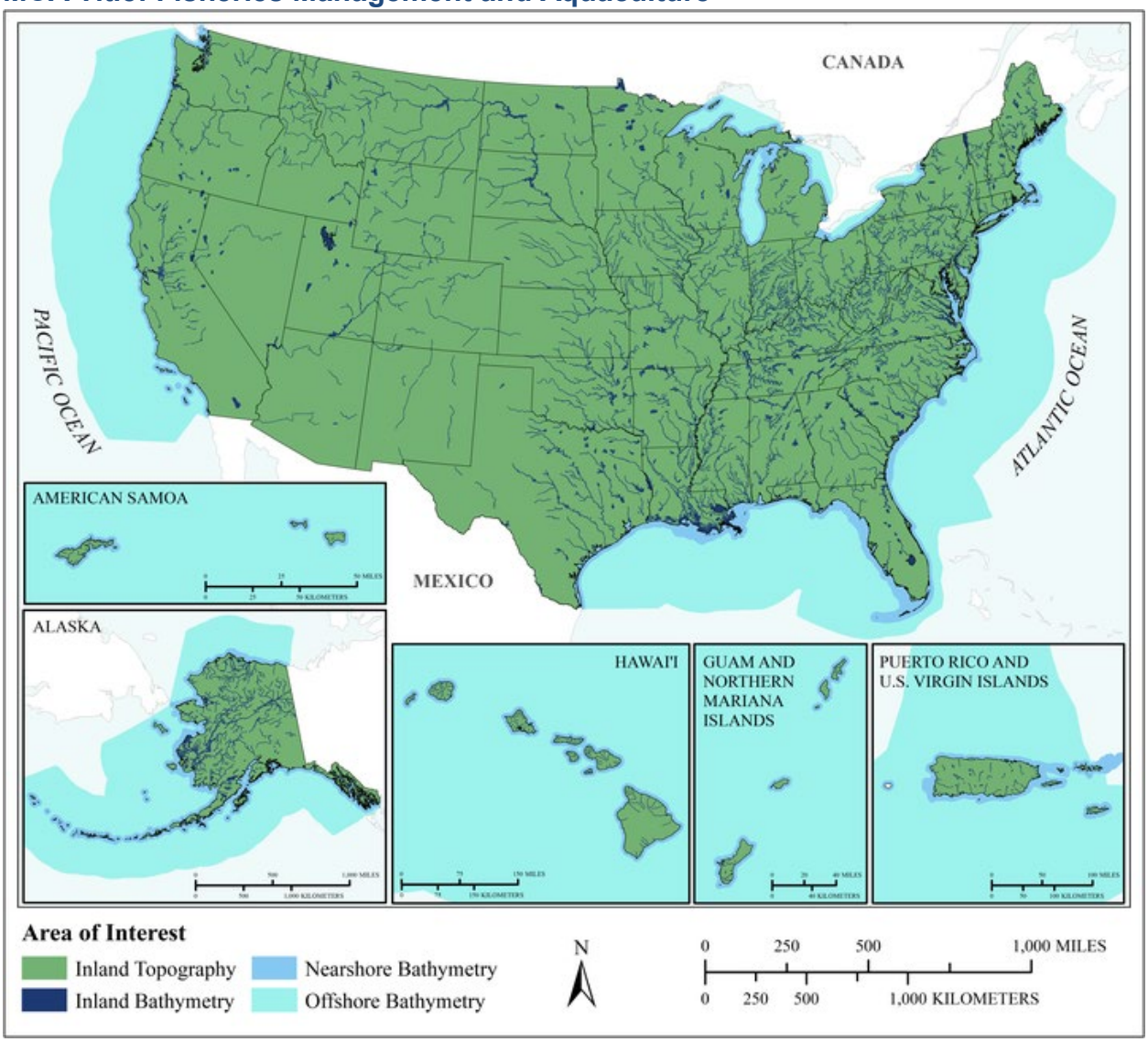
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Minor	Minor	Minor
Improved customer experience	Minor	Moderate	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Moderate	Minor	Minor
Environmental	Major	Major	Major	Major
Public safety, including life and property	Minor	Minor	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$440		Annual dollars saved/ realized	$552		Annual dollars saved/ realized	$18		Annual dollars saved/ realized	$434
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$89		Annual dollars saved/ realized	$249		Annual dollars saved/ realized	$0		Annual dollars saved/ realized	$15
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate			Moderate		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Moderate			Moderate			Moderate			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			Yes
Curvature maps	Yes	Yes		Yes
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			Yes
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Fisheries Management and Aquaculture



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Management of fisheries. Sustainable aquaculture.
MCA Title	Fisheries Management and Aquaculture
MCA ID	60675
Organization Type	Federal Agencies and Commissions
Organization Name	Smithsonian Institution (SI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 09 - Fisheries Management and Aquaculture
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL1B	Special Order
Update Frequency	4-5 years	6-10 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 2 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Nice to have	Nice to have	Required	Nice to have
Entire AOI under same environmental conditions	Required	Highly desirable	Required	Highly desirable	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Highly desirable	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Required
DTM	Required	Highly desirable	Highly desirable	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	Nice to have
Classified point cloud	Highly desirable	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Required
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Nice to have	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Required	Highly desirable
Underwater videography			Nice to have	Required
Bottom texture			Nice to have	Required
Bottom type			Highly desirable	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Nice to have	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Nice to have	Required
Floating observation/navigation systems			Nice to have	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Nice to have	Highly desirable
Wetlands	Required	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Required	Required	Nice to have	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Required	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Moderate
Cost savings/cost reduction	Major	Moderate	Major	Moderate
Cost avoidance	Major	Moderate	Moderate	Minor
Increased revenues	Moderate	Moderate	Minor	None
Mission-driven performance improvements	Major	Major	Major	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Moderate

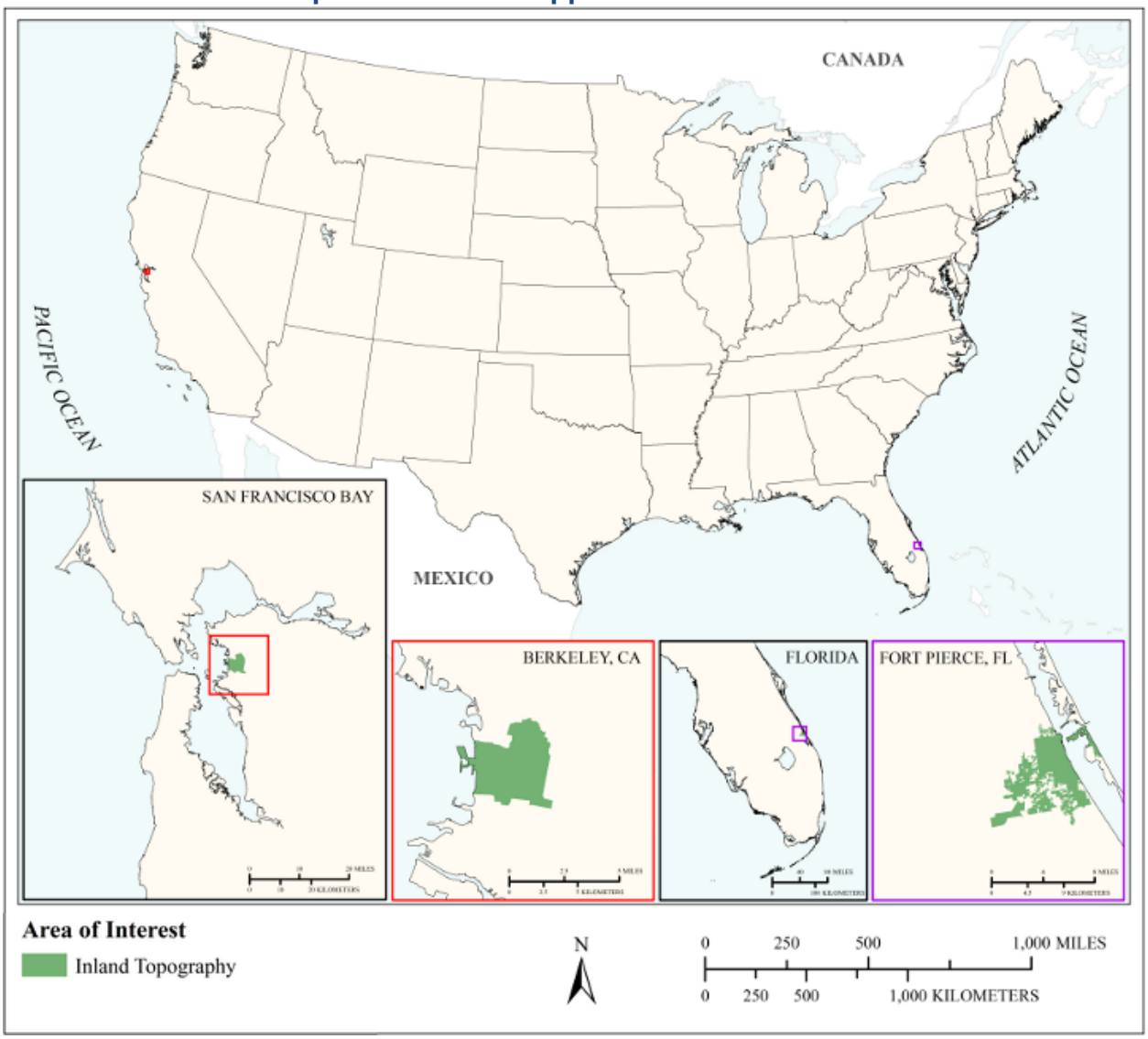
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Major	Major	Minor
Improved customer experience	Major	Major	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Moderate	Moderate
Environmental	Major	Major	Major	Moderate
Public safety, including life and property	Major	Minor	Moderate	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide	
Increased revenues	Minor	Unable to provide		None			Moderate	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$367		Annual dollars saved/ realized	$719		Annual dollars saved/ realized	$598		Annual dollars saved/ realized	$17
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$399		Annual dollars saved/ realized	$327		Annual dollars saved/ realized	$87		Annual dollars saved/ realized	$5
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Moderate			Moderate		
Environmental	Major			Major			Major			Major		
Public safety, including life and property	Moderate			Moderate			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes		Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps	Yes	Yes	Yes	Yes
Cross sections	Yes		Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Facilities Operations and Support



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Custom description			
Sub Area Requirements	Berkeley, CA and Fort Pierce, FL			

MCA Description	Response
Mission Critical Activity	Develop visualizations to help museum staff understand how we are using built space. Elevation data are used in BIM, GIS, and CADD to map facilities.
MCA Title	Facilities Operations and Support
MCA ID	1153
Organization Type	Federal Agencies and Commissions
Organization Name	Smithsonian Institution (SI)
Sub-Agency or Division	Geospatial
Organization Mission	Understanding the natural world and our place in it.
Program Name	Smithsonian Facilities
Total Annual Program Budget	$1,000,000
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Individual feature (e.g. single tree, single structure)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Sign, curb,

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	To MHW			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Nice to have			
Classified point cloud	Nice to have			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			
Other	Highly desirable			
Other description				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Land use/land cover	Nice to have			
Wetlands	Required			
Estuaries				
Inland surface water features	Required			
Bridges/culverts	Required			
Landmark features	Highly desirable			
Cultural resources	Required			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	I don't know			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	Major			
Mission-driven performance improvements	Major			

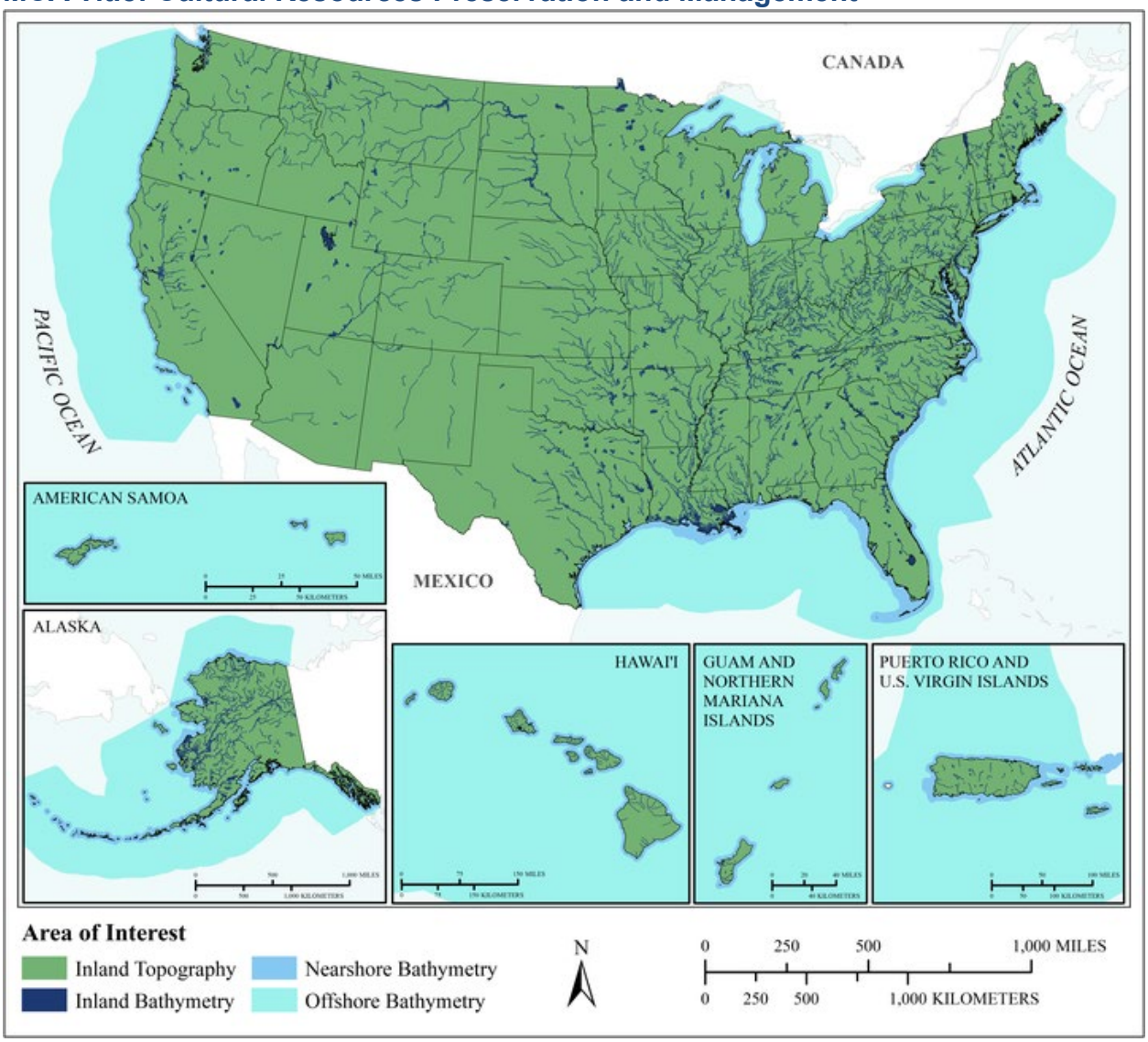
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost savings/cost reduction description	Drone acquisition for facilities.											
Cost avoidance	Moderate	Unable to provide										
Increased revenues	Moderate	Unable to provide										
Mission-driven performance improvements	Moderate	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved customer experience	Moderate	Unable to provide										
Other customer service benefits	Moderate	Unable to provide										
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Moderate											
Public safety, including life and property	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Cultural Resources Preservation and Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Discovery and analysis of underwater archaeological and historical cultural sites. Site protection and preservation planning. Discovery and analysis of Native American and other historical cultural sites and subsistence activities.
MCA Title	Cultural Resources Preservation and Management
MCA ID	60688
Organization Type	Federal Agencies and Commissions
Organization Name	Smithsonian Institution (SI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	Order 1a
Update Frequency	4-5 years	6-10 years	4-5 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Nice to have	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Required
DTM	Required	Highly desirable	Nice to have	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Not required	Nice to have
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Nice to have	Highly desirable	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Required	Highly desirable	Highly desirable	Nice to have
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Highly desirable	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Required	
Land use/land cover	Nice to have	Highly desirable	Nice to have	Highly desirable
Wetlands	Nice to have	Highly desirable	Nice to have	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Nice to have	Highly desirable	Nice to have	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Highly desirable	
Cultural resources	Required	Highly desirable	Required	
Coastal and riverine structures	Nice to have	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	Moderate
Cost savings/cost reduction	Major	Minor	Minor	Minor
Cost avoidance	Moderate	Minor	Minor	Minor
Increased revenues	Minor	Minor	None	None
Mission-driven performance improvements	Moderate	Minor	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	None	Minor

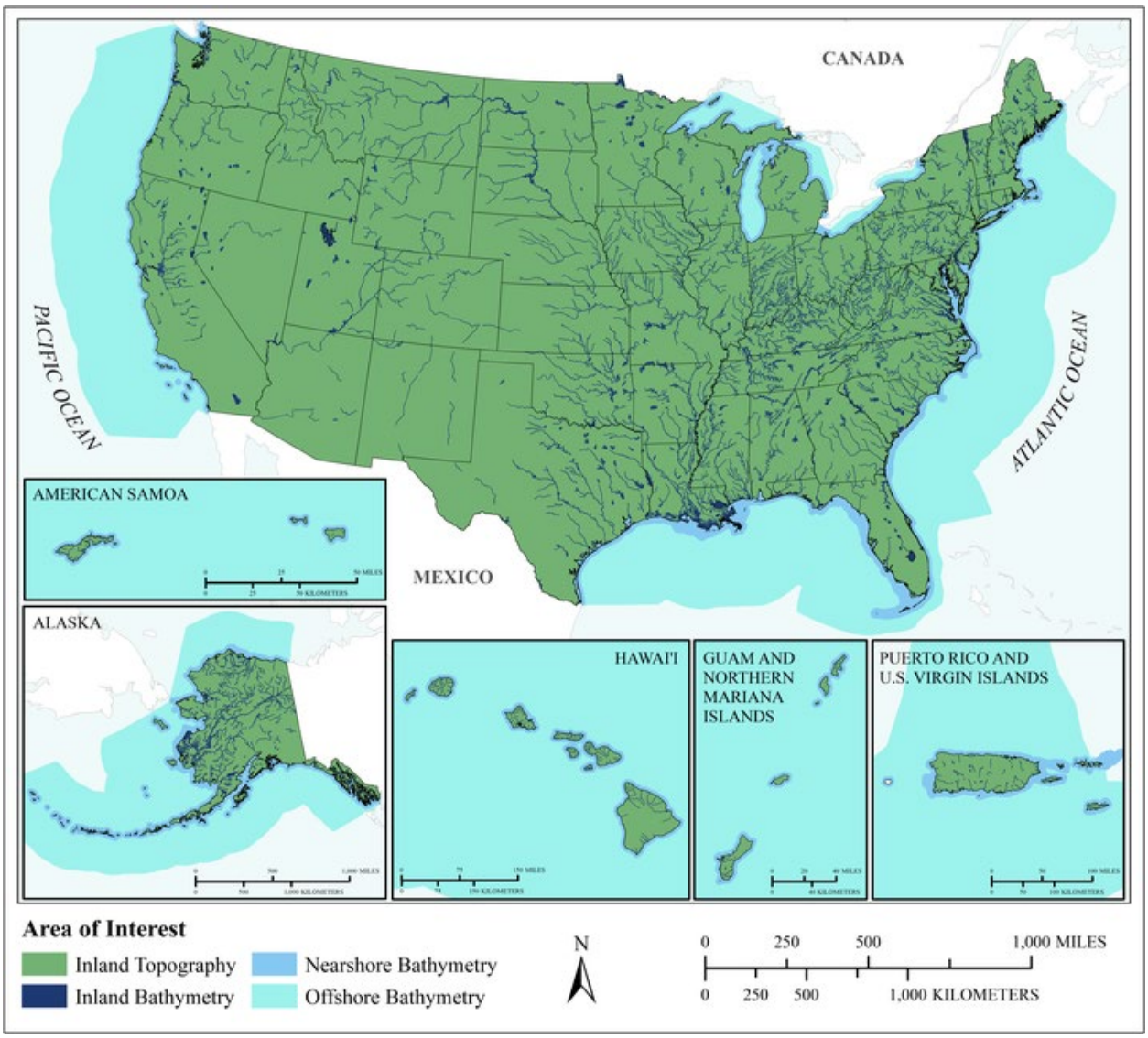
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Major	Minor	Moderate
Improved customer experience	Moderate	Moderate	Minor	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	Minor
Environmental	Moderate	Moderate	Minor	Moderate
Public safety, including life and property	Minor	Moderate	None	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$167		Annual dollars saved/ realized	$115		Annual dollars saved/ realized	$32		Annual dollars saved/ realized	$1,069
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2									
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Minor			Minor		
Environmental	Moderate			Moderate			Moderate			Moderate		
Public safety, including life and property	Minor			Minor			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Sea Level Rise and Subsidence



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment.
MCA Title	Sea Level Rise and Subsidence
MCA ID	60676
Organization Type	Federal Agencies and Commissions
Organization Name	Smithsonian Institution (SI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 16 - Sea Level Rise and Subsidence
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL1B	QL1B	Order 1a
Update Frequency	4-5 years	4-5 years	2-3 years	6-10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Required	Nice to have	Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Required	Required	Nice to have	Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Required	Required	Highly desirable	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Nice to have	Nice to have
Classified point cloud	Required	Nice to have	Highly desirable	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Required
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Required	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Not required	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Nice to have
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Not required
Water column properties - Biological			Nice to have	Not required
Currents			Nice to have	Nice to have
Tide/wave heights			Required	Required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Highly desirable	Highly desirable	Nice to have
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	Moderate
Cost savings/cost reduction	Major	Moderate	Major	Moderate
Cost avoidance	Major	Major	Major	Moderate
Increased revenues	None	Minor	Minor	None
Mission-driven performance improvements	Major	Major	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major

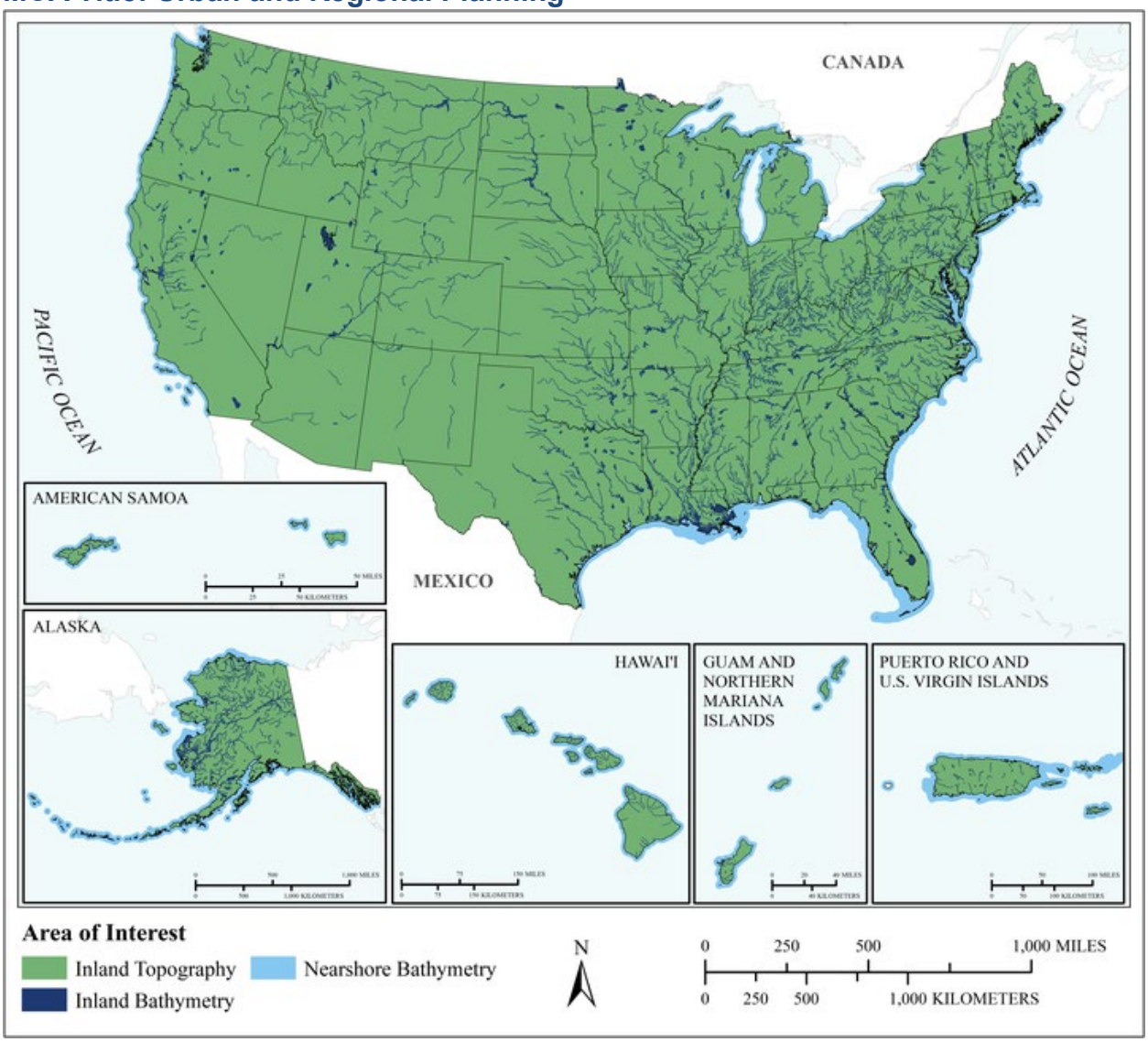
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	Moderate	Moderate	Moderate
Improved customer experience	Moderate	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Moderate	Moderate
Environmental	Major	Moderate	Major	Moderate
Public safety, including life and property	Major	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$18,931									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major			Major		
Environmental	Moderate			Major			Major			Major		
Public safety, including life and property	Moderate			Major			Minor			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes	Yes	
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness		Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Urban and Regional Planning



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	

MCA Description	Response
Mission Critical Activity	Land development and zoning. Municipal mapping of building footprints and elevations. Port resilience planning. Parks and transportation planning. Virtual city creation. Urban ecology planning.
MCA Title	Urban and Regional Planning
MCA ID	60677
Organization Type	Federal Agencies and Commissions
Organization Name	Smithsonian Institution (SI)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	
Update Frequency	4-5 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Nice to have	Highly desirable	
Classified point cloud	Required	Required	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Highly desirable	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Required	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Highly desirable	
Land use/land cover	Required	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Minor	
Cost savings/cost reduction	Major	Minor	Minor	
Cost avoidance	Major	Minor	Minor	
Increased revenues	Minor	None	None	
Mission-driven performance improvements	Major	Moderate	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	

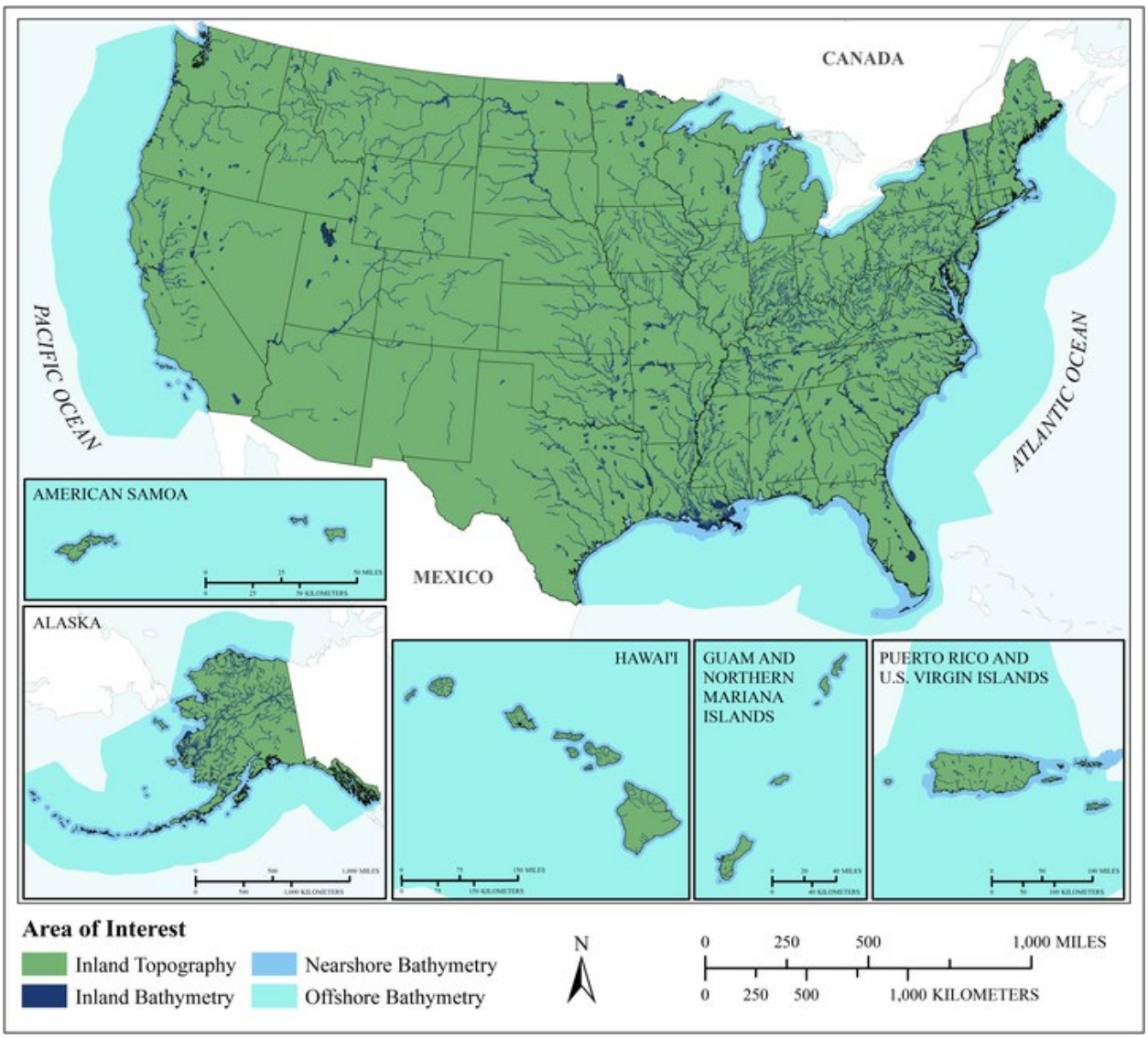
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Minor	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Minor	
Environmental	Major	Minor	Minor	
Public safety, including life and property	Major	Moderate	Minor	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$96,750		Annual dollars saved/ realized	$3,942		Annual dollars saved/ realized	$2,088			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$6,873		Annual dollars saved/ realized	$2,992		Annual dollars saved/ realized	$2,203			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate					
Environmental	Major			Moderate			Moderate					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours	Yes	Yes		
Hillshades		Yes		
Slope maps		Yes		
Aspect maps		Yes		
Curvature maps		Yes		
Cross sections		Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps		Yes		
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Museum and Research Centers



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Nice to have	Nice to have	Nice to have
Geographic Area Requirements	States and/or Territories	States and/or Territories	All study waters	All study waters
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		

MCA Description	Response
Mission Critical Activity	Development of 3-D visualizations to help the public understand the Earth they live on. Understanding of continental-scale climate change impacts. Ocean science. Ocean education. Scientific earth and space research. Data dissemination. Development of training simulators. For the study of evolution on Mars, Earth datasets are used for analogue studies.
MCA Title	Museum and Research Centers
MCA ID	1323
Organization Type	Federal Agencies and Commissions
Organization Name	Smithsonian Institution (SI)
Sub-Agency or Division	
Organization Mission	To provide the increase and diffusion of knowledge to the public.
Program Name	Exhibits
Total Annual Program Budget	$270,000
Primary Business Use	BU 26 - Education K12 and Beyond, Basic Research
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Archaeological and paleobiological dig sites. Coral reefs, algae blooms, vegetation, 1-meter size corals.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	I don't know
Update Frequency	6-10 years and certain events.	Event driven only – Data need to coincide with a specific event.	4-5 years	Event driven only – Data need to coincide with a specific event.
Event type(s)	Natural disaster such as a volcano, wildfire, or earthquake.	Natural disaster such as a volcano, wildfire, or earthquake.		Natural disaster such as a volcano, wildfire, or earthquake.
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	I don't know	I don't know	Up to 1 meter
Acceptable Vertical Error	Up to 50 cm	I don't know	I don't know	I don't know
How far onshore needed			To MHW	
How far down the beach profile needed	To MHW		To MHW	
Tide correction requirement			I don't know	MSL
Cross sections and/or transects meet needs		Partial	Partial	Partial
Cross section/transect requirement		Unknown. QL0B equivalent	Unknown. QL0B equivalent	Unknown.

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable	Highly desirable	Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Highly desirable	Required	Nice to have	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Highly desirable	Not required	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Required	Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Required	Highly desirable
DTM	Required	Required	Required	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Nice to have	Nice to have	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Nice to have
Tide Predictions			Not required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Highly desirable
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Highly desirable	Required
Underwater videography			Nice to have	Highly desirable
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Nice to have	Highly desirable
Geologic and seismic data	Required	Required	Required	Required
Water column properties - Physical			Nice to have	Required
Water column properties - Chemical			Nice to have	Required
Water column properties - Biological			Required	Required
Currents			Nice to have	Required
Tide/wave heights			Nice to have	Required
Sea ice conditions			Highly desirable	Required
Habitat distribution and classification			Required	Required
Boundaries			Nice to have	Required
Routes			Not required	Nice to have
Offshore cadastral			Not required	Nice to have
Lease areas			Nice to have	Highly desirable
Fixed obstructions			Nice to have	Required
Floating observation/navigation systems			Nice to have	Required
Shorelines – current, historic, change rates	Highly desirable	Required	Highly desirable	
Land use/land cover	Required	Required	Required	Required
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Highly desirable	Highly desirable	Required	
Cultural resources	Highly desirable	Required	Required	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Stereo derived photogrammetrically produced 3D data. National Elevation Database. Various airborne lidar (from NCALM)	Unknown	Unknown	Best available data. State MOUs provide some data.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI				Yes
Open Topography				
NOAA nautical charts				Yes
USACE navigation charts				Yes
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS				Yes
State Repositories		Yes		
State repositories used		Alaska		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	I don't know	I don't know
Cost savings/cost reduction	Major	Moderate	I don't know	I don't know
Cost avoidance	Moderate	I don't know	I don't know	None

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	Moderate	I don't know	I don't know	None
Mission-driven performance improvements	Moderate	I don't know	I don't know	I don't know
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Moderate	I don't know
Improved response or timeliness	Moderate	I don't know	I don't know	I don't know
Improved customer experience	Moderate	I don't know	I don't know	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Minor	I don't know
Environmental	Moderate	I don't know	Minor	I don't know
Public safety, including life and property	Moderate	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		None			None		
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,889		Annual dollars saved/ realized	$494		Annual dollars saved/ realized	$74		Annual dollars saved/ realized	$853
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Moderate	Unable to provide		None			None		
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		None			None		
Improved customer experience	I don't know	Unable to provide		Moderate	Unable to provide		None			None		
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$3,613					Annual dollars saved/ realized	$1			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			I don't know			I don't know		
Environmental	I don't know			Moderate			I don't know			I don't know		
Public safety, including life and property	I don't know			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

Tennessee Valley Authority (TVA)

TVA is a corporate agency of the United States that provides electricity for business customers and local power companies serving 10 million people in parts of seven southeastern states. TVA receives no taxpayer funding, deriving virtually all of its revenues from sales of electricity. In addition to operating and investing its revenues in its electric system, TVA provides flood control, navigation, and land management for the Tennessee River system and assists local power companies and state and local governments with economic development and job creation.

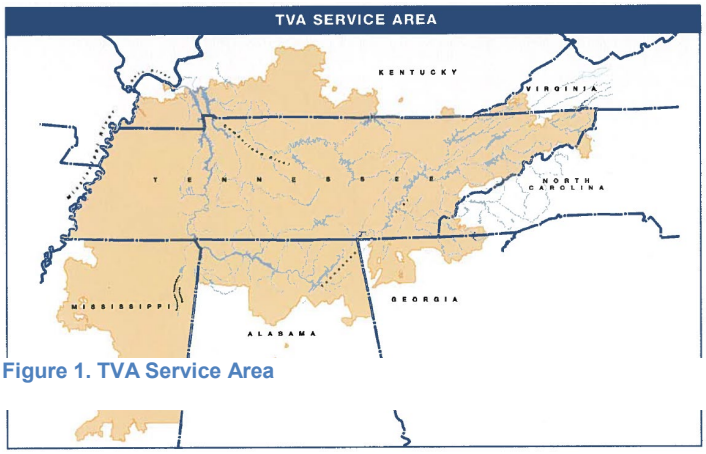


Figure 1. TVA Service Area

TVA was established by Congress in 1933 to provide for river navigation, flood control, and agricultural and industrial development, and to promote the use of electric power in the Tennessee Valley region. As shown on the adjoining map, TVA's service territory includes most of Tennessee and parts of Alabama, Mississippi, Kentucky, Georgia, North Carolina, and Virginia – an area of 90,000 square miles with a population of nine million, and sells electricity to 155 power distributor customers and 56 directly served industries and federal agencies.

TVA operates 29 hydroelectric dams, 6 fossil fuel-fired power plants, 3 nuclear plants, 17 natural gas-fired power facilities, 1 diesel generator site, 15 solar energy sites, and 1 wind energy site and supplies up to 37,188 million kilowatts of electricity, delivered over 16,000 miles of high-voltage power lines.

TVA's core mission is to improve the quality of life and economic prosperity for people and businesses in the Tennessee Valley by providing: affordable electricity, economic and agricultural development, environmental stewardship, integrated river system management, and technological innovation.

TVA partners with federal, state, and local entities to acquire elevation data to meet its mission requirements. TVA also will acquire elevation and other geospatial data as needed for specific project areas.

- TVA has partnered with the states of Tennessee, Alabama, and Mississippi for the 3DEP program.
- TVA has acquired lidar data from other states for some specific project areas.
- TVA has bathymetric data every 500 feet of the navigable Tennessee River from the U.S. Army Corps of Engineers (Nashville District).
- TVA periodically collects data with internal resources in various departments for small project areas (such as for vegetation management, cultural resources, dam safety inspections, and ground surveys).
- TVA contracts with vendors to acquire and process lidar and aerial photography as needed.

TVA has a large breadth of uses for elevation data and multiple purposes. Quality Level 1 (QL1) or QL2 lidar is required by TVA for new transmission line planning, vegetation management along transmission lines, uprate of transmission line studies, flood risk modeling that includes probability modeling and

analysis for maximum flooding for generating power plants and substations, and detailed topographic mapping and site development. Some examples within each of TVA's three mission elements are:

Energy – power generation, dam safety inspections, flood risk mitigation, transmission line siting, vegetation management, wind and solar siting, emergency preparedness, federal property protection. The applicable Business Uses include the following:

BU 12 – Renewable Energy Resources
BU 15 – Flood Risk Management
BU 18 – Homeland Security, Law Enforcement
BU 21 – Aviation Navigation and Safety
BU 22 – Infrastructure and Construction Management

Environment – environmental stewardship, weed management, threatened and endangered species, cultural resource protection, water supply and water quality, land boundary management, integrated resource management, wetlands mitigation. The applicable Business Uses include the following:

BU 01 – Water Supply and Water Quality (bathymetry)
BU 02 – Riverine Ecosystem Management
BU 06 – Natural Resources Conservation
BU 07 – Wildlife and Habitat Management
BU 10 – Geologic Assessment and Hazard Mitigation
BU 14 – Cultural Resources Preservation and Management
BU 30 – Maritime and Land Boundary Management

Economic Development – recreation, navigation, boating safety, urban and regional planning. The applicable Business Uses include the following:

BU 20 – Riverine Navigation and Safety
BU 23 – Urban and Regional Planning
BU 25 – Real Estate, Banking, Mortgage, and Insurance
BU 27 – Recreation

QL1 lidar and inland bathymetric data are needed in and around the Tennessee River, its tributaries, and flood zone areas plus TVA facilities and protected areas. Data generally needs to be updated every 2-3 years or in the event of a flood. QL2 is adequate in other areas.

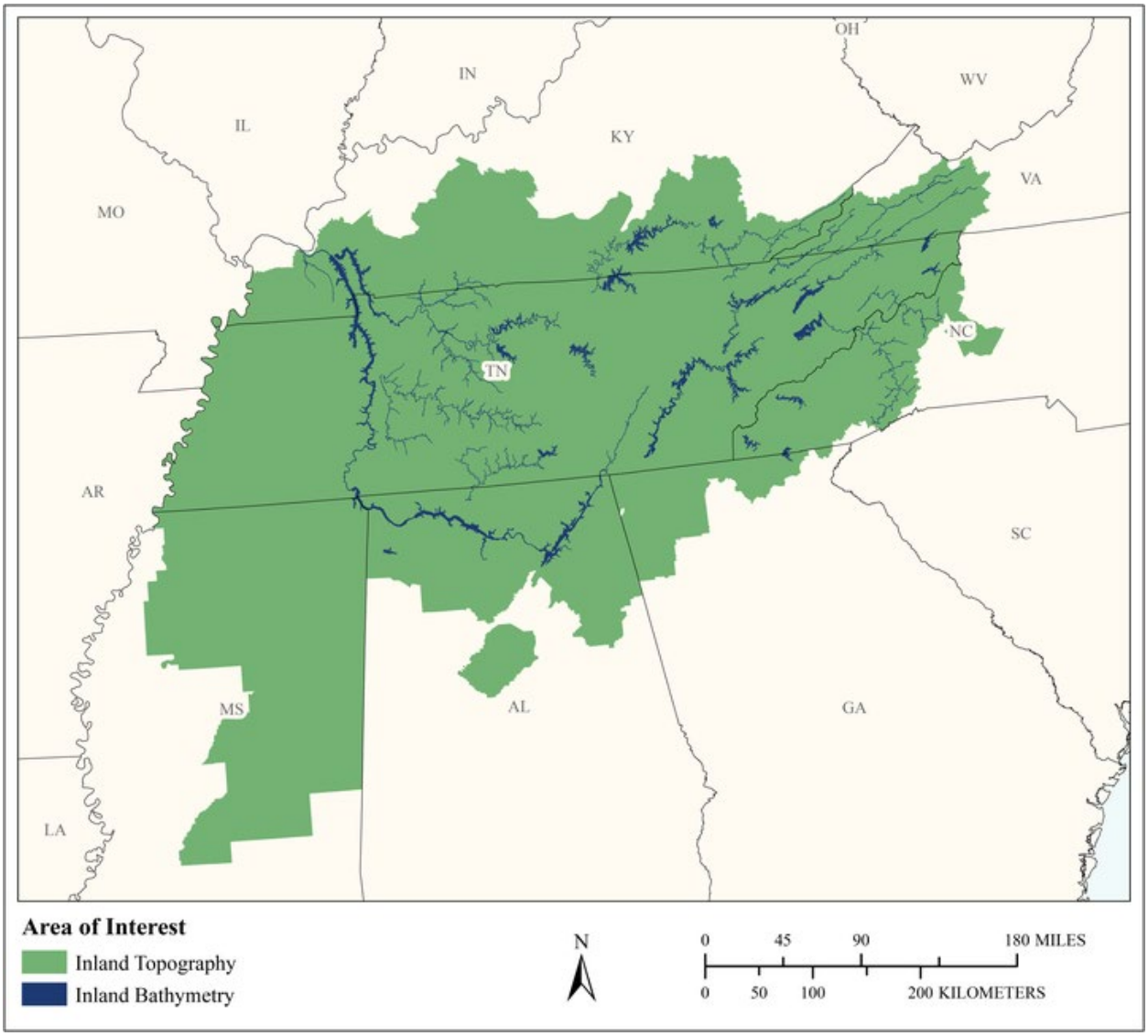
With readily available higher resolution elevation data, TVA would be better positioned to perform its Mission Critical Activities. Access to region-wide and nationwide elevation data, in addition to successful partnerships, is necessary for TVA to complete its mission.

TVA has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 07 – Wildlife and Habitat Management	Tennessee Valley Authority (TVA)	1213	Environment	Inland Topo	(a) QL1 HD (b) QL2	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
BU 22 – Infrastructure Management	Tennessee Valley Authority (TVA)	1064	Energy Generation and Transmission	Inland Topo	QL1	2-3 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Inland Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major
BU 23 – Urban and Regional Planning	Tennessee Valley Authority (TVA)	21683	Economic Development	Inland Topo	QL1	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Major

MCA Title: Environment



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Area split by varying quality level or update frequency	Respondent provided own shapefile, KML, or geodatabase		
Sub Area Requirements	All land within Tennessee River watershed and power service area boundary	All waters within Tennessee River watershed		

MCA Description	Response
Mission Critical Activity	Environment - We are committed to protecting the Tennessee Valley's natural resources, as well as its historical and cultural heritage. This includes management of natural resources during transmission line siting, etc. Elevation data are needed to help identify wetlands under power corridors and for other habitat management activities. Inland bathymetry is needed for reservoirs and their connecting rivers (but not for small farm dams). Bathymetry is also needed for permitting for docks, underwater weed control, and to check for underwater artifacts before issuing a dock permit. Additional Business Uses for this MCA include BU 01 – Water Supply and Water Quality, BU 02 – Riverine Ecosystem Management, BU 06 – Natural Resources Conservation, and BU 30 – Maritime and Land Boundary Management.
MCA Title	Environment
MCA ID	1213
Organization Type	Federal Agencies and Commissions
Organization Name	Tennessee Valley Authority (TVA)
Sub-Agency or Division	Operations / Resources & River Management / Land & River Management / Realty Services & GIS / GIS & Mapping
Organization Mission	To improve the quality of life in the Valley through the integrated management of the region's resources
Program Name	Natural and Cultural Resource Management and Conservation, Seismic hazard assessment, Integrated Resource management
Total Annual Program Budget	$10,000,000
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 14 - Cultural Resources Preservation and Management
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Algae, invasive plant species, underwater artifacts

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL1 HD (b) QL2	QL1B		
Update Frequency	2-3 years and certain events.	2-3 years and certain events.		
Event type(s)	New project, flood event, etc.	New project, flood event, etc.		
Quality Level and/or update frequency variability across AOI	Wetlands or areas with endangered species are of greatest concern (QL1 HD). QL2 is acceptable elsewhere.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross section/transect requirement	Vertical: Less than 5 cm Distance between cross-section lines: 10 meters Where: For Seismic: crest of dam, regional scale For wildlife/riverine ecosystem: sampling density every 10-100 meters in areas near rivers/streams where not getting continuous data. (Permitting and stabilization projects need continuous data. Non-permitting areas could use cross-section data).	Vertical: Less than 10 cm Distance between cross-section lines: 10 meters Where: rivers - perpendicular to river flow For wildlife/riverine ecosystem: sampling density every 10-100 meters in areas near rivers/streams where not getting continuous data. (Permitting and stabilization projects need continuous data. Non-permitting areas could use cross-section data)		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Required	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Highly desirable		
Raw point cloud data	Required	Highly desirable		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Highly desirable		
Full waveform	Nice to have	Nice to have		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Required		
Land use/land cover	Required	Highly desirable		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Highly desirable		
Landmark features	Required	Highly desirable		
Cultural resources	Required	Required		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	3DEP (QL1 and QL2), specific acquisitions required for projects	Sometimes acquire site specific data using sidescan sonar, Navigation charts with underwater contours, US Army Corps of Engineers 500 ft cross-section data along navigable channels, Data not available in some areas		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

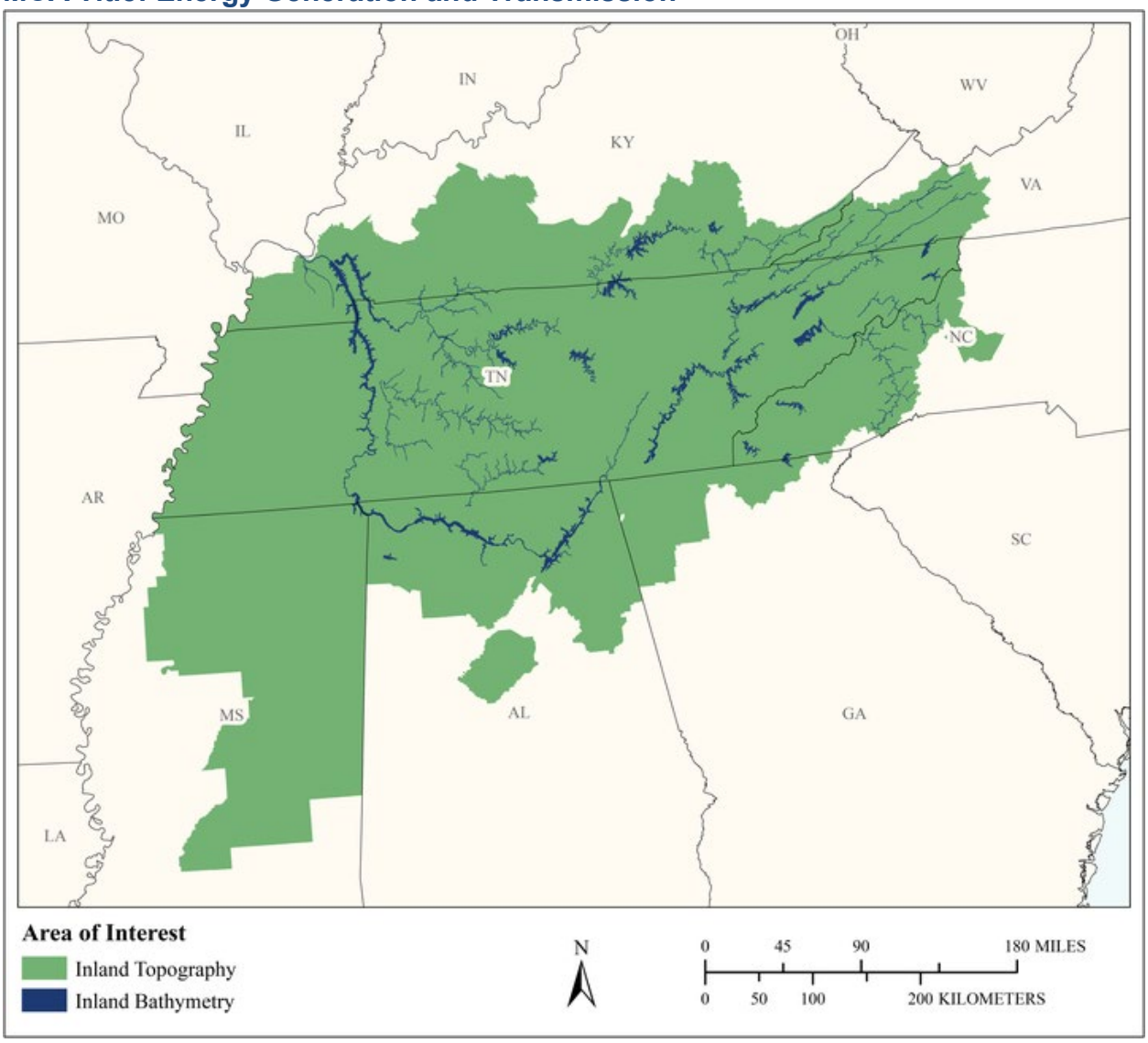
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	TVA collaborates with USGS on 3DEP program and receives LiDAR data directly on hard drive. (TN, KY, MS, AL, GA, VA, NC) if available.			
Other	Yes	Yes		
Other description	Specific acquisitions required for projects	US Army Corps of Engineers sonar data along navigable waterways every 500 ft. Not close enough spacing.		
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Moderate		
Increased revenues	Major	Minor		
Mission-driven performance improvements	Major	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor		
Improved response or timeliness	Major	Minor		
Improved customer experience	Major	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor		
Environmental	Major	Minor		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Minor								
Environmental	Major			Moderate								
Public safety, including life and property	Major			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Energy Generation and Transmission



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase		
Sub Area Requirements	All land within Tennessee River watershed and power service area boundary	All waters within Tennessee River watershed		

MCA Description	Response
Mission Critical Activity	Energy (generation and transmission) - "As the nation's largest government-owned power provider, TVA delivers safe, reliable, clean, competitively priced electricity to local power companies and to large, energy-intensive industrial customers and federal facilities." This MCA includes hydroelectric dams and reservoirs, monitoring of sedimentation in reservoirs, also flow, hydroengineering permitting, modeling of downstream consequences, preparation of Emergency Action Plans (EAPs), H&H modeling for dam breach modeling, and providing data to FEMA. Seamless bathymetry and topography are needed.
MCA Title	Energy Generation and Transmission
MCA ID	1064
Organization Type	Federal Agencies and Commissions
Organization Name	Tennessee Valley Authority (TVA)
Sub-Agency or Division	Operations / Resources & River Management / Land & River Management / Realty Services & GIS / GIS & Mapping
Organization Mission	To improve the quality of life in the Valley through the integrated management of the region's resources
Program Name	Power Generation, Transmission Line, and Vegetation Management Grid Resiliency, Power Operations & Restoration, Emergency Management Flood Risk Management
Total Annual Program Budget	$200,000,000
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Cracks in dam, cracks in bushings and insulators

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	2-3 years and certain events.	6-10 years and certain events.		
Event type(s)	A project or natural disaster (flood, disaster)	A flood, drought, etc.		
Quality Level and/or update frequency variability across AOI	Waterways, some natural areas, and structure/facility areas have higher needs. Nuclear plant requires at least QL1. QL1 not needed for entire power service area.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Less than 5 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		
Cross section/transect requirement	Vertical: Up to 10 cm Distance between cross section lines: 3 meters Where: near rivers and streams	Vertical: Less than 20 cm Distance between xsec lines: 3 meters Where: rivers - perpendicular to river flow		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Required	Nice to have			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Required	Highly desirable		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Highly desirable		
Land use/land cover	Required	Highly desirable		
Wetlands	Required	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Required	Highly desirable		
Cultural resources	Required	Highly desirable		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	3DEP (QL1), specific acquisitions required for projects	- US Army Corps 500 ft cross-sections along navigable Tennessee River - Acquiring sonar in project areas - At times, using 1930s siltation cross-sections when other data not available - Testing Bathymetric lidar for riparian zones (QL1) - Data not available in some areas - Navigation charts		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

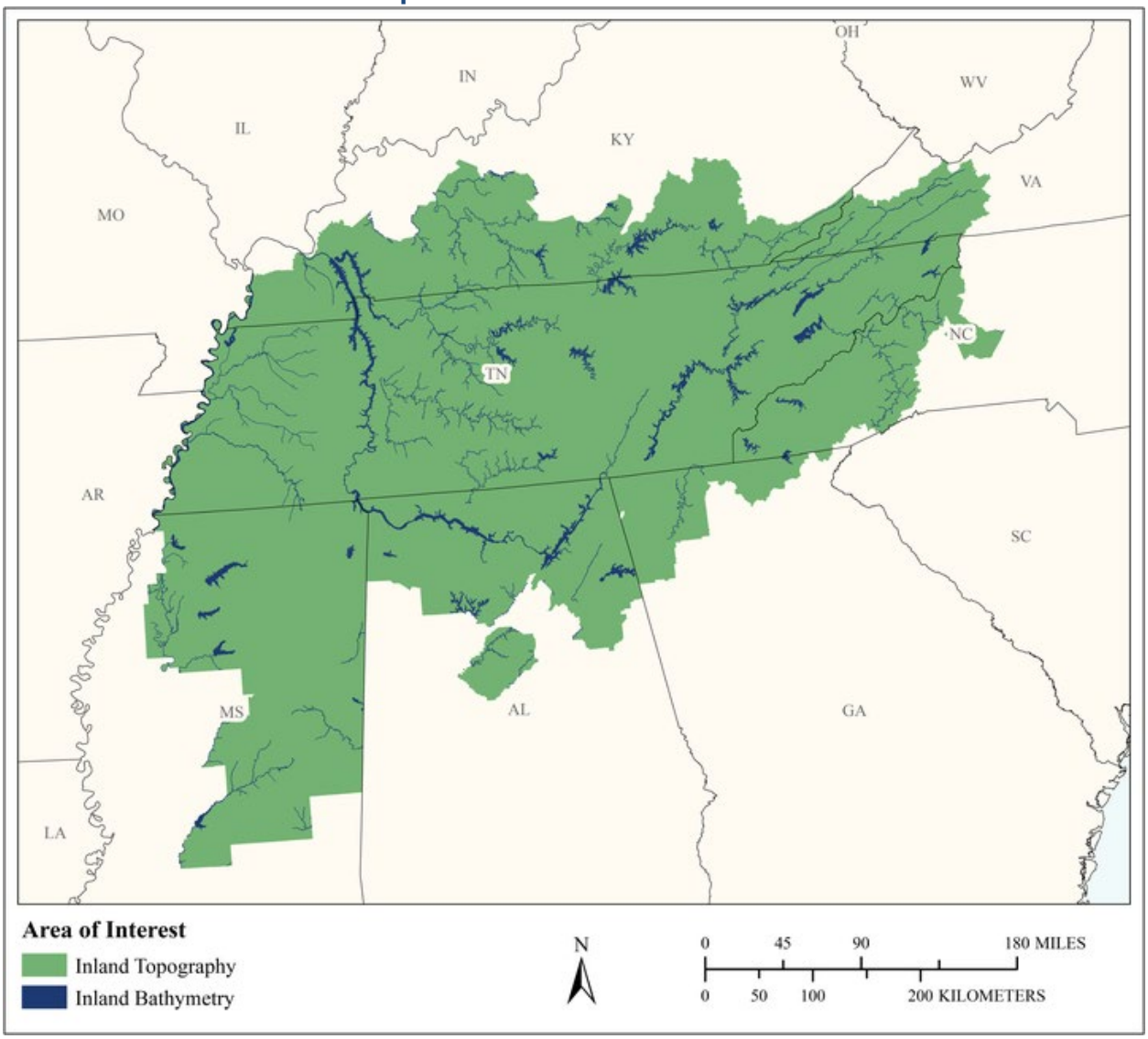
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	TVA collaborates with USGS on 3DEP program and receives LiDAR data directly on hard drive. (TN, KY, MS, AL, GA, VA, NC if available)			
Other	Yes	Yes		
Other description	Specific acquisitions for projects, Directly from USGS	US Army Corps provided		
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Moderate		
Increased revenues	Major	Moderate		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate		
Improved response or timeliness	Major	Moderate		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate		
Environmental	Major	Moderate		
Public safety, including life and property	Major	Moderate		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Moderate	Unable to provide		None								
Increased revenues description	Strategic fiber initiative.											
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Improved customer experience description	Meter data management, GIS applications.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Major			Moderate								
Environmental description	Decisions about herbicides on private property											
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Economic Development



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase		
Sub Area Requirements	All land within Tennessee River watershed and power service area boundary	All waters within Tennessee River watershed and power service area boundary		

MCA Description	Response
Mission Critical Activity	Economic Development - TVA Economic Development serves the seven states that make up the TVA service area—almost all of Tennessee and parts of Mississippi, Alabama, Georgia, North Carolina, Virginia and Kentucky. Through our partnerships with other economic development organizations, we help foster capital investment and job growth in the area. TVA Economic Development works to attract new companies—which results in more jobs and investments in the Valley—and to engage existing businesses and industries to help them grow in a sustainable way. Working in concert with our partners—regional, state and community organizations—we offer site selection services, incentives, research and technical assistance to help companies locate, stay and expand existing operations in the Tennessee Valley. Elevation data are needed to improve recreation opportunities, shipping on navigable waters, and to help attract quality investors and new residents.
MCA Title	Economic Development
MCA ID	21683
Organization Type	Federal Agencies and Commissions
Organization Name	Tennessee Valley Authority (TVA)
Sub-Agency or Division	Operations / Resources & River Management / Land & River Management / Realty Services & GIS / GIS & Mapping
Organization Mission	To improve the quality of life in the Valley through the integrated management of the region's resources
Program Name	Economic Development, Navigation, Recreation
Total Annual Program Budget	$21,500,000
Primary Business Use	BU 23 - Urban and Regional Planning
Secondary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Tertiary Business Use	BU 27 - Recreation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Manhole covers, culverts, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	2-3 years and certain events.	2-3 years and certain events.		
Event type(s)	New client (project), natural event, etc.	New client (project), natural event, etc.		
Quality Level and/or update frequency variability across AOI	Waterways, recreation areas and project areas need QL1, QL2 is acceptable elsewhere.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Less than 5 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs	Partial	Partial		
Cross section/transect requirement	Vertical: Up to 10 cm; Distance between cross section lines: 3 meters; Where: near rivers and streams	Bathymetry: Vertical accuracy: Up to 50 cm Sampling density every few feet Where: navigable channel		

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable

Hydrologic Processing Required	Response
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Nice to have			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Nice to have		
Classified point cloud	Required	Highly desirable		
Edited/cube XYZ		Nice to have		
Full waveform	Required	Nice to have		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required	Required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required	Required		
Land use/land cover	Required	Required		
Wetlands	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Required	Required		
Cultural resources	Highly desirable	Required		
Coastal and riverine structures	Highly desirable	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	3DEP (QL1 and QL2), specific acquisitions required for projects	Rec: Look at current recreation paper map with underwater topo Nav: USACE cross-section data of navigable channels on TN River spaced every 500 ft (sonar)		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	TVA collaborates with USGS on 3DEP program and receives LiDAR data directly on hard drive. (TN, KY, MS, AL, GA, VA, NC) if available.			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes			
Other description	Specific acquisitions required for projects			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	Major	Major		
Cost avoidance	Major	Major		
Increased revenues	Major	None		
Mission-driven performance improvements	Major	Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate		
Improved response or timeliness	Major	Moderate		
Improved customer experience	Major	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor		
Environmental	Moderate	Minor		
Public safety, including life and property	Moderate	Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Increased revenues	Major	Unable to provide		None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate								
Environmental	Major			Moderate								
Public safety, including life and property	Major			Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

U.S. Army Corps of Engineers (USACE)

The mission of USACE is to deliver vital public and military engineering services; partnering in peace and war to strengthen our Nation's security, energize the economy and reduce risks from disasters.

Since its founding in 1802, USACE has responded to changing defense requirements and played an integral part in the development of the country. Throughout the 19th century, USACE built coastal fortifications, surveyed roads and canals, eliminated navigational hazards, explored and mapped the western frontier, constructed buildings and monuments in the nation's capital, constructed lighthouses, helped develop jetties and piers for harbors, and carefully mapped the navigation channels.

In the 20th century, USACE became the lead federal flood control agency and significantly expanded its civil works activities, becoming among other things a major provider of hydroelectric energy and the country's leading provider of recreation. Its role in responding to natural disasters also grew dramatically.

In the late 1960s, USACE became a leading environmental preservation and restoration agency. It now carries out natural and cultural resource management programs at its water resources projects and regulates activities in the nation's wetlands. In addition, USACE assists the military services in environmental management and restoration at former and current military installations.

Currently, environmental issues are the chief public works challenges for USACE. Infrastructure development requires developing management techniques, new approaches, and new technology to use resources more efficiently and to reduce resource depletion. It also means eliminating or reducing contaminants, such as radioactive wastes, toxic and solid wastes, and nonpoint source pollutants of our surface and groundwater. Finally, it involves working with other agencies and organizations to develop effective responses to ecological crises such as oil spills, drought, and fire. In all these areas, USACE began developing expertise a century or more ago. USACE's historical strengths in program management, engineering design, research and development, and construction will prove invaluable as the agency readies to meet the challenges of the 21st century.

Elevation data are used for coastal zone mapping and modeling, flood risk and emergency management, army geospatial coordination, harbor management and navigation, water supply and quality, riverine ecosystem management, marine navigation and safety, and infrastructure and construction management.

Most of USACE's Mission Critical Activities require Quality Level 0 (QL0) inland topography. Harbor and construction management require elevation data to be updated annually, whereas coastal zone mapping and emergency management only require updates every 4-5 years. Most responses indicated a need for QL0B inland and nearshore bathymetry with an update frequency of every 2-3 years. Offshore bathymetry has an average update frequency of every 4-5 years, and ranges from needing only cross sections to requiring Special Order data.

Future benefits from improved elevation data include significant hours saved through more efficient modeling and avoided data manipulation. Considerable cost savings can be attributed to avoided data acquisition, processing, and errors. Other benefits include improved decision making due to better data and modeling and improved projections of at-risk locations and/or faster warning to the public of impending natural or man-made hazards.

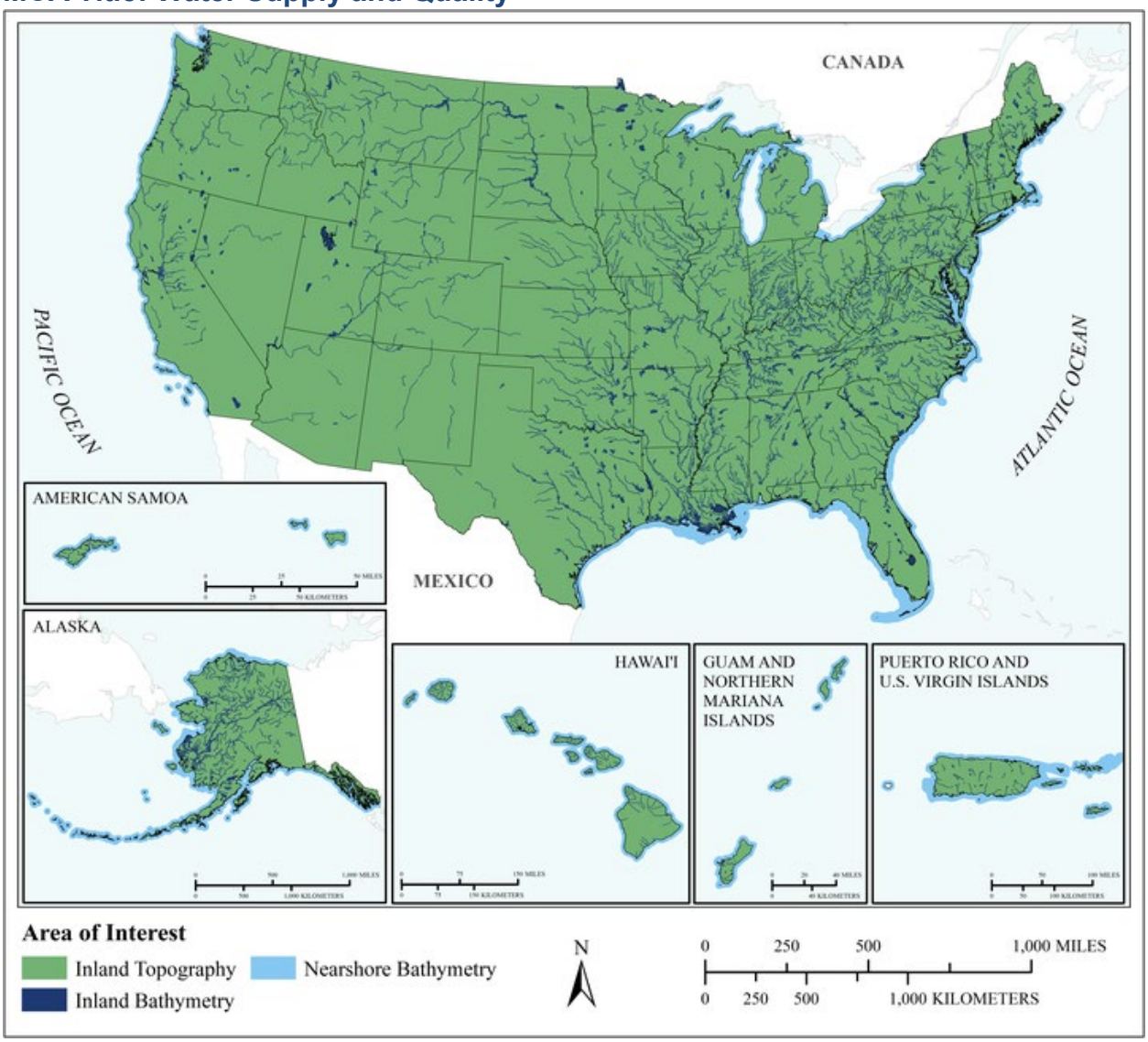
USACE has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	DoD: U.S. Army Corps of Engineers (USACE)	60679	Water Supply and Quality	Inland Topo	QL2	6-10 years	$18,208,275	$2,089,711	Moderate	Major	None
				Inland Bathy	QL1B	6-10 years	$70,615,844	$4,099,749	Moderate	Major	None
				Nearshore Bathy	QL1B	6-10 years	$3,763,786	$3,100,198	Moderate	Moderate	None
BU 02 – Riverine Ecosystem Management	DoD: U.S. Army Corps of Engineers (USACE)	60680	Riverine Ecosystem Management	Inland Topo	QL1	6-10 years	$5,503,923	$329,856	Major	Major	Major
				Inland Bathy	QL0B	4-5 years	$2,931,795	$137,819	Major	Major	Major
				Nearshore Bathy	QL0B	2-3 years	$11,414,676	$4,361,309	Moderate	Moderate	Moderate
BU 15 – Flood Risk Management	DoD: U.S. Army Corps of Engineers (USACE)	21590	Flood Risk and Emergency Management	Inland Topo	QL0	4-5 years	$443,176,220	$36,707,139	None	Major	Major
				Inland Bathy	QL2B	2-3 years	$28,396,705	$15,811,263	None	Minor	Moderate
				Nearshore Bathy	Cross sections and/or transects meet needs	2-3 years	$13,060,385	$6,577,438	None	Minor	Moderate
				Offshore Bathy	Cross sections and/or transects meet needs	4-5 years	Unable to quantify	$150,750	None	Minor	I don't know
BU 20 – Marine and Riverine Navigation	DoD: U.S. Army Corps of Engineers (USACE)	21512	Coastal Zone Mapping	Inland Topo	QL1 HD	4-5 years	$77,989	Unable to quantify	Minor	Minor	Moderate
				Inland Bathy	QL1B	2-3 years	$11,714,143	$33,768,379	Minor	Minor	Minor
				Nearshore Bathy	QL0B	4-5 years	$19,778,611	$21,328,019	Minor	Minor	Moderate
				Offshore Bathy	Order 1b	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Moderate
BU 20 – Marine and Riverine Navigation	DoD: U.S. Army Corps of Engineers (USACE)	22396	Harbor Management and Navigation	Inland Topo	Cross sections and/or transects meet needs	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL0B	2-3 years	$53,618	Unable to quantify	None	None	Minor
				Nearshore Bathy	QL0B	Annually	$54,221	Unable to quantify	I don't know	Moderate	Moderate
				Offshore Bathy	Special Order	2-3 years	$133,618	Unable to quantify	I don't know	I don't know	Minor
BU 20 – Marine and Riverine Navigation	DoD: U.S. Army Corps of Engineers (USACE)	60681	Marine and Riverine Navigation and Safety	Inland Bathy	QL0B	2-3 years	$32,843,495	$4,319,054	Moderate	Major	Major
BU 22 – Infrastructure Management	DoD: U.S. Army Corps of Engineers (USACE)	21648	Infrastructure and Construction Management	Inland Topo	QL0	Annually	$142,660,531	$91,455,985	Minor	Moderate	Minor
				Inland Bathy	QL0B	2-3 years	$38,932,187	$2,432,927	Minor	Moderate	Moderate
				Nearshore Bathy	QL2B	Annually	$2,384,782	$327,905	Minor	Minor	None

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 29 – Military	DoD: U.S. Army Corps of Engineers (USACE)	22536	Army Geospatial Coordination	Inland Topo	QL0	Event driven	$10,725,671	Unable to quantify	I don't know	I don't know	I don't know

MCA Title: Water Supply and Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	

MCA Description	Response
Mission Critical Activity	Fate and transport of contaminants. Pollution risk mitigation. Runoff and sedimentation analyses. Point- or non-point source pollution modeling. Management of contaminants and marine debris - point, non-point, vessel, and atmospheric pollution; spills; trash.
MCA Title	Water Supply and Quality
MCA ID	60679
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: U.S. Army Corps of Engineers (USACE)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	
Update Frequency	6-10 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Nice to have		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Nice to have	
DTM	Required	Highly desirable	Nice to have	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Not required	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Nice to have	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	
Cost savings/cost reduction	Major	Minor	Moderate	
Cost avoidance	Major	Minor	Moderate	
Increased revenues	Minor	None	Minor	
Mission-driven performance improvements	Major	Moderate	Moderate	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Moderate	

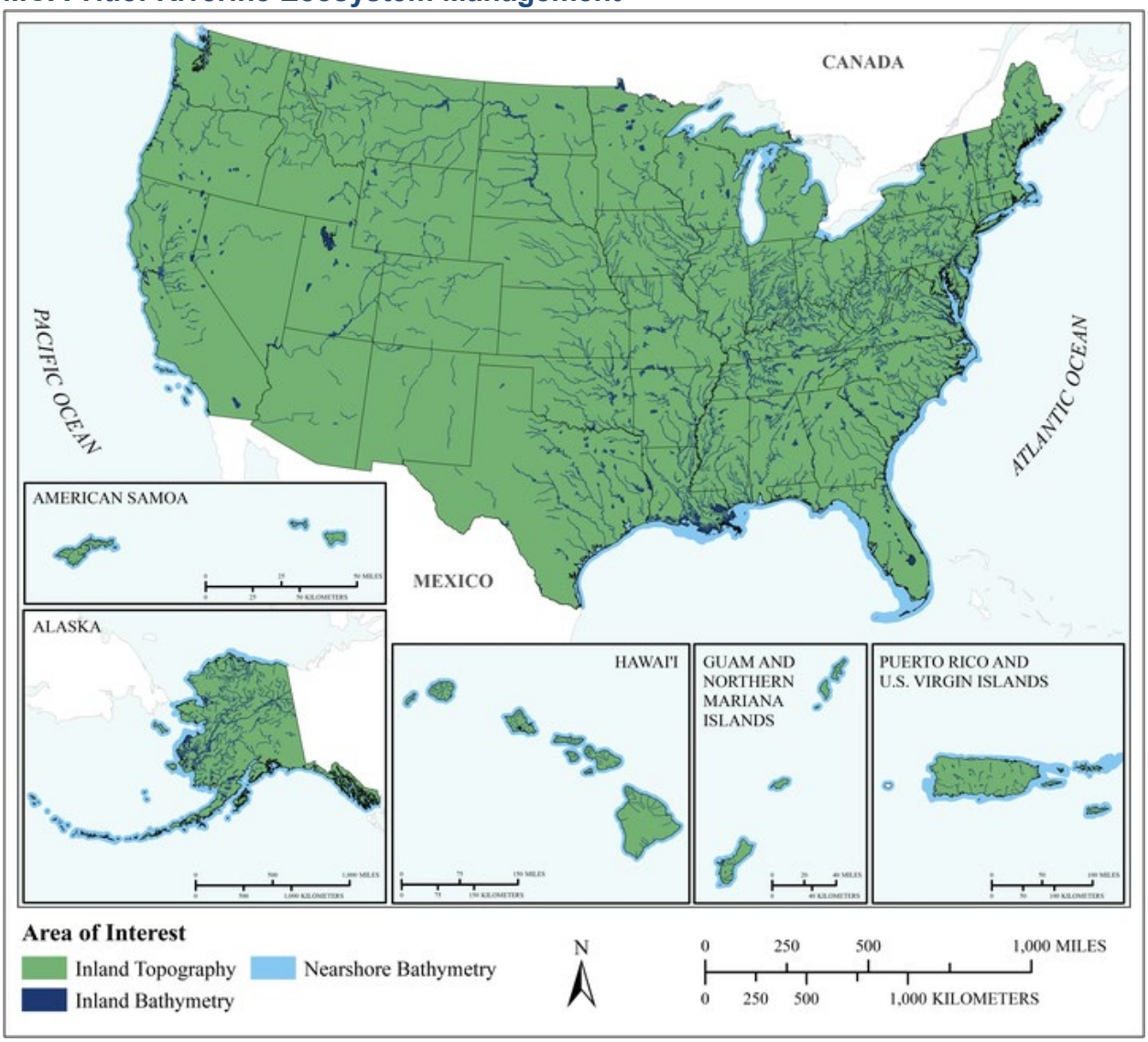
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Major	Minor	Moderate	
Improved customer experience	Major	Minor	Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Moderate	
Environmental	Major	Moderate	Moderate	
Public safety, including life and property	Major	Minor	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$18,208,275		Annual dollars saved/ realized	$70,615,844		Annual dollars saved/ realized	$3,763,786			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$2,089,711		Annual dollars saved/ realized	$4,099,749		Annual dollars saved/ realized	$3,100,198			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			Moderate					
Environmental	Major			Major			Moderate					
Public safety, including life and property	None			None			None					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes		Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Riverine Ecosystem Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	

MCA Description	Response
Mission Critical Activity	Stream channel analysis and mapping. Stream bank erosion analysis. Aquatic and terrestrial species habitat management. Environmental management.
MCA Title	Riverine Ecosystem Management
MCA ID	60680
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: U.S. Army Corps of Engineers (USACE)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 02 - Riverine Ecosystem Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL0B	
Update Frequency	6-10 years	4-5 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters	Up to 2 meters	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Highly desirable		Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required		Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Highly desirable	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	I don't know		I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable	Highly desirable	
DTM	Required	Highly desirable	Required	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Nice to have	
Full waveform	Nice to have	Nice to have	Highly desirable	
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Not required	
Tidal Constituent And Residual Interpolation (TCARI)			Not required	
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Highly desirable	Required	Required	
Underwater videography			Not required	
Bottom texture			Highly desirable	
Bottom type			Required	
Submerged features			Highly desirable	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Nice to have	Not required	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Highly desirable	Nice to have	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Required	
Wetlands	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Nice to have	Not required	
Cultural resources	Nice to have	Nice to have	Not required	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	
Cost savings/cost reduction	Moderate	Moderate	Moderate	
Cost avoidance	Moderate	Minor	None	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Minor	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Moderate	Minor	

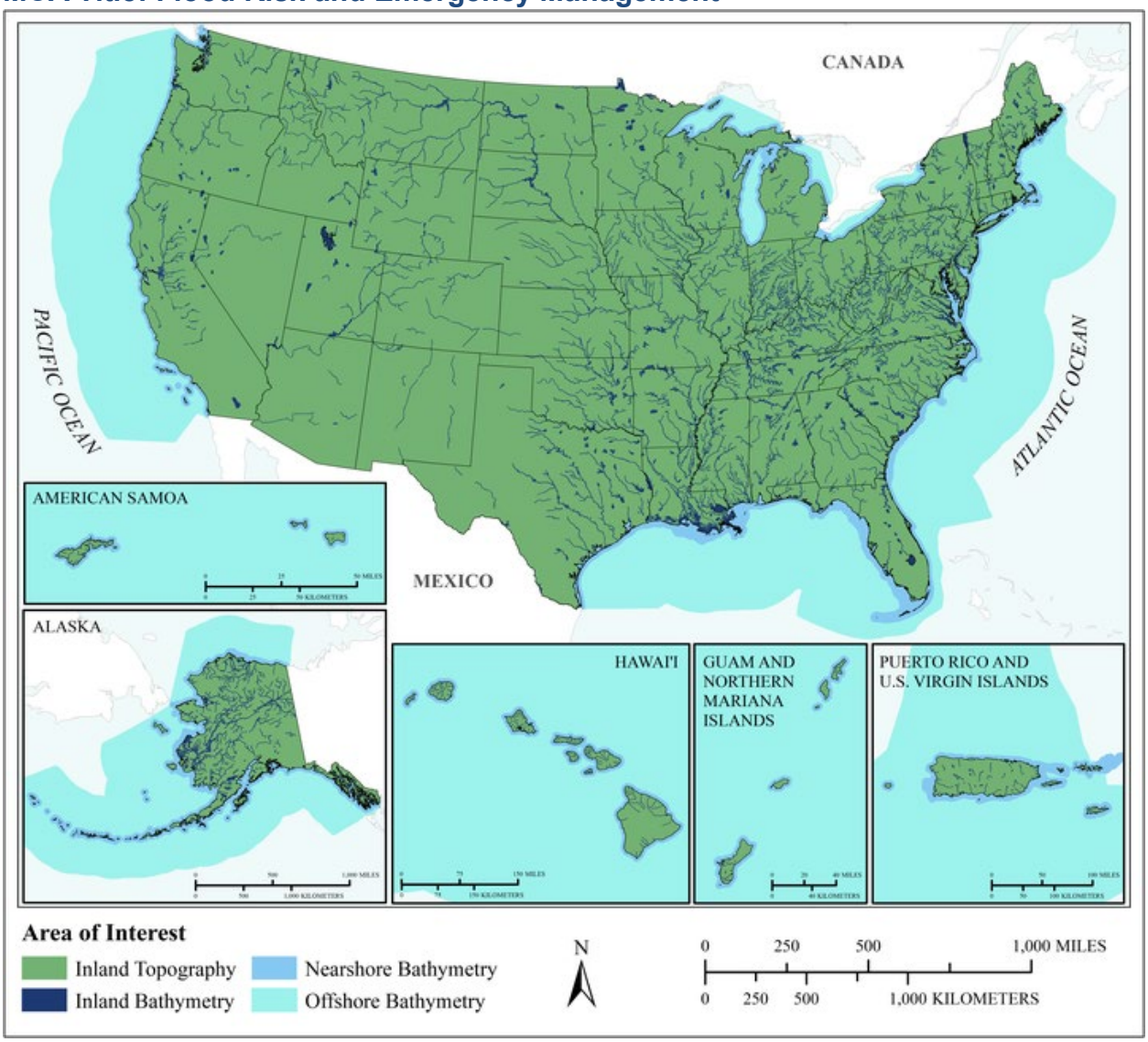
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate	Minor	Minor	
Improved customer experience	Major	Moderate	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	
Environmental	Major	Major	Moderate	
Public safety, including life and property	Major	Moderate	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$5,503,923		Annual dollars saved/ realized	$2,931,795		Annual dollars saved/ realized	$11,414,676			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$329,856		Annual dollars saved/ realized	$137,819		Annual dollars saved/ realized	$4,361,309			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major			Moderate					
Environmental	Major			Major			Moderate					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades	Yes			
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes		

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Flood Risk and Emergency Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Nationwide, inland areas	Nationwide, inland areas	Custom description	Custom description
Sub Area Requirements			States and Territories out to the EEZ	States and Territories out to the EEZ

MCA Description	Response
Mission Critical Activity	Flood Risk Management, Emergency Management, Navigation, Riverine Ecosystem, Coastal Zone Management
MCA Title	Flood Risk and Emergency Management
MCA ID	21590
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: U.S. Army Corps of Engineers (USACE)
Sub-Agency or Division	Civil Design
Organization Mission	Deliver vital engineering and water resource solutions in collaboration with our partners to secure our Nation, reduce disaster risk and enhance quality of life, providing value to the region and Nation.
Program Name	Water Management, flood inundation mapping; Geospatial Coordination; Dam and Levee Safety - Regulatory - Civil Design - Emergency Operations - Operations Division - Master Planning Design - Environmental Engineering; Upper Mississippi River Restoration (UMRR) Program National Levee Database Ecosystem Management and Restoration Research Program (EMRRP); Military Construction, Reservoir Control, Threatened and Endangered Species, Air Obstruction, Emergency Management, etc.; Flood Risk Management; Civil Works; and CAP 205, CAP206, GLFER, and WRDA
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 20 - Marine and Riverine Navigation and Safety

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	25,000 sq mi - 74,999 sq mi (e.g. medium state or large multi-county region)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Structures that impede or affect flow or would be in the way of construction; Some of the 3d features we are needing is places where we have sink holes in our dams and our leveed areas, the location of trees near the dam embankments, any power lines near our dam which would be a place of seepage if it is too close to our embankments, and any utilities located near dams and near levee embankments. Dam, levee or adjacent lands. Obstructions in waterways. Ground survey-Utilities and/or instrumentation for dams/levees Lidar-docks, sandbars. Features at an Army Reserve site.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL2B	Cross sections and/or transects meet needs	Cross sections and/or transects meet needs
Update Frequency	4-5 years	2-3 years	2-3 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 1 meter	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Up to 20 cm	Less than 1 meter
How far onshore needed			To Mean Lower Low Water (MLLW)	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs		Partial	Yes	Yes
Cross section/transect requirement		Navigation and major rivers.		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	Nice to have
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	Nice to have
Full waveform	Nice to have	Not required	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Highly desirable	Required	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Nice to have	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Not required	Nice to have
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Nice to have
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Highly desirable	Highly desirable
Wetlands	Highly desirable	Nice to have	Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Nice to have	Nice to have	
Cultural resources	Highly desirable	Nice to have	Nice to have	
Coastal and riverine structures	Required	Highly desirable	Highly desirable	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	DEMs provided by the States, USGS DEMs, Lidar data where available from states and others, . in-house and contracted survey crews for specific features. We currently use the best available DEM and/or LIDAR for an area. We will send out survey crew if online data is not good enough for the application.	Hydro survey data by USACE. Contractor collected or in-house collected data. Multi-beam Channel Survey. Bathy-LiDAR Pilot for ecosystem restoration. Hydro survey data gathered from boat mounted devices.	Varies by project. Hydrographic surveying and coastal beach profiles. Using survey data from USACE collects. QL2 equivalent.	Using survey data from USACE and NOAA collects.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	
NCEI		Yes		
Open Topography	Yes			
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			

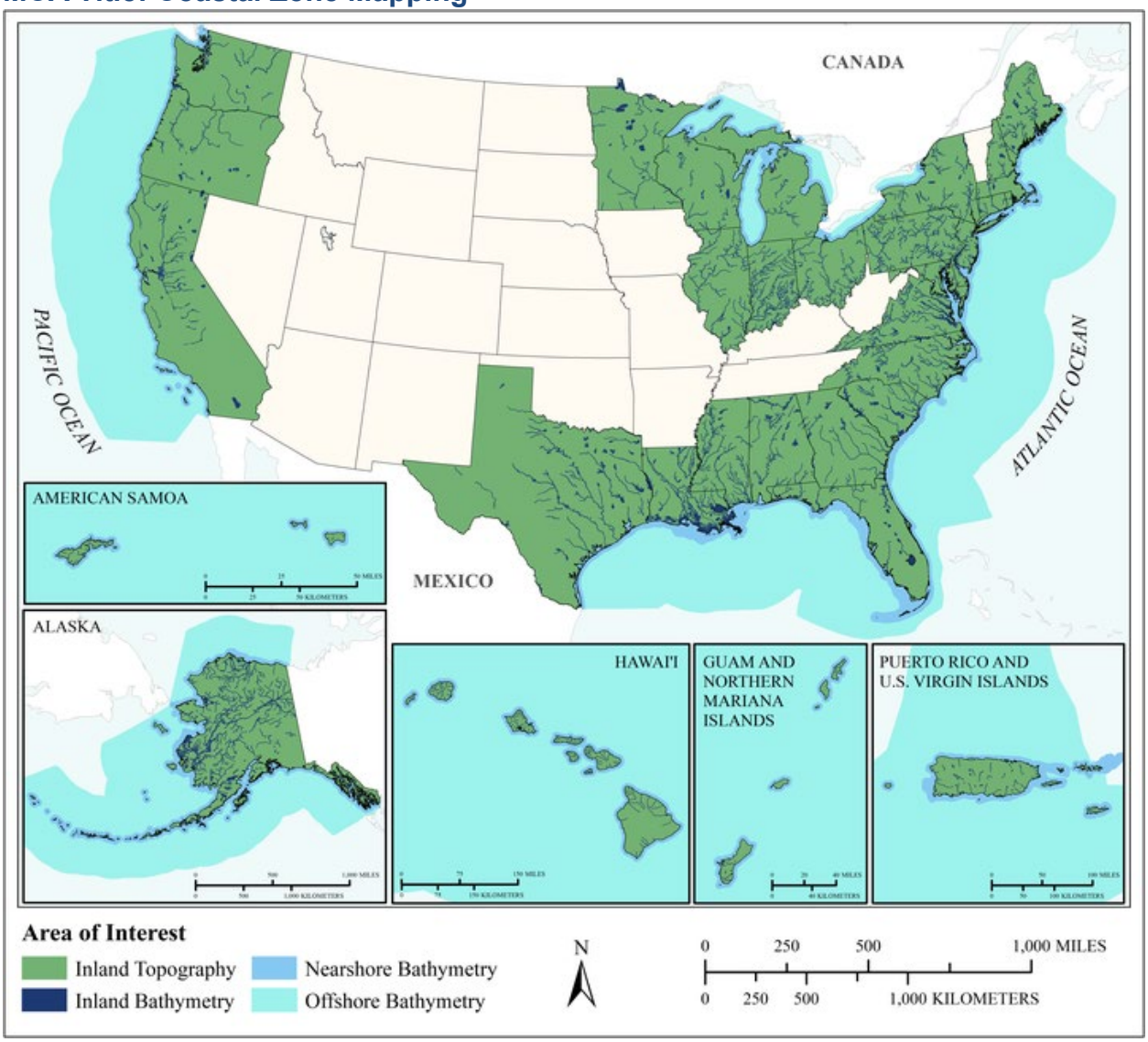
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	Any and all state repositories if they post LIDAR.			
Other	Yes	Yes		
Other description	Internally contracted collections. GRiD. Contracting. U.S. Interagency Elevation Inventory Website	In House Data. Collected via contract. USACE Inland Electronic Navigation Charts. USACE Collections. USGS Coastal and Marine Geology Program Inland Waters of the United States Map Server, USACE internal surveys.		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Moderate	Moderate
Cost savings/cost reduction	Major	Moderate	Moderate	Moderate
Cost avoidance	Major	Moderate	Moderate	Moderate
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Major	Minor	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	Moderate
Improved response or timeliness	Major	Moderate	Moderate	Moderate
Improved customer experience	Major	Major	Moderate	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	None	Minor	None
Environmental	Moderate	Moderate	Moderate	Minor
Public safety, including life and property	Major	Moderate	Moderate	Minor

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$40,401	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Time savings description	Time savings if data already exist.											
Cost savings/cost reduction	Major	Annual dollars saved/realized	$1,770,000	Major	Unable to provide		Moderate	Annual dollars saved/realized	$50,000	Moderate	Unable to provide	
Cost avoidance	Major	Annual dollars saved/realized	$270,000	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Major	Annual percent improvement	50%	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Other operational benefits	Moderate	Annual dollars saved/realized	$6,030,000									
Other operational benefits description	Existing data will save us time and $ that we would otherwise need to spend on collections.											
Future annual operational benefits added during validation		Annual dollars saved/ realized	$435,065,819		Annual dollars saved/ realized	$28,396,705		Annual dollars saved/ realized	$13,010,385			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$3,015,000	Major	Unable to provide		Moderate	Annual dollars saved/realized	$753,750	Moderate	Unable to provide	
Value added to products or services description	Existing QL2 data will save us time and $ that we would otherwise need to spend on collections.											
Improved response or timeliness	Major	Annual dollars saved/realized	$301,500	Major	Annual dollars saved/realized	$753,750	Moderate	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Annual dollars saved/realized	$301,500	Major	Unable to provide		Moderate	Annual dollars saved/realized	$150,750	Moderate	Annual dollars saved/realized	$150,750
Other customer service benefits	Minor	Unable to provide					Minor	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$33,089,139		Annual dollars saved/ realized	$15,057,513		Annual dollars saved/ realized	$5,672,938			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None			None			None		
Education or outreach description	In-House data always serves best for in-house education outreach											
Environmental	Major			Minor			Minor			Minor		
Environmental description	This will prompt more use by Regulators and Environmental personnel											
Public safety, including life and property	Major			Moderate			Moderate			I don't know		
Other												
Other benefits	Moderate						Moderate					
Other description	Quick access to data benefits all of our disciplines											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes		
Slope maps	Yes	Yes	Yes	
Aspect maps	Yes	Yes		
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps	Yes	Yes		
Viewshed maps	Yes	Yes		
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Coastal Zone Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	States and/or Territories	States and/or Territories	All study waters	All study waters
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Palau		

MCA Description	Response
Mission Critical Activity	Mapping changes in coastal elevations and depths, in a one-mile wide swath along the sandy open US coasts. Coastal zone management. Sea Level Rise and Subsidence. Modeling and mapping the effects of sea level rise or subsidence. Population and economic vulnerability assessments. Coastal inundation and infrastructure assessment. Harbor dredging. BU 15 - Flood Risk Management is an additional Business Use.
MCA Title	Coastal Zone Mapping
MCA ID	21512
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: U.S. Army Corps of Engineers (USACE)
Sub-Agency or Division	Joint Airborne Lidar Bathymetry Technical Center of Expertise
Organization Mission	Deliver vital public and military engineering services; partnering in peace and war to strengthen our Nation's security, energize the economy and reduce risks from disasters.
Program Name	Regional Sediment Management
Total Annual Program Budget	$981,000,000
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Road crossings, dams, levees, bridges, coastal structures, individual structure/house

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD	QL1B	QL0B	Order 1b
Update Frequency	4-5 years	2-3 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	Stream channels and shorelines		Developed urbanized areas would need better accuracy and more frequent updates	
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 20 cm	Less than 1 meter
How far onshore needed			To the fall line	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs	Partial	Partial		Partial
Cross section/transect requirement	Beach profiles every 50 feet, channel cross-sections every 100 feet	5 cm accuracy every 50 to 100 feet		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Required	Required	Nice to have	Required
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	No vertical manipulation is acceptable; prefer an ancillary data product that describes the source data	No vertical manipulation is acceptable; prefer an accompanying layer describing data sources	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	No vertical manipulation is acceptable; prefer accompanying layer that describes source data

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Required	Required
DTM	Highly desirable	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Required	Required
Classified point cloud	Highly desirable	Highly desirable	Required	
Edited/cube XYZ		Nice to have	Nice to have	Highly desirable
Full waveform	Nice to have	Nice to have	Required	Required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Required	Nice to have
Ground control/ground truthing	Highly desirable	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Highly desirable	Highly desirable
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Required	Nice to have
Geologic and seismic data	Nice to have	Not required	Nice to have	Nice to have
Water column properties - Physical			Required	Required
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Nice to have	Highly desirable
Tide/wave heights			Required	Highly desirable
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Required	Required
Boundaries			Nice to have	Nice to have
Routes			Nice to have	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Nice to have	Nice to have
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Land use/land cover	Highly desirable	Highly desirable	Required	Required
Wetlands	Highly desirable	Highly desirable	Required	Required
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Highly desirable	Required	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Highly desirable	
Cultural resources	Not required	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Varies on study, we have used/acquired tripod LIDAR for stream channels changes, UAV LIDAR for coastal structures to determine individual rock movements, standard aerial LIDAR for floodplain mapping	Single and multibeam hydrosurvey	JALBTCX collected nearshore LIDAR	JALBTCX, Single and multibeam hydrosurvey
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes		Yes	Yes
NCEI			Yes	
Open Topography				
NOAA nautical charts				
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			

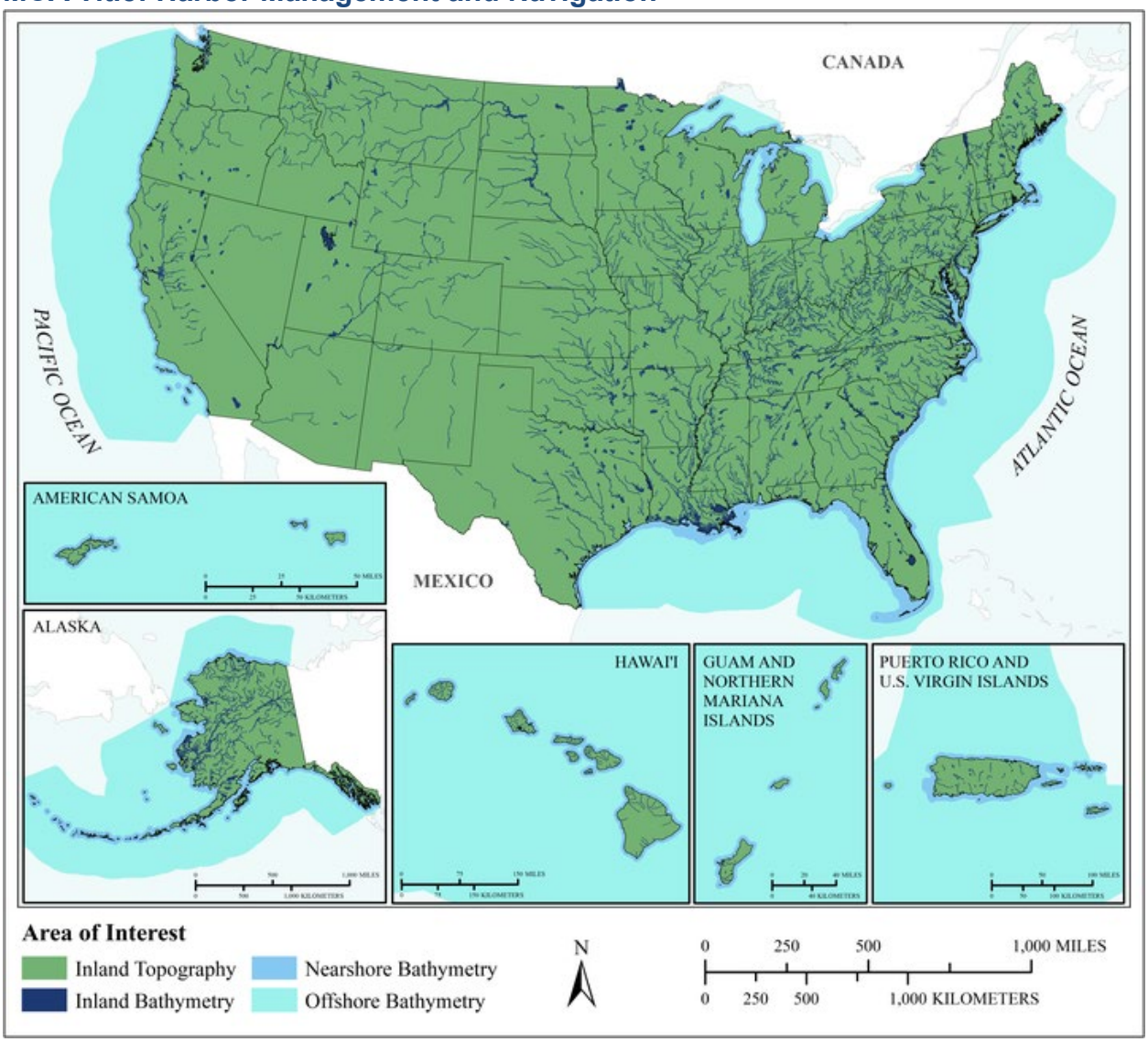
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used	Hawaii, Guam, others as available			
Other	Yes		Yes	Yes
Other description	County Planning Departments		USACE GRiD	USACE GRiD
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Minor	Major	Major
Cost savings/cost reduction	Major	Moderate	Major	Major
Cost avoidance	Major	Moderate	Major	Major
Increased revenues	None	None	Major	Major
Mission-driven performance improvements	Major	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Major	Major
Improved response or timeliness	Major	Minor	Major	Major
Improved customer experience	Major	Moderate	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Major	Major
Environmental	Major	Moderate	Major	Major
Public safety, including life and property	Major	Moderate	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$28,944	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Time savings description	Depends on project and study area.											
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction description	Depends on project or study area.											
Cost avoidance	Major	Annual dollars saved/realized	$40,000	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	None			None			None			None		
Mission-driven performance improvements	Major	Annual percent improvement	20%	Major	Annual percent improvement	30%	Major	Annual percent improvement	20%	Moderate	Unable to provide	
Other operational benefits	Moderate	Annual dollars saved/realized	$9,045									
Future annual operational benefits added during validation					Annual dollars saved/ realized	$11,714,143		Annual dollars saved/ realized	$19,778,611			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$33,768,379		Annual dollars saved/ realized	$21,328,019			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor			Minor		
Environmental	Minor			Minor			Minor			Minor		
Public safety, including life and property	Moderate			Minor			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Harbor Management and Navigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Nationwide, inland areas	Nationwide, inland areas	Custom description	Custom description
Sub Area Requirements			States and Territories out to the EEZ	States and Territories out to the EEZ

MCA Description	Response
Mission Critical Activity	Hydrographic survey for dredging the harbors for navigation. Flood risk management. Maritime channel and harbor improvements, ecological restoration, and navigation. Harbor maintenance. Planning and constructing new navigation channels, ports, and harbors, and maintaining channel depths along coastal channels, and harbors. We conduct hydrographic surveys on a daily basis to assess channel shoaling conditions for our 1500 miles of navigation channels. BU 22 – Infrastructure and Construction Management is an additional Business Use
MCA Title	Harbor Management and Navigation
MCA ID	22396
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: U.S. Army Corps of Engineers (USACE)
Sub-Agency or Division	Operations Division
Organization Mission	Deliver vital public and military engineering services; partnering in peace and war to strengthen our Nation's security, energize the economy and reduce risks from disasters. The Navigation mission is to provide safe, reliable, efficient, effective, and environmentally sustainable waterborne transportation systems (i.e. channels, harbors, and waterways) for movement of commerce, national security needs and recreation.
Program Name	Operations and Maintenance (O&M) Dredging of Harbors, Navigation,
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Top of coastal structure, bridge abutments, road edges, culverts, submerged vehicles, mooring anchors, and docks

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required

Inland Bathy Feature Size Requirements	Response
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	Cross sections and/or transects meet needs	QL0B	QL0B	Special Order
Update Frequency	Annually	2-3 years	Annually	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI			Annual collection is needed for harbors and connecting channels for navigation.	Primary Areas of Interest include dredged material placement sites.
Acceptable Horizontal Error	Less than 20 cm	Up to 2 meters	Less than 50 cm	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm	Up to 50 cm	Less than 10 cm	Less than 1 meter
How far onshore needed			To the fall line	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			Multiple: Tide correction using Mean Lower Low Water (MLLW) and IGLD85	MLLW
Cross sections and/or transects meet needs	Yes	Partial	Partial	Partial
Cross section/transect requirement			Every 50 feet.	Sampling density of 2 m along transects spaced at 32 m (100 feet).

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Highly desirable	Required	Nice to have	Nice to have	Not required
Entire AOI under same environmental conditions	Not required	Highly desirable	Required	Highly desirable	Nice to have	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required	Nice to have	Highly desirable	Highly desirable	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Not required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	Required
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Nice to have	Nice to have	Nice to have	Nice to have
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Required	Required	Required
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Required	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Required	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Nice to have
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Required	Highly desirable
Underwater videography			Highly desirable	Not required
Bottom texture			Highly desirable	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Highly desirable	Nice to have
Geologic and seismic data	Not required	Not required	Highly desirable	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Not required
Tide/wave heights			Required	Nice to have
Sea ice conditions			Highly desirable	Not required
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Nice to have	Nice to have
Routes			Required	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Not required	Nice to have	Highly desirable	Nice to have
Wetlands	Not required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Highly desirable	Required	Required	
Bridges/culverts	Not required	Required		
Landmark features	Highly desirable	Highly desirable	Required	
Cultural resources	Not required	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We currently use the best available DEM and/or LIDAR for an area. We will send out survey crew if online data is not good enough for the application.	The USACE utilizes a minimal amount of inland navigation data. The Navigation program primarily utilizes nearshore and offshore bathymetry (not inland).	USACE presently uses nearshore bathymetric data collected by the USGS (Coastal and Marine Geology Program), and nearshore/beach topographic data collected by the USACE JALBTCX program. The USACE JALBTCX data is collected about every 2 to 3 years along the US West Coast and the vertical and horizontal accuracy standards have been +/- 15 cm RMSE and +/1.5 m RMSE, respectively. Also, annually collected multi-beam and single-beam bathymetric data for all federal navigation products (harbors and channels)	USACE typically collects offshore bathymetry of dredged material disposal sites with an in-house crew. USACE standards recommend a vertical accuracy of 0.3 ft (repeatability) with a typical standard deviation (+/- 95%) of 0.8 ft.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			

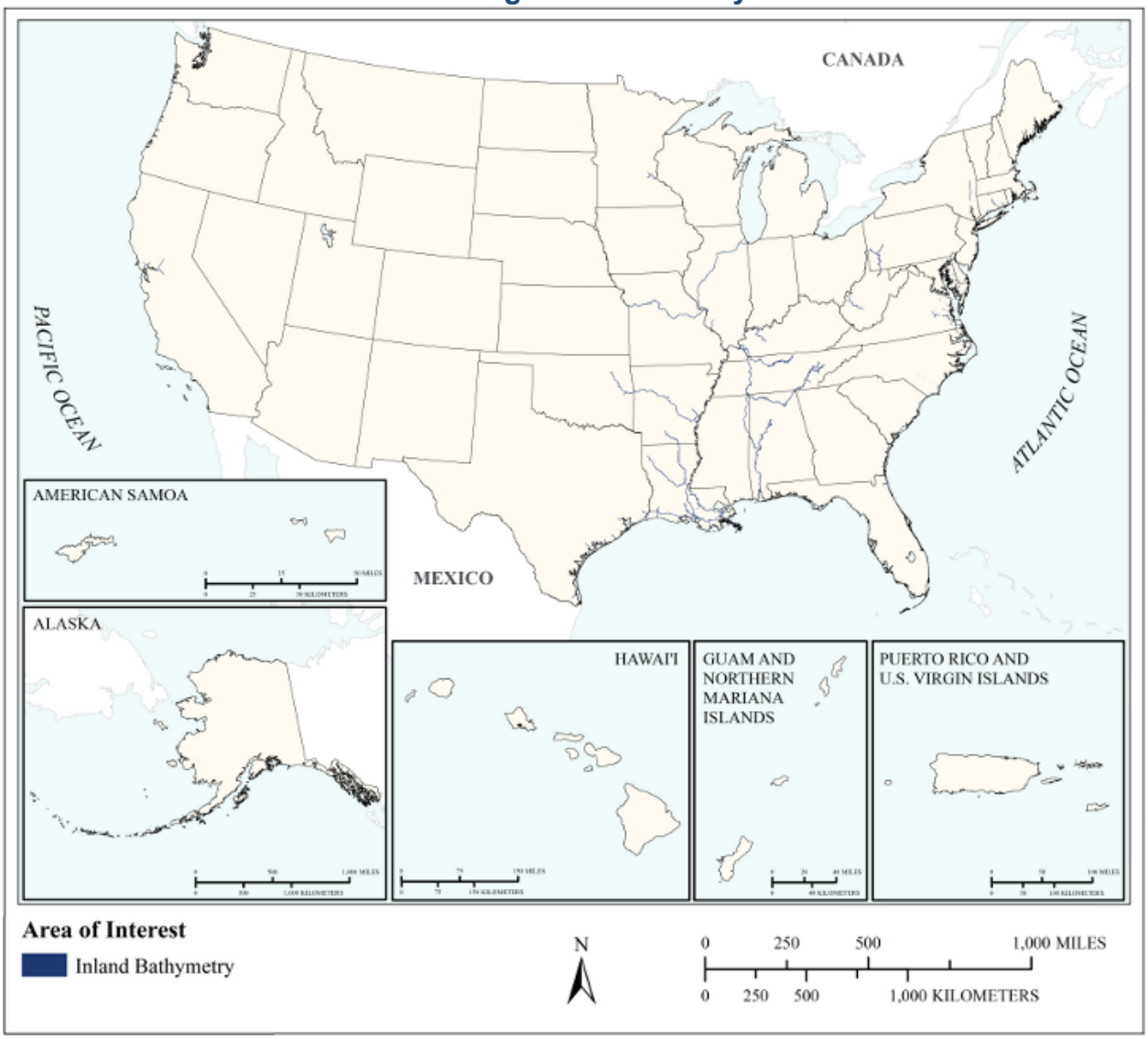
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Digital Coast	Yes	Yes	Yes	Yes
NCEI	Yes			
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	All available			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	Minor	Moderate	Minor
Cost savings/cost reduction	I don't know	I don't know	Moderate	Minor
Cost avoidance	I don't know	Minor	Moderate	Minor
Increased revenues	I don't know	I don't know	I don't know	I don't know
Mission-driven performance improvements	I don't know	Moderate	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	Moderate	Minor	Minor
Improved response or timeliness	I don't know	Moderate	Minor	Minor
Improved customer experience	I don't know	Moderate	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	I don't know	I don't know	I don't know	I don't know
Environmental	I don't know	I don't know	Minor	I don't know
Public safety, including life and property	I don't know	I don't know	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		Minor	Annual dollars saved/realized	$3,618	Minor	Annual dollars saved/realized	$4,221	Minor	Annual dollars saved/realized	$3,618
Time savings description				Time savings from less contract management (assumes no contract needed to collect data). Time savings for GIS analyst. Fewer (or no) site visits required.			Time savings if no contract needed for nearshore bathymetric data collection. Less effort for GIS Analyst. Fewer site visits.			Could reduce data processing time for hydrographer. Could reduce need for in-house offshore survey. Time saved if no offshore bathymetry data collection contract is needed.		
Cost savings/cost reduction	I don't know	Unable to provide		Minor	Annual dollars saved/realized	$50,000	Moderate	Annual dollars saved/realized	$50,000	Moderate	Annual dollars saved/realized	$50,000
Cost savings/cost reduction description				It costs approximately $50,000 to contract a typical bathymetric survey.			Cost savings if no contract needed for nearshore bathymetric data collection.			Cost saving if no offshore bathymetry data collection contract is needed.		
Cost avoidance	I don't know	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Increased revenues	I don't know	Unable to provide		None			I don't know	Unable to provide		None		
Mission-driven performance improvements	I don't know	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements description							Up-to-date nearshore bathymetry (including coastal structures) supports the USACE Navigation mission.					
Other operational benefits							Minor	Unable to provide		Minor	Annual dollars saved/realized	$80,000
Other operational benefits description										Estimate of time and cost savings if no offshore bathymetry data collection contract is needed.		
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	
Improved customer experience	I don't know	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Other customer service benefits										Minor	Unable to provide	
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			None			I don't know			I don't know		
Environmental	I don't know			None			Moderate			I don't know		
Environmental description							Improved coordination with environmental agencies regarding dredging and nearshore sand placement.					
Public safety, including life and property	I don't know			Minor			Moderate			Minor		
Public safety, including life and property description							Improved understanding of condition of coastal structures (e.g., jetties).					
Other												
Other benefits				Minor								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement	Yes	Yes	Yes	
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Marine and Riverine Navigation and Safety



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type		Required		
Geographic Area Requirements		Custom description		
Sub Area Requirements		Navigable channels		

MCA Description	Response
Mission Critical Activity	Nautical charting. Bathymetric measurements of nearshore submerged coastal topography. Identification of hazards to navigation. Sediment management at coastal navigation projects. Precision marine navigation. Movement of goods and fishing vessels.
MCA Title	Marine and Riverine Navigation and Safety
MCA ID	60681
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: U.S. Army Corps of Engineers (USACE)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order		QL0B		
Update Frequency		2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error		Up to 2 meters		
Acceptable Vertical Error		Up to 30 cm		
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season		Nice to have				
Entire AOI under same environmental conditions		Highly desirable				
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless		Required				
DEM for entire AOI needs to be seamless		Required				
Amount of acceptable vertical manipulation to achieve spatial seamlessness		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM		Highly desirable		
DTM		Highly desirable		
DEM		Required		
Raw point cloud data		Nice to have		
Classified point cloud		Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform		Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening		Not required		
Additional breaklines for hydro-enforcement of culverts				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery		Nice to have		
Ground control/ground truthing		Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery		Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data		Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates		Required		
Land use/land cover		Highly desirable		
Wetlands		Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features		Required		
Bridges/culverts		Required		
Landmark features		Required		
Cultural resources		Highly desirable		
Coastal and riverine structures		Required		
Overhead structures				
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts		Yes		
USACE navigation charts		Yes		
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings		Major		
Cost savings/cost reduction		Major		
Cost avoidance		Moderate		
Increased revenues		Minor		
Mission-driven performance improvements		Major		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services		Major		

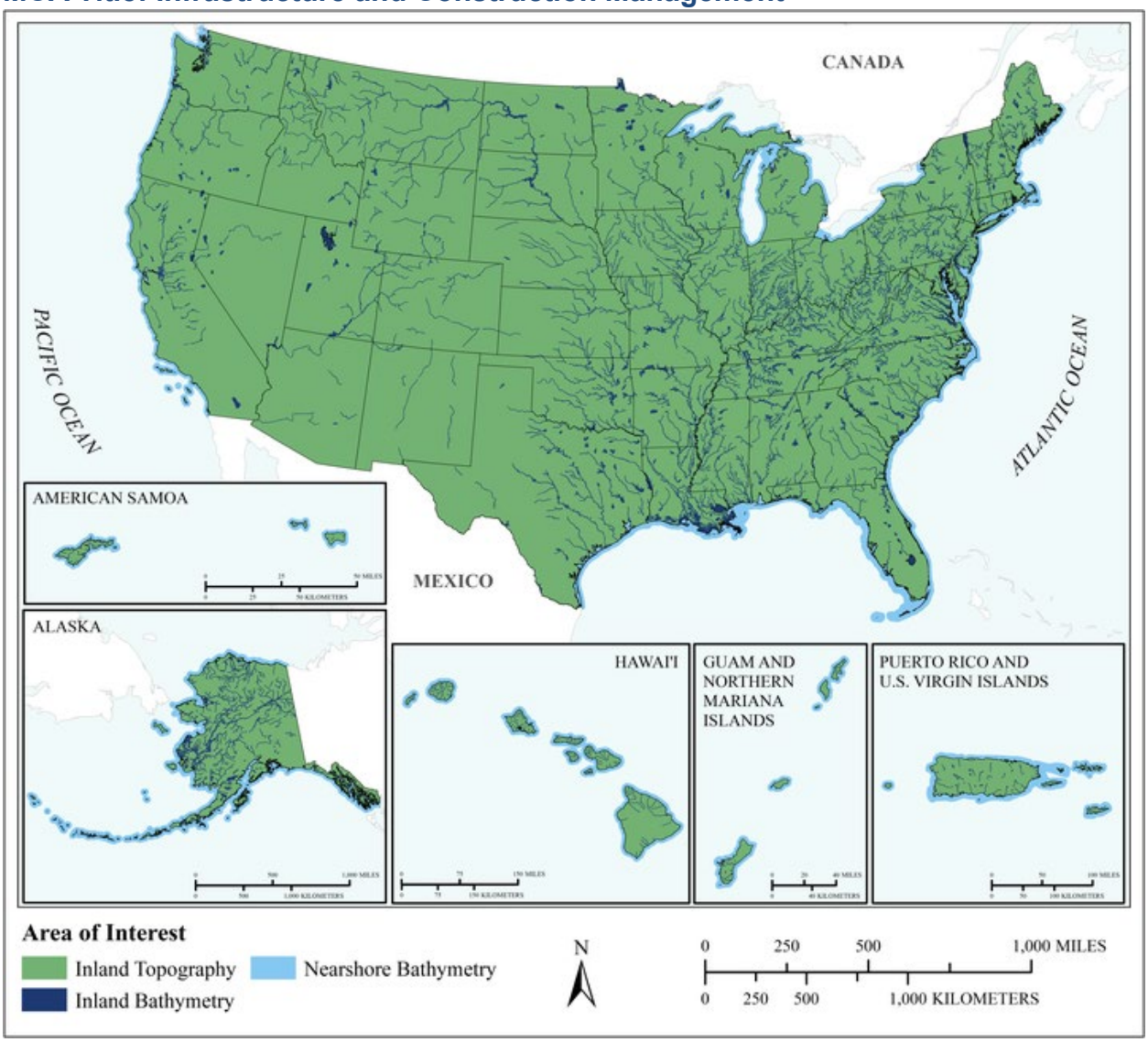
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness		Major		
Improved customer experience		Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach		Moderate		
Environmental		Moderate		
Public safety, including life and property		Major		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings				Major	Unable to provide							
Cost savings/cost reduction				Major	Unable to provide							
Cost avoidance				Major	Unable to provide							
Increased revenues				Major	Unable to provide							
Mission-driven performance improvements				Major	Unable to provide							
Future annual operational benefits added during validation					Annual dollars saved/ realized	$32,843,495						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services				Major	Unable to provide							
Improved response or timeliness				Major	Unable to provide							
Improved customer experience				Major	Unable to provide							
Future annual customer service benefits added during validation					Annual dollars saved/ realized	$4,319,054						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach				Moderate								
Environmental				Major								
Public safety, including life and property				Major								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)		Yes		
Contours		Yes		
Hillshades		Yes		
Slope maps				
Aspect maps				
Curvature maps				
Cross sections		Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Nationwide, inland areas	Nationwide, inland areas	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Infrastructure Maintenance. Engineering services. BU 07 – Wildlife and Habitat Management is an additional Business Use.
MCA Title	Infrastructure and Construction Management
MCA ID	21648
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: U.S. Army Corps of Engineers (USACE)
Sub-Agency or Division	
Organization Mission	Deliver vital public and military engineering services; partnering in peace and war to strengthen our Nation's security, energize the economy and reduce risks from disasters.
Program Name	Civil works, engineering, and water resources
Total Annual Program Budget	$300,000,000
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	BU 02 - Riverine Ecosystem Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	75,000 sq mi - 199,999 sq mi (e.g. large state or medium multi-state region)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Jetty rocks, smaller than a car, but bigger than a mailbox

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL0B	QL2B	
Update Frequency	Annually	2-3 years	Annually	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 1 meter	
Acceptable Vertical Error	Up to 10 cm	Up to 30 cm	Up to 40 cm	
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		5 ft transects on either side of transect, survey point every 5 ft along that line, and a point where terrain significantly changes (slope). Vertical accuracy expectation is high (10cm). This is for a smaller river/tributary, not the mainstem of a major river like the Columbia.		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Required	Not required		Required	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Required	Not required		Required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Nice to have		Required	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Nice to have		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Nice to have	
DTM	Required	Highly desirable	Nice to have	
DEM	Required	Highly desirable	Nice to have	
Raw point cloud data	Not required	Highly desirable	Not required	
Classified point cloud	Highly desirable	Required	Nice to have	
Edited/cube XYZ		Highly desirable	Nice to have	
Full waveform	Not required	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Not required	Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	
Ground control/ground truthing	Highly desirable	Required	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Not required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Required	Nice to have	Nice to have	
Underwater videography			Not required	
Bottom texture			Not required	
Bottom type			Not required	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable	Nice to have	Not required	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Nice to have	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Nice to have	Nice to have	Nice to have	
Wetlands	Nice to have	Nice to have	Nice to have	
Estuaries			Nice to have	
Inland surface water features	Highly desirable	Highly desirable	Not required	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Highly desirable	Not required	
Cultural resources	Not required	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy

Current dataset used	8 pt/sq m lidar 5c RMSE; State and Federal Gov't LIDAR - FEMA Specs	For single- and multi-beam surveys in dam stilling basins: − The delivered data shall, as clearly demonstrated through industry standard position and quality checks, meet or exceed horizontal accuracy of 0.50 feet at 95 percent confidence level and vertical accuracy of 0.25 feet at 95 percent confidence level. For single-beam conditional surveys on the Columbia River: - The delivered data shall, meet or exceed horizontal accuracy of 1.50 feet at 95 percent confidence level and vertical accuracy of 0.50 feet at 95 percent confidence level. For a Jetty mapping survey combining Bathy with Photo, we have used this: (2) Positional Accuracy Standards. Accuracy standards, measurement, testing, and reporting under this task order shall follow the 2014 ASPRS Positional Accuracy Standards for Digital Geospatial Data (Photogrammetric Engineering & Remote Sensing Vol. 81, No. 3, March 2015, pp. A1- A26. 0099-1112/15/813-A1).	We've been using Oregon Coast data acquired by USACE, specifically JOINT AIRBORNE LIDAR BATHYMETRY TECHNICAL CENTER OF EXPERTISE. These data were flown/acquired via bathy lidar in 2014.	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
		https://www.asprs.org/a/society/committees/standards/ASPRS_Positional_Accuracy_Standards_Edition1_Version100_November2014.pdf - Horizontal Accuracy Class: 5cm RMSEx and RMSEy (7cm RMSEr; +/-12cm at 95% confidence). - Vertical Accuracy Class: 5cm RMSEz (+/-10cm at 95% confidence for non-vegetated); +/-15cm at 95% confidence for vegetated topographic terrain (VVA) and non-vegetated bathymetric terrain. 20 cm vertical and clean/filtered 2 m horizontal		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts		Yes	Yes	
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Oregon's DOGAMI and Washington's Puget Sound Lidar, others as available			

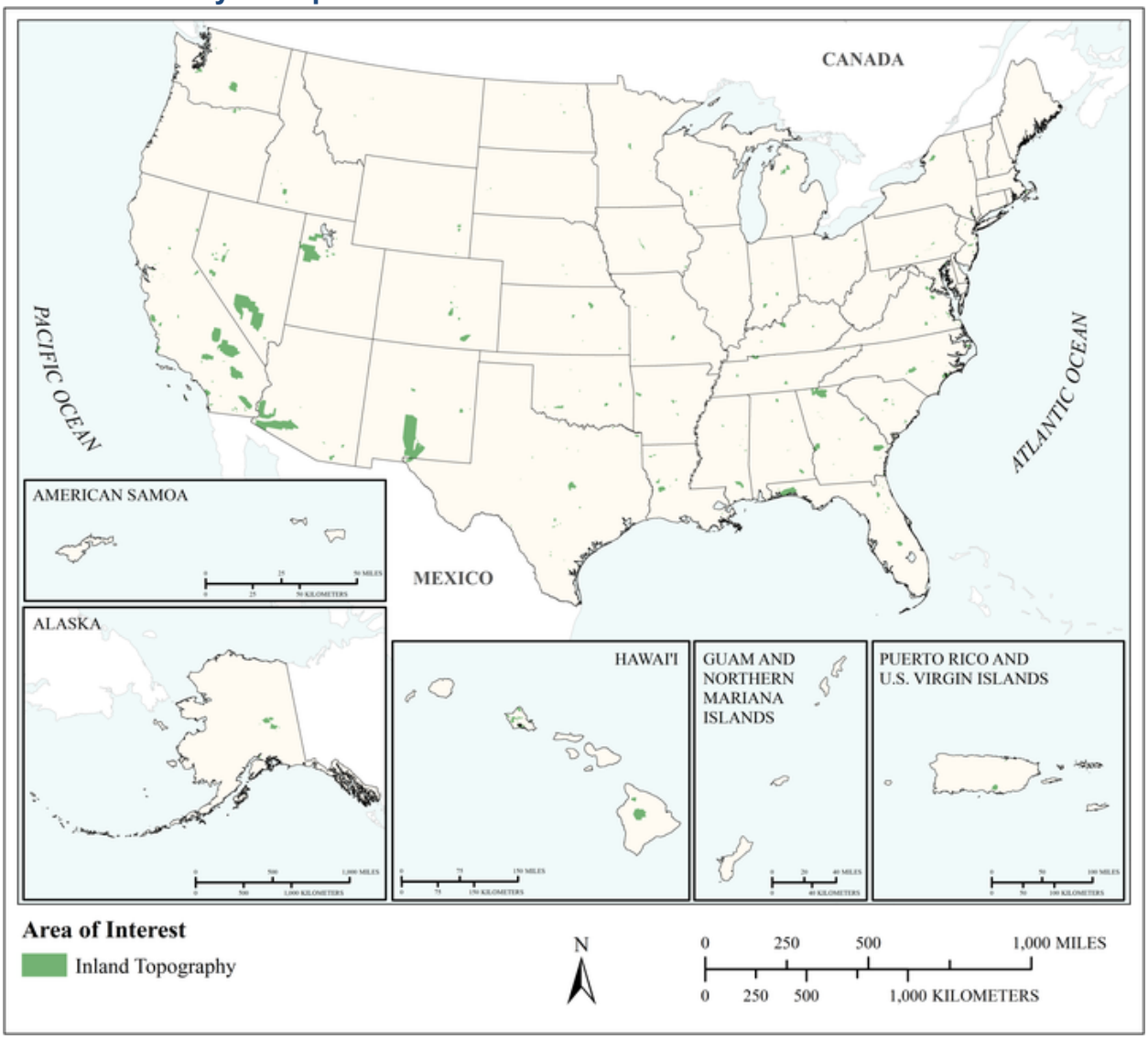
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other	Yes	Yes		
Other description	State data copied to local server	USACE and USGS surveys		
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Minor	
Cost savings/cost reduction	Major	Major	Minor	
Cost avoidance	Major	Major	Minor	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Major	Minor	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	None	
Improved response or timeliness	Major	Major	None	
Improved customer experience	Major	Major	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	None	Minor	
Environmental	Major	Moderate	Minor	
Public safety, including life and property	Moderate	Moderate	None	
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other		Moderate		
Other description		Sometimes we find shallow water bathymetry for inland areas that meet our needs, but it is a rare occurrence		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		None					
Increased revenues	None			Minor	Unable to provide		None					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide				
Other operational benefits	Moderate	Annual dollars saved/realized	$100,000				Minor	Unable to provide				
Future annual operational benefits added during validation		Annual dollars saved/ realized	$142,560,531		Annual dollars saved/ realized	$38,932,187		Annual dollars saved/ realized	$2,384,782			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide				
Other customer service benefits				Moderate	Unable to provide		Minor	Unable to provide				
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$91,455,985		Annual dollars saved/ realized	$2,432,927		Annual dollars saved/ realized	$327,905			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor					
Education or outreach description	Potentially improved Public Affairs outreach products											
Environmental	Moderate			Moderate			Minor					
Public safety, including life and property	Minor			Moderate			None					
Public safety, including life and property description	Potentially improved Public Affairs outreach products											
Other												
Other benefits	Moderate			Moderate			Minor					
Other description				It would be great to get detailed bathy data for project areas where it is required, but in most cases I can't imagine a future scenario where we do not acquire these data either internally or by contract.			Very much a "nice to have" for background information and increasing understanding of dynamics in the coastal zone (including sand movement, impact of our infrastructure on dynamic coastal processes)					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes	Yes	
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps				
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes	Yes	
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes	Yes		
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Army Geospatial Coordination



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies			
Sub Area Requirements	DoD			

MCA Description	Response
Mission Critical Activity	The US Army Geospatial Center (AGC) is a Field Operating Activity under the Commanding General, United States Army Corps of Engineers (USACE). AGC coordinates, integrates, and synchronizes geospatial information requirements and standards across the Army, develops and fields geospatial-enterprise enabled systems and capabilities to the Army and the Department of Defense, and provides direct geospatial support and products to Warfighters. AGC develops, maintain, and publishes geospatial information products and services in support of National and USACE civil and environmental programs.
MCA Title	Army Geospatial Coordination
MCA ID	22536
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: U.S. Army Corps of Engineers (USACE)
Sub-Agency or Division	Army Geospatial Center
Organization Mission	The U.S. Army Geospatial Center (AGC) is a Field Operating Activity under the Commanding General, United States Army Corps of Engineers (USACE). AGC coordinates, integrates, and synchronizes geospatial information requirements and standards across the Army, develops and fields geospatial-enterprise enabled systems and capabilities to the Army and the Department of Defense, and provides direct geospatial support and products to Warfighters. AGC develops, maintain, and publishes geospatial information products and services in support of National and USACE civil and environmental programs.
Program Name	Combat Terrain Information Systems
Total Annual Program Budget	$5,000,000
Primary Business Use	BU 29 - Military
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Utilities sized objects, drains and manholes, hazards to navigation

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	Event driven only – Data need to coincide with a specific event.			
Event type(s)	Event driven only			
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Highly desirable			
Raw point cloud data	Required			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Nice to have			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Highly desirable			
Cultural resources	Nice to have			
Coastal and riverine structures	Required			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	On demand LiDAR data <5cm RMSE			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	DoD			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None			
Cost savings/cost reduction	None			
Cost avoidance	I don't know			
Increased revenues	I don't know			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	I don't know			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			
Improved response or timeliness	None			
Improved customer experience	None			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide										
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$10,725,671									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know											
Environmental	I don't know											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	

U.S. Arctic Research Commission (USARC)

The USARC is an independent agency that advises the President and Congress on domestic and international Arctic research through recommendations and reports.

By law, the U.S. Congress created the USARC through the Arctic Research and Policy Act of 1984 and in January 1985, President Reagan established the agency through Executive Order 12501. The Commission's principal duties are:

- Establish the national policy, priorities, and goals necessary to construct a federal program plan for basic and applied scientific research with respect to the Arctic, including natural resources and materials, physical, biological and health sciences, and social and behavioral sciences.
- Promote Arctic research, to recommend Arctic research policy, and to communicate research and policy recommendations to the President and the Congress.
- Work with the National Science and Technology Council (NSTC) and the National Science Foundation (NSF) as the lead agency responsible for implementing the Arctic research policy and to support cooperation and collaboration throughout the federal government.
- Give guidance to the Interagency Arctic Research Policy Committee (IARPC) to develop national Arctic research projects and a five-year plan to implement those projects.
- Interact with Arctic residents, international Arctic research programs and organizations and local institutions including regional governments in order to obtain the broadest possible view of Arctic research needs.

Elevation data are used to inform additional responsibilities of the USARC which include to develop and recommend national Arctic research policy; assist the NSTC, NSF, and IARPC in establishing a national Arctic Research Plan; review federal Arctic research programs and suggest improvements; review the President's budget request and report to Congress on the adherence to the Arctic Research Plan; facilitate cooperation among federal, state, and local governments in advancing Arctic research; cooperate with the Governor of Alaska to support Arctic Research policy; recommend improved Arctic research logistics planning and support; recommend improved sharing and dissemination of Arctic data/information among public and private institutions and publish a statement of goals and objectives to guide IARPC.

In order to fulfil its duties, USARC requires Quality Level 2 (QL2) inland topography, QL2B inland and nearshore bathymetry, and Order 1b offshore bathymetry. The elevation data needs to be updated every 2-3 years. The area of interest primarily consists of Alaska including the Aleutian Islands.

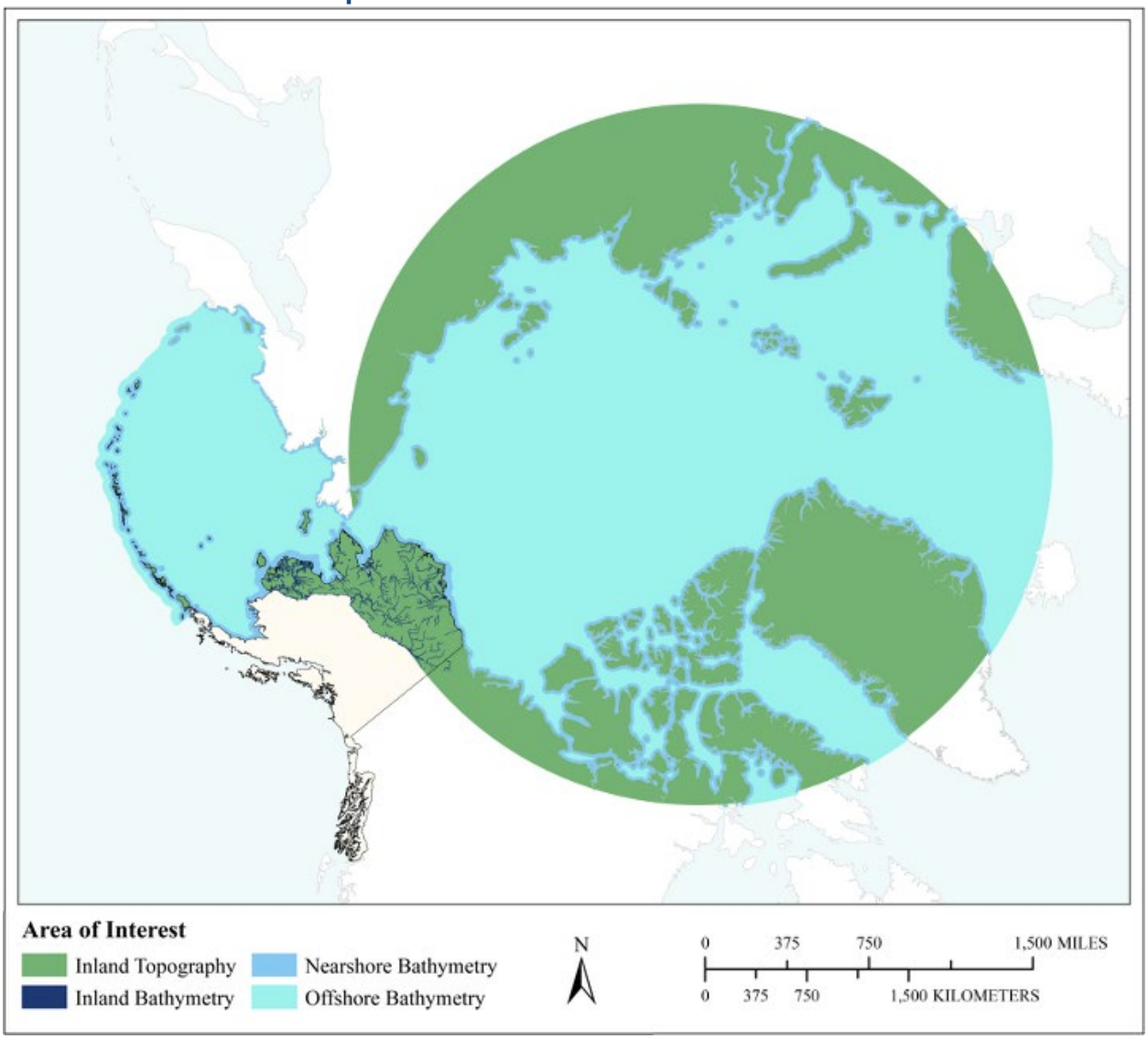
Potential future benefits that would come from higher quality elevation data include Major mission-driven performance improvements including increased program effectiveness, improved ability to carry out mission, significant hours saved and improved decision making due to better data and modeling.

USARC has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	U.S. Arctic Research Commission (USARC)	1383	Provide Geospatial Framework for All Arctic Research	Inland Topo	QL2	2-3 years	Unable to quantify	Unable to quantify	Major	Moderate	Moderate
				Inland Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	Major	Moderate	Moderate
				Offshore Bathy	Order 1b	2-3 years	Unable to quantify	Unable to quantify	Major	Moderate	Moderate

MCA Title: Provide Geospatial Framework for All Arctic Research



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase
Sub Area Requirements	Arctic Boundary	Arctic Boundary	Arctic Boundary	Arctic Boundary

MCA Description	Response
Mission Critical Activity	Develop and recommend national Arctic research policy. Review federal Arctic research programs and suggest improvements. Review the President's budget request and report to Congress on the adherence to the Arctic Research Plan. Facilitate cooperation among federal, state and local governments in advancing Arctic research. Cooperate with the Governor of Alaska to support Arctic Research policy. Recommend improved Arctic research logistics planning and support. Recommend improved sharing and dissemination of Arctic data/information among public and private institutions. Publish a statement of goals and objectives to guide IARPC. Provide geospatial framework for all Arctic research.
MCA Title	Provide Geospatial Framework for All Arctic Research
MCA ID	1383
Organization Type	Federal Agencies and Commissions
Organization Name	U.S. Arctic Research Commission (USARC)
Sub-Agency or Division	
Organization Mission	Develop and recommend national Arctic research policy. Assist the National Science and Technology Council (NSTC), National Science Foundation (NSF), and Interagency Arctic research Policy Committee (IARPC) in establishing a national Arctic Research Plan. Review federal Arctic research programs and suggest improvements. Review the President's budget request and report to Congress on the adherence to the Arctic Research Plan. Facilitate cooperation among federal, state and local governments in advancing Arctic research. Cooperate with the Governor of Alaska to support Arctic Research policy. Recommend improved Arctic research logistics planning and support. Recommend improved sharing and dissemination of Arctic data/information among public and private institutions. Publish a statement of goals and objectives to guide IARPC.
Program Name	Assist the NSTC, NSF and IARPC in establishing a national Arctic Research Plan.
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	We don't directly work with data
Smallest 3D features needed	We don't directly work with data
Description of smallest 3D features	Establish priorities and needs

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	Order 1b
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI	Dependent on study and research project		Dependent on study and research project	Dependent on study and research project
Acceptable Horizontal Error	I don't know	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	I don't know	I don't know	I don't know	Less than 1 meter
How far onshore needed			>1 kilometer inland	
How far down the beach profile needed	Not applicable		Below MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required	Not required	Not required	Not required	Not required
Entire AOI under same environmental conditions	Not required	Not required	Not required	Not required	Not required	Not required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Not required	Not required	Nice to have	Highly desirable	Not required	Nice to have
DEM for entire AOI needs to be seamless	Not required	Not required	Nice to have	Highly desirable	Not required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Nice to have	Highly desirable	Highly desirable
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Highly desirable	Nice to have
Classified point cloud	Highly desirable	Nice to have	Nice to have	
Edited/cube XYZ		Nice to have	Nice to have	Nice to have
Full waveform	Nice to have	Nice to have	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Highly desirable
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable	Nice to have	Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Nice to have	Nice to have
Bottom type			Nice to have	Nice to have
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Nice to have
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Highly desirable	Nice to have
Boundaries			Required	Required
Routes			Highly desirable	Nice to have
Offshore cadastral			Nice to have	Nice to have
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Nice to have	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Nice to have	Nice to have	Nice to have
Wetlands	Highly desirable	Nice to have	Nice to have	Nice to have
Estuaries			Nice to have	Nice to have
Inland surface water features	Highly desirable	Nice to have	Nice to have	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Best available and/or applicable to individual projects	Best available and/or applicable to individual projects	Best available and/or applicable to individual projects	Best available and/or applicable to individual projects
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI	Yes	Yes	Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts				
USGS Inland Waters server		Yes		
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Major
Cost savings/cost reduction	Major	Major	Major	Major

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Major	Major	Major	Major
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Moderate	Minor
Improved response or timeliness	Major	Minor	Moderate	Moderate
Improved customer experience	Major	Minor	I don't know	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Major	Major	Major
Environmental	Moderate	Moderate	Moderate	Moderate
Public safety, including life and property	Moderate	I don't know	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		None			None		
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		None			None		
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Other operational benefits	Major	Unable to provide										
Other operational benefits description	We produce general products to support Arctic Research -- the availability of easily accessible, accurate, 3D topographic data is very helpful.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Major			Major		
Environmental	Moderate			Moderate			Moderate			Moderate		
Public safety, including life and property	Moderate			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				
Other (please specify)	Yes	Yes	Yes	Yes
Other description	DTMs/DEMs			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

U.S. Bureau of Reclamation (USBR)

USBR, one of eight bureaus under the Department of the Interior, manages water resources, including dams, reservoirs, and hydroelectric power facilities, in the 17 western states of the United States. Its main customers for water deliveries are water and irrigation districts, tribal entities, USFWS, and NOAA fisheries. **The mission of the USBR is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.**

Figure 1. USBR Regions

Under its mission, USBR manages all aspects of its water resources, including water quality, supply, delivery, and conservation; dam safety; flood risk modeling and management; river restoration; facilities design, construction, maintenance, and management; and fisheries management. USBR is the largest supplier and manager of water in the 17 western states (see Figure 1) and the nation's second largest producer of hydroelectric power. USBR manages water for agricultural, municipal, and industrial use, and provides flood control risk reduction and recreation for millions of people. The 53 hydroelectric power plants owned and operated by USBR account for 15 percent of the hydroelectric generating capacity in the United States. USBR owns an additional 23 hydroelectric plants that are operated by other entities, five of which generate hydropower that is marketed by federal power marketing administrations.

In addition to USBR's customers in 17 states and tribal nations, irrigation districts, USFWS, NPS, and NOAA's Fisheries Service, USBR also works closely with USGS regarding streamflows and other water resources conditions as well as EPA regarding water quality.

Importance of elevation data to USBR

USBR currently uses publicly available lidar and bathymetry and typically acquires Quality Level 1 (QL1) lidar, photogrammetry, or field collected topographic data and bathymetric data of selected streams or reservoirs as needed for projects. USBR's current uses of lidar and bathymetric data include project design and construction, monitoring river flows and fish habitats, reservoir volume calculations, water forecasting, habitat mapping, identification of restoration opportunities, performing hydrodynamic modeling, dam inundation modeling, groundwater and surface water modeling, hydrologic and hydraulic modeling, and sediment and flow modeling.

High-level summary of elevation data requirements

USBR needs QL1 topographic data for all of its Mission Critical Activities, although in marsh/wetland areas, higher resolution data would improve USBR's ability to evaluate avian habitats. USBR's needs for inland bathymetry vary between QL0B, QL1B, and QL3B, depending on the project area and use. Higher resolution and accuracy inland bathymetry data (QL0B) are needed for monitoring sedimentation and water levels in USBR maintained structures, while lower resolution and accuracy data (QL3B) are usually sufficient to support flood risk modeling. Update frequencies are also project dependent and vary considerably.

High-level summary of benefits that would come from higher resolution elevation data

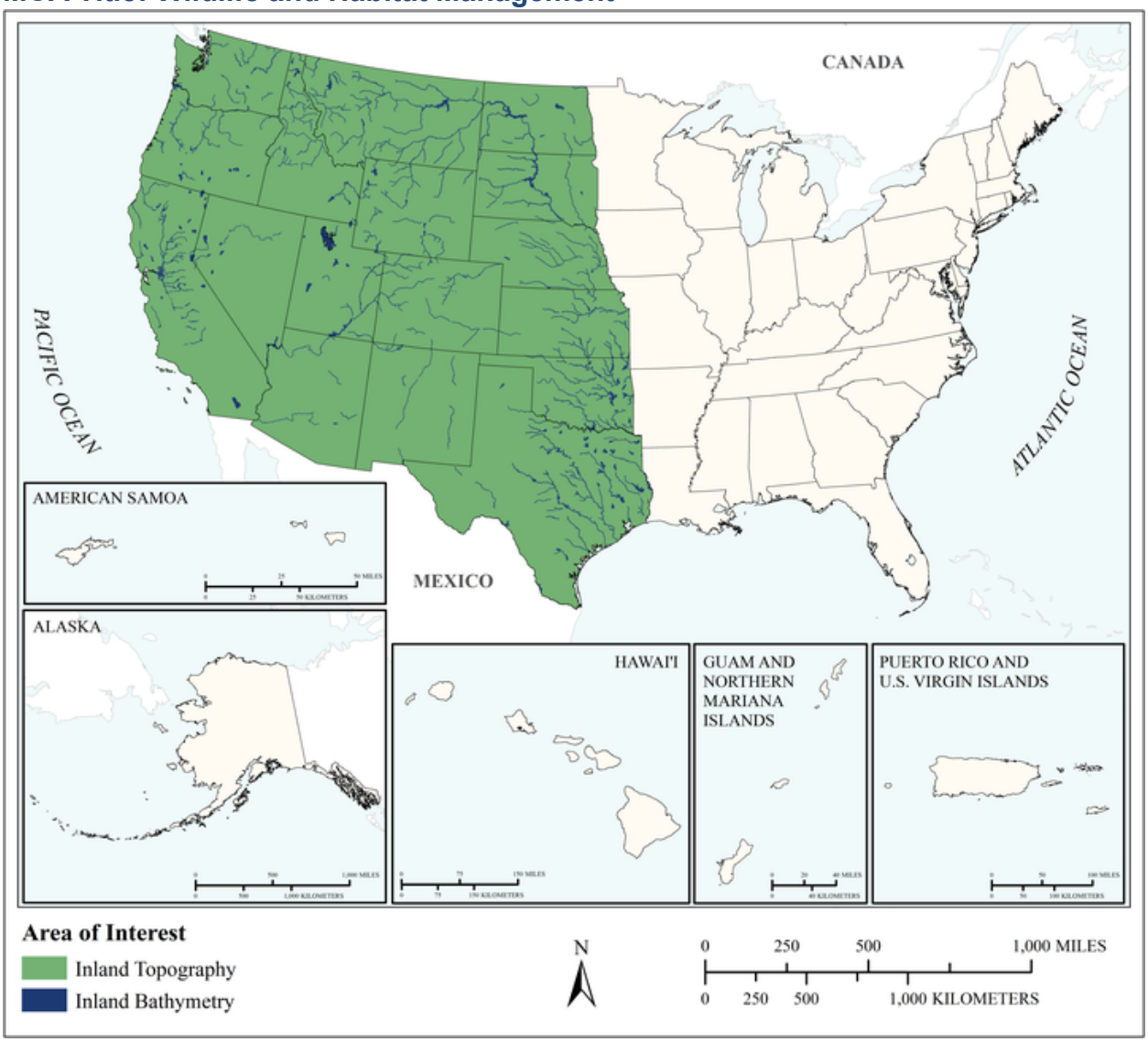
USBR reported major future annual benefits from enhanced elevation data based on acquisition costs saved, less field work, improved modeling, more efficient workflows, new apps for inventory and monitoring, more accurate flood modeling, improved disaster response, and improved public safety.

USBR has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 07 – Wildlife and Habitat Management	DoI: U.S. Bureau of Reclamation (USBR)	1084	Wildlife and Habitat Management	Inland Topo	QL1	2-3 years	$250,000	Unable to quantify	Minor	Moderate	None
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Minor	Minor	None
BU 22 – Infrastructure Management	DoI: U.S. Bureau of Reclamation (USBR)	21616	Management of Water Resources	Inland Topo	QL1	4-5 years	$551,121	$60,300	Minor	Major	Major
				Inland Bathy	QL0B	4-5 years	$61,783	$30,150	I don't know	Major	Major
BU 22 – Infrastructure Management	DoI: U.S. Bureau of Reclamation (USBR)	22110	Dam Break Inundation Modeling	Inland Topo	QL1	6-10 years	$5,713	$2,412	None	None	Minor
				Inland Bathy	QL3B	>10 years	$3,412	Unable to quantify	None	None	Moderate

MCA Title: Wildlife and Habitat Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Evaluation of created riparian and aquatic habitat for 20 species across the U.S. Bureau of Reclamation states. These activities are especially important in the Pacific Northwest and the Upper Colorado River Basin. Elevation data are needed for evaluation of riparian vegetation. We are typically interested in individual trees and branches of those trees. This allows us to evaluate physiognomic structure requirements of avian species. For evaluation of marsh/wetland vegetation, we are interested in even higher resolution due to the types of vegetation present and the way that marsh birds use these habitat types.
MCA Title	Wildlife and Habitat Management
MCA ID	1084
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Bureau of Reclamation (USBR)
Sub-Agency or Division	
Organization Mission	The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.
Program Name	Lower Colorado River Multi-Species Conservation Program
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Highly desirable
Tops of buildings, structures, objects	Not required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	For evaluation of riparian vegetation, we are typically interested in individual trees and branches of those trees. This allows us to evaluate physiognomic structure requirements of avian species. For evaluation of marsh/wetland vegetation, we are interested in even higher resolution due to the types of vegetation present and the way that marsh birds use these habitat types.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable

Inland Bathy Feature Size Requirements	Response
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B		
Update Frequency	2-3 years	2-3 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have			Nice to have	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level			Up to double the required TVU at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Highly desirable		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Required	Required		
Edited/cube XYZ		Nice to have		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Not required		
Ground control/ground truthing	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Nice to have		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable	Nice to have		
Bridges/culverts	Not required	Not required		
Landmark features	Not required	Not required		
Cultural resources	Nice to have	Nice to have		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We currently task lidar for our AOIs along the lower Colorado River. We task QL1 data for approximately 100 sq mi every year during summer (leaf-on acquisition).	We use topobathy lidar and sonar data acquired on a per project basis. These are typically small AOIs (<10 ha) collected on a per-project basis.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	Inland bathy data not available		

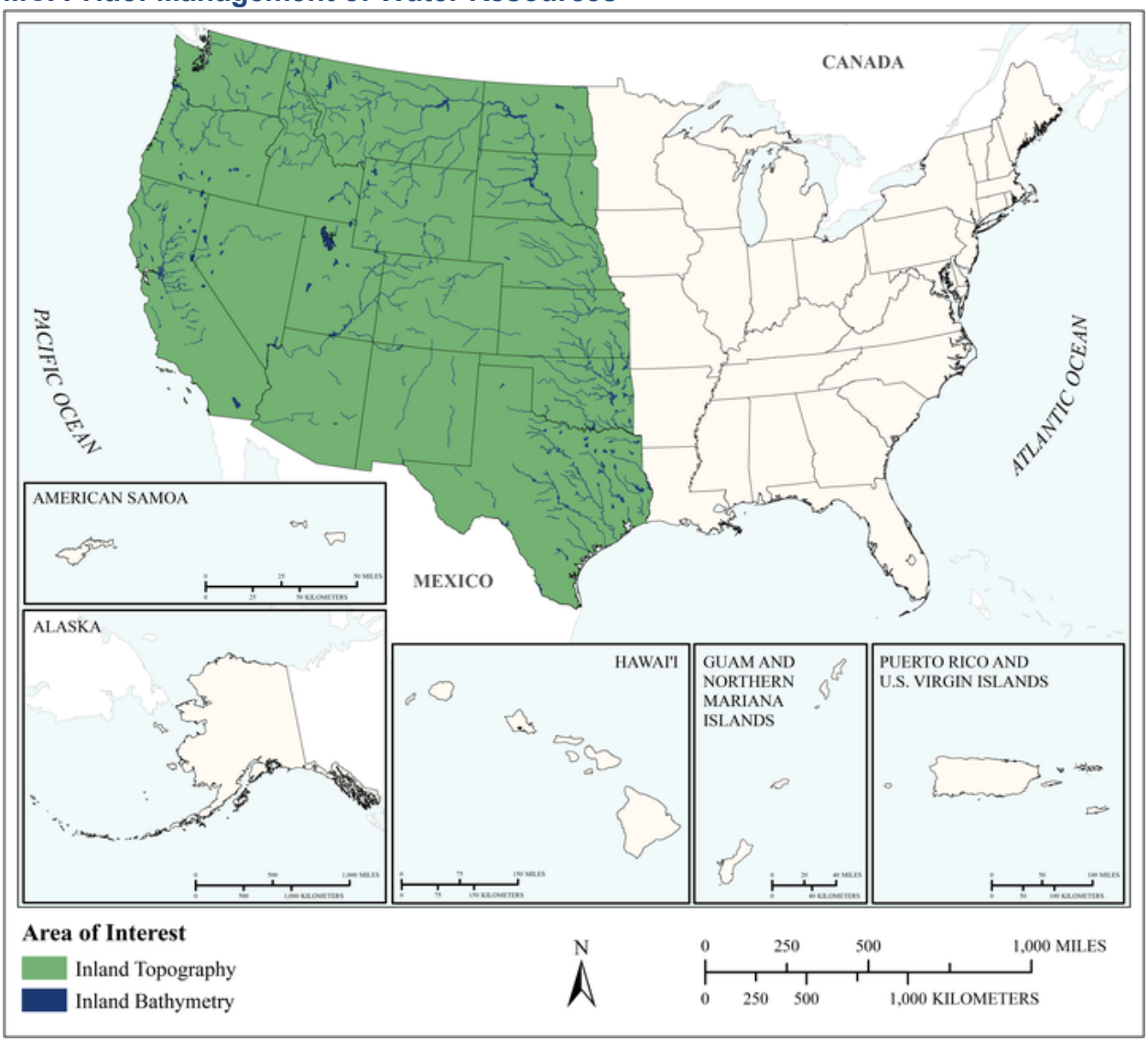
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	Minor	Inland bathy data not available		
Cost avoidance	Minor	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Minor	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	I don't know	Inland bathy data not available		
Improved response or timeliness	I don't know	Inland bathy data not available		
Improved customer experience	I don't know	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Inland bathy data not available		
Environmental	Minor	Inland bathy data not available		
Public safety, including life and property	I don't know	Inland bathy data not available		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide		Minor	Unable to provide							
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$250,000	Minor	Unable to provide							
Cost savings/cost reduction description	We rely on lidar for vegetation monitoring. Contracted field crews used to spend hundreds of hours to collect ground-based measurements. The difference in cost between ground-based and lidar is approx. $250,000. More accurate cost-estimating for construction projects.											
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide							
Increased revenues	None			None								
Mission-driven performance improvements	Moderate	Unable to provide		Minor	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	None			None								
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide							
Improved customer experience	None			None								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor								
Education or outreach description	3D topo data can be used in our outreach materials to educate the public about the benefits of the habitat that we create.											
Environmental	Moderate			Minor								
Environmental description	3D topo data allows us to better manage our created habitat and ensure that we are meeting the habitat requirements for our covered species.											
Public safety, including life and property	None			None								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Management of Water Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Deliver irrigation water to farmers, and drinking water to others, in the 17 western states. Produce hydroelectric power for the 17 western states. Water storage and delivery. Inventory, monitoring, operations and maintenance of water delivery features and infrastructure such as canals, dams, reservoirs, ditches and laterals. Elevation data are needed for specific projects within the USBR 17-state mission area. Bathymetric data are needed to monitor sedimentation within the larger reservoirs (e.g. Lake Mead, Lake Powell) as well as for river restoration for salmon habitat. Topographic data are needed for watershed analysis, drought monitoring, and to maintain canals and other infrastructure. Data are also needed for post fire management; fire increases sedimentation in streams, rivers, canals, and reservoirs, and affects their operation and maintenance. In the Lower Colorado River basin, lidar is being used to monitor vegetation growth and the tree canopy. Data are collected at project based frequency, not on a regular review cycle. USBR starts with publicly available data or their own acquisitions. If better data are needed for a project, they will acquire lidar, photogrammetry, or send a field crew to collect it depending on project requirement. In addition to the listed Business Uses, the following also apply: BU 01 - Water Supply and Quality, BU 06 - Natural Resources Conservation, BU 07 - Wildlife and Habitat Management, and BU 08 - Agriculture and Precision Farming.
MCA Title	Management of Water Resources
MCA ID	21616
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Bureau of Reclamation (USBR)
Sub-Agency or Division	Technical Service Center
Organization Mission	The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.
Program Name	Dam Safety
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 15 - Flood Risk Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.

General Geographic Area and Size	
Description of smallest 3D features	Canal gate valves, shrubs, trees, sand bars, channel banks, tanks, boulders, signs, outhouses.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B		
Update Frequency	4-5 years and certain events.	4-5 years and certain events.		
Event type(s)	Fire, flood, Congress, new dam construction, increased reservoir capacity.	Fire, flood, Congress, new dam construction, increased reservoir capacity.		
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Less than 50 cm		
Acceptable Vertical Error	Up to 20 cm	Less than 10 cm		
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable

Hydrologic Processing Required	Response
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Required		
Classified point cloud	Required	Required		
Edited/cube XYZ		Required		
Full waveform	Not required	Nice to have		
Bathymetric Attributed Grid (BAG)		Highly desirable		
Breaklines required for standard hydro-flattening	Required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Required		
Ground control/ground truthing	Required	Required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Highly desirable	Required		
Land use/land cover	Highly desirable	Nice to have		
Wetlands	Highly desirable	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Nice to have		
Landmark features	Highly desirable	Nice to have		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LiDAR-QL1, photogrammetrically derived DTM-DEM-Contour data, IFSAR (InterMap-NextMap), topographic field survey crews, USGS 10m/30m DEM data.	Project based - Dual beam boat based sonar, single beam sonar, airborne topobathy, field survey crews with rod or line from boat, USACE, other Federal agencies		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes			
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	The 17 western states			
Other	Yes	Yes		
Other description	Universities, Cities and counties	In house collection		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate		
Cost savings/cost reduction	Major	Moderate		
Cost avoidance	Major	Minor		
Increased revenues	Minor	None		
Mission-driven performance improvements	Major	Moderate		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major		
Improved response or timeliness	Moderate	Moderate		
Improved customer experience	Moderate	Moderate		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	Minor		
Environmental	Moderate	Minor		
Public safety, including life and property	Moderate	Moderate		

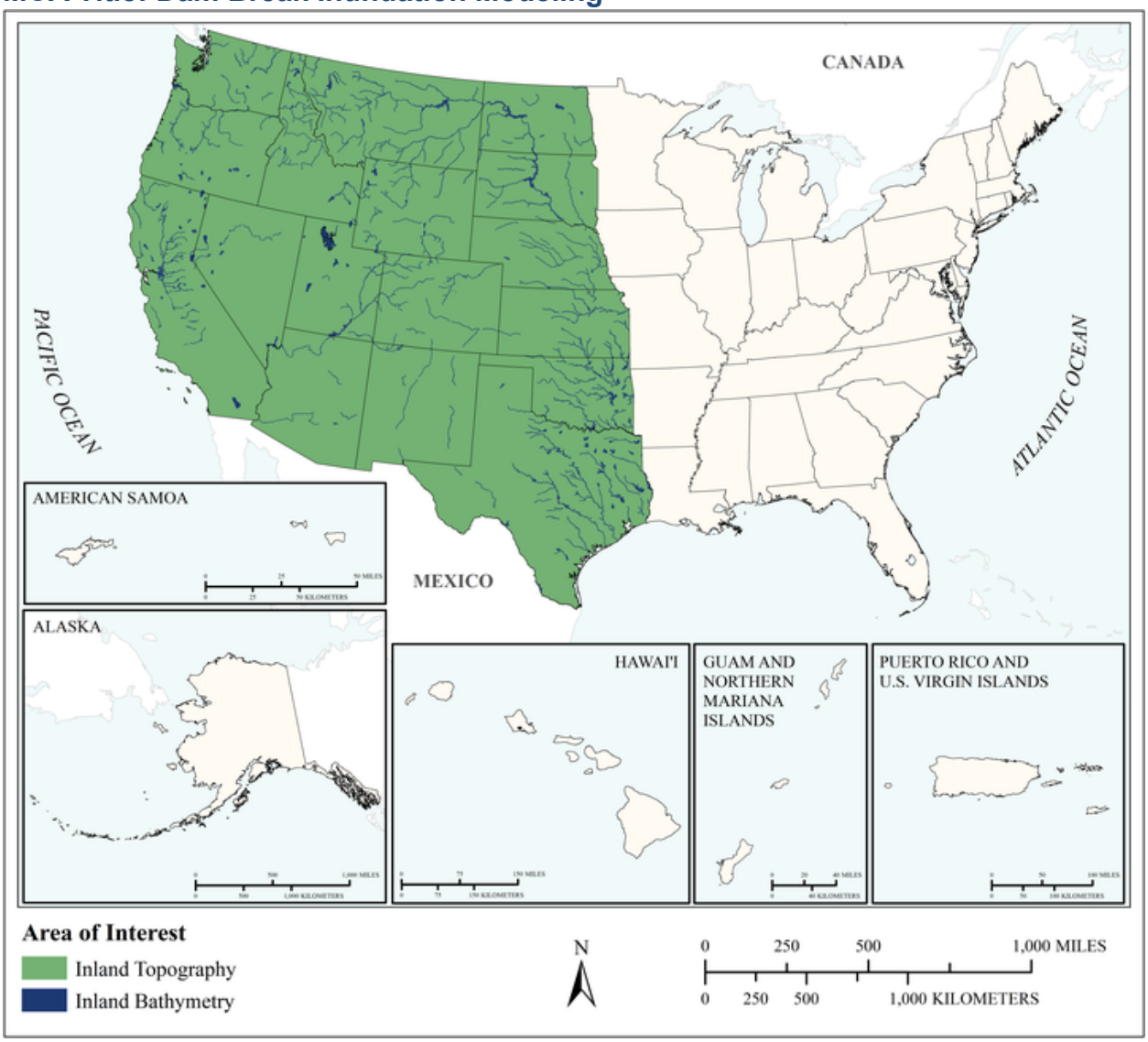
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$161,122	Major	Annual dollars saved/realized	$36,783						
Time savings description	Lands actions, water delivery. Old datasets are not seamless and contain errors. Saves hours on installing new infrastructure. Engineers can see things in office vs. field. Multiple lidar datasets to cover entire area of interest. Time saved on manipulating data from third party sources. Hydrologic modeling. Also time saved on QA/QC of contracted data collection and using data from various sources to fit needs.			Time saved from manipulating bathymetric data from the past for answering project questions in an estimated way.								
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$350,000	Major	Annual dollars saved/realized	$25,000						
Cost savings/cost reduction description	Estimate of contracted costs associated with topographic data collection averaged over the last 20 years from two regional offices.			General estimate based on past needs for bathymetric data over multiple years from one regional office. Construction of new water control structures.								
Cost avoidance	Major	Annual dollars saved/realized	$40,000	Major	Unable to provide							
Cost avoidance description	Avoided loss of life due to dam breach. Errors avoided if seamless tiles. Data processing avoided for all lidar derived products; DEMs, surface models, intensity models, etc.											
Increased revenues	I don't know	Unable to provide		Major	Unable to provide							
Increased revenues description	Water delivery to agricultural fields.											
Mission-driven performance improvements	Major	Annual percent improvement	15%	Major	Unable to provide							
Mission-driven performance improvements description	Since the last lidar collect, at least 15 percent of structures are new or have changed in a spatial way.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Annual dollars saved/realized	$12,060	Major	Unable to provide							
Value added to products or services description	Inventory and monitoring apps. Flood mapping.			Dam breach flood maps.								
Improved response or timeliness	Major	Annual dollars saved/realized	$30,150	Major	Annual dollars saved/realized	$30,150						
Improved response or timeliness description	Hydrologic models, maps of canals. Dam breach, flooding. Providing up to date info to stakeholders such as DOT, State, Counties, Tribes, other. Knowing where water will flow after a flood disaster event.											
Improved customer experience	Major	Annual dollars saved/realized	$18,090	Major	Unable to provide							
Improved customer experience description	Higher resolution, better for all projects. Measurements of canals. Less datasets.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			I don't know								
Environmental	Major			Major								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Environmental description	Water extents, critical habitat recognized. Will allow more consistent modeling and accuracy of fish and endangered species habitat.	Water extents, habitats. Better fish and species habitat modeling. Environmental compliance requirements.		
Public safety, including life and property	Major	Major		
Public safety, including life and property description	More accurate dam breach modeling could save loss of life from flooding.	Dam breach modeling, loss of life.		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps				
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Dam Break Inundation Modeling



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	One or more states, territories, or counties	One or more states, territories, or counties		
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Dam break inundation modeling. Flood Risk Management. Heavy civil construction of dams. Elevation data are needed for H&H modeling for dam break inundation, Emergency Action Plans (EAPS) for dams, and identification of the number of structures downstream of high and significant hazard dams. Elevation data are also needed for the design and construction of dams.
MCA Title	Dam Break Inundation Modeling
MCA ID	22110
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Bureau of Reclamation (USBR)
Sub-Agency or Division	
Organization Mission	The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.
Program Name	Dam Safety and Security Program
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 15 - Flood Risk Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Road embankments, culverts, bridges

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL3B		
Update Frequency	6-10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Not required			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable			Highly desirable	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level			Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Highly desirable	Highly desirable		
Classified point cloud	Highly desirable	Highly desirable		
Edited/cube XYZ		Not required		
Full waveform	Nice to have	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have	Not required		
Ground control/ground truthing	Required	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Nice to have		
Land use/land cover	Highly desirable	Not required		
Wetlands	Nice to have	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Not required		
Cultural resources	Highly desirable	Not required		
Coastal and riverine structures	Required	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	LIDAR at QL 2, DTM's, IFSAR	Inland bathymetry comes from various sources with variable quality. We also produce our own bathymetry.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI	Yes			
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	State of Utah AGRC			
Other	Yes	Yes		
Other description	IfSAR purchase	Private and local entities as well as producing our own.		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	I don't know		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	Moderate	I don't know		
Cost avoidance	Moderate	I don't know		
Increased revenues	I don't know	I don't know		
Mission-driven performance improvements	Major	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	I don't know		
Improved response or timeliness	Major	I don't know		
Improved customer experience	Major	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	I don't know		
Environmental	I don't know	I don't know		
Public safety, including life and property	Major	Minor		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Annual dollars saved/realized	$2,714	Minor	Annual dollars saved/realized	$2,412						
Time savings description	Time saved not having to stitch data sets. Time it takes to go through purchasing process.			Seamless data would help avoid time to mosaic data together into one surface. Inundation modeling through lakes/reservoirs would be improved with bathymetric data. A one stop shop for bathymetry would save a lot of time searching for data.								
Cost savings/cost reduction	Minor	Annual dollars saved/realized	$1,000	Minor	Annual dollars saved/realized	$500						
Cost savings/cost reduction description				Some savings if data doesn't need to be purchased.								
Cost avoidance	Minor	Annual dollars saved/realized	$2,000	Minor	Annual dollars saved/realized	$500						
Cost avoidance description	Small amount of savings for reduced data processing.			Better models produce better predictions of inundation.								
Increased revenues	None			None								
Mission-driven performance improvements	Minor	Annual percent improvement	10%	Moderate	Unable to provide							
Mission-driven performance improvements description	Better models would better identify potential inundation areas.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Minor	Unable to provide							
Improved response or timeliness	Minor	Annual dollars saved/realized	$1,206	Minor	Unable to provide							
Improved response or timeliness description	Inundation maps would be done more quickly.											
Improved customer experience	Minor	Annual dollars saved/realized	$1,206	Minor	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None								
Environmental	None			None								
Public safety, including life and property	Minor			Moderate								
Public safety, including life and property description	Better models would better identify potential inundation areas			Better modeling helps identify potentially inundated areas more accurately								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes		
Contours	Yes	Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

U.S. Coast Guard (USCG)

The USCG mission is to ensure our Nation's maritime safety, security and stewardship. Within the overarching mission of the USCG, there are 11 statutory missions: Ports & Waterway Security, Drug Interdiction, Aids to Navigation, Search and Rescue, Living Marine Resources, Marine Safety, Defense Readiness, Migrant Interdiction, Marine Environmental Protection, Ice Operations, and Other Law Enforcement.

The USCG currently relies on topographic and bathymetric data from other federal organizations. The Federal Aviation Administration (FAA) aeronautical charts are used for USCG safe aerial navigation. NOAA nautical charts and U.S. Army Corps of Engineers (USACE) channel surveys are used for assessing navigation off the coast and in navigable waterways respectively.

Topographic data are used for two major purposes: maintenance of navigation landmarks and aerial navigation. Digital Surface Models (DSMs) are needed to support line of site with navigation ranges used to aid vessels in lining up entrances to navigable channels. DSMs are used in conjunction with FAA charts to determine safe aerial navigation during search and rescue missions.

Bathymetric data are used for three major purposes: environmental impact analysis, safe marine navigation, and ice breakup. Bathymetry helps the USCG ensure the livelihood of marine species and enforce regulations that protect the maritime environment. Bathymetric DSMs can be used to update charts in high traffic waterways, allowing for safer and more efficient routes to be coursed based on boat sizes.

Two regions that would see major improvements to safe navigation are the Alaska coast and USACE designated inland navigable channels. Some areas off the coast of Alaska have not seen updates since the late 1800s, posing risks to U.S. commercial and military vessels as Arctic channels become more commonly used. Many of the current NOAA charts lack depth soundings, posing risks to larger vessels using those routes. Increased knowledge of the elevation under the water will prevent damages to vessels that could hit bottom while using outdated or insufficient maps.

Integration between updated bathymetric elevation and bottom characteristics would allow for better predictions of future changes in underwater elevation. Integrated bottom characteristics would allow for updates in how frequently different areas would need to have new collections. This would increase the accuracy of safe shipping routes over time while decreasing costs in areas determined to need less frequent updates.

In order to accomplish its mission, USCG requires different levels of quality for each data type. Inland topography is recognized as having the least concern, with data available from FAA and the USGS fulfilling those needs. USCG needs QL1B inland bathymetry and QL0B nearshore bathymetry updated every six months. USCG required IHO Order 1a offshore bathymetry updated every 2-3 years for all U.S. waters. While these requirements are generally uniform across all U.S. lands and waters, Districts 9 (Great Lakes) and 17 (Alaska) are the most in need of updates.

USCG would receive moderate future annual benefits from having its inland topographic benefits met; however, moderate to major future annual benefits would be realized from having its bathymetric data needs met. USCG would realize these benefits from increased program effectiveness, improved ability to carry out its mission, improved accuracy of products or services, faster recovery after events, and more up to date services or products.

USCG Headquarters is in the process of implementing a unified data access system for the entire organization. Currently, GIS data are managed at the district level. The new scheme will allow for a uniform system whereby any district will be able to access necessary elevation data on demand.

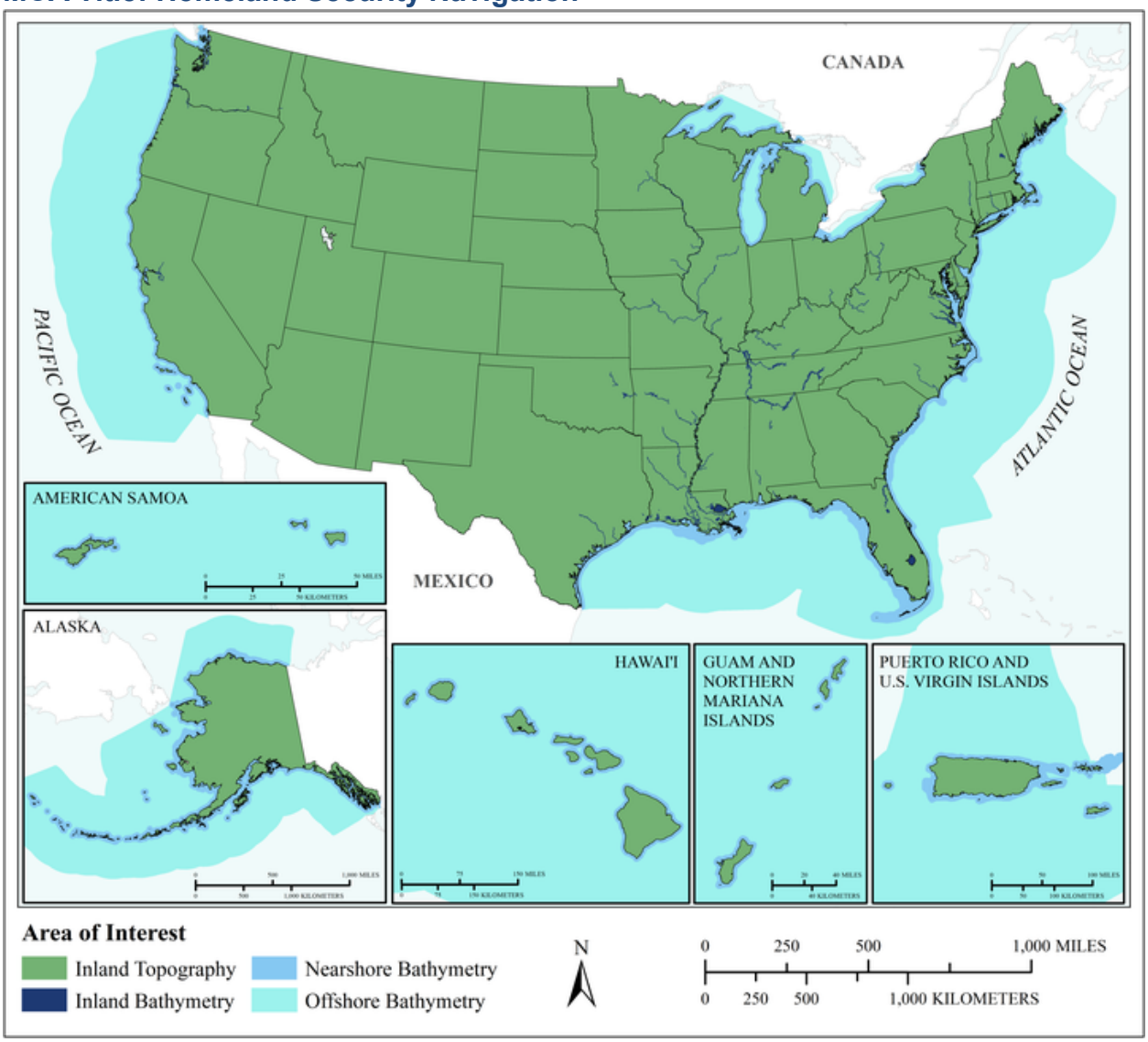
Some of the missions for ice breakup in the Arctic Circle require cooperative efforts with other nations that have stakes in safe passage in that region. While the purview of this study is for land and waters administrated by the U.S., USCG would receive benefits from future access to data for nearshore and offshore waters outside of U.S. jurisdiction.

USCG has identified Business Uses and Mission Critical Activity that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 18 – Homeland Security	DHS: U.S. Coast Guard (USCG)	1165	Homeland Security Navigation	Inland Topo	QL2	Event driven	Unable to quantify	Unable to quantify	None	None	Moderate
				Inland Bathy	QL0B	Annually	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL0B	Annually	Unable to quantify	Unable to quantify	None	None	None
				Offshore Bathy	Order 1a	2-3 years	Unable to quantify	Unable to quantify	None	None	None

MCA Title: Homeland Security Navigation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	States and/or Territories	Custom description	All study waters	All study waters
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Navigable waters only, vessel traffic areas that need aids to navigation		

MCA Description	Response
Mission Critical Activity	Homeland Security, Law Enforcement, Disaster Response, and Emergency Management; Marine and Riverine Navigation and Safety; Aviation Navigation and Safety; Military; Environmental Protection; Coastal search and rescue. Elevation data are needed to improve mariner safety, improve the accuracy of maritime navigation, for advancements and enhancements to maritime charting, and to support our customers (public, commercial and private sector, military, and USCG districts). Elevation data are also needed for landmark recognition (e.g. lighthouses, navigation towers), for managing port infrastructure, and for situational awareness.
MCA Title	Homeland Security Navigation
MCA ID	1165
Organization Type	Federal Agencies and Commissions
Organization Name	DHS: U.S. Coast Guard (USCG)
Sub-Agency or Division	Office of Navigation Systems
Organization Mission	Maritime Safety and Security
Program Name	Maritime Safety and Security
Total Annual Program Budget	$20,191,418,378
Primary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Secondary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Tertiary Business Use	BU 29 - Military

What Needs to be Measured in 3D	Response
Bare earth ground	Nice to have
Tops of buildings, structures, objects	Required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Items that could affect maritime services, safety, and navigation such as underwater shipwrecks, obstructions to navigation, bottom surface characteristics

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required

Inland Bathy Feature Size Requirements	Response
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Not required
5.1 – 10 acres	Not required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL0B	Order 1a
Update Frequency	Event driven only – Data need to coincide with a specific event.	Annually	Annually	2-3 years
Event type(s)	Extreme weather event, ice formations, military operations, rescue efforts, humanitarian need, etc.			
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Less than 1 meter
How far onshore needed			To Mean Lower Low Water (MLLW)	
How far down the beach profile needed	To MLLW		To MHHW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Not required	Not required	Nice to have	Not required	Not required
DEM for entire AOI needs to be seamless	Nice to have	Nice to have	Not required	Nice to have	Nice to have	Not required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	Required
DTM	Nice to have	Required	Required	Required
DEM	Nice to have	Not required	Not required	Not required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Not required	Not required	Not required	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	Nice to have

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Not required		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Nice to have	Not required	Not required	Not required
Ground control/ground truthing	Not required	Not required	Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Not required	Not required
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Underwater videography			Not required	Not required
Bottom texture			Highly desirable	Required
Bottom type			Required	Not required
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Nice to have
Geologic and seismic data	Not required	Nice to have	Not required	Not required
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Required
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Required	Required
Habitat distribution and classification			Not required	Required
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Highly desirable	Required
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Required	
Land use/land cover	Not required	Not required	Nice to have	Not required
Wetlands	Highly desirable	Not required	Nice to have	Not required
Estuaries			Nice to have	Not required
Inland surface water features	Nice to have	Required	Nice to have	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Required	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	FAA Aeronautical Charts	Data from NOAA or USACE charts	Data from NOAA or USACE charts	NOAA and USACE survey data
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI	Yes	Yes	Yes	Yes
Open Topography	Yes			
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS			Yes	Yes
State Repositories				
State repositories used				
Other	Yes	Yes	Yes	Yes
Other description	FAA Aeronautical Charts	USACE Channel Surveys	USACE Channel Surveys	USACE Channel Surveys
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	None	Major	Major	Moderate

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	None	Moderate	Moderate	None
Cost avoidance	None	Moderate	Moderate	None
Increased revenues	None	None	None	None
Mission-driven performance improvements	None	I don't know	None	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	None	I don't know	None	None
Improved response or timeliness	None	Moderate	Moderate	Moderate
Improved customer experience	None	Moderate	Moderate	Moderate
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	I don't know	None	None
Environmental	None	I don't know	None	None
Public safety, including life and property	Major	Major	Major	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	None			Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction	None			None			None			None		
Cost avoidance	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Increased revenues	I don't know	Unable to provide		None			None			None		
Mission-driven performance improvements	I don't know	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements description				By rapidly determining the location of mariners in distress, the USCG will experience significant (and often critical) time savings in deploying rescue vessels or aircraft to distress locations.						By rapidly determining the location of mariners in distress, the USCG will experience significant (and often critical) time savings in deploying rescue vessels or aircraft to distress locations.		
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness description							Better protection of mariners and defense of the coasts. Additional lives and property can be saved at sea by taking the “search” out of search and rescue.			Better protection of mariners and defense of the coasts. Additional lives and property can be saved at sea by taking the “search” out of search and rescue.		
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		None			I don't know	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			I don't know			None			None		
Environmental	None			I don't know			None			None		
Public safety, including life and property	Moderate			I don't know			None			None		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes	Yes	Yes	Yes
Viewshed maps				
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness		Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

U.S. Forest Service (USFS)

The mission of the USFS is to sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations. To advance its mission, the USFS balances the short and long-term needs of people and nature by:

- Working in collaboration with communities and partners;
- Providing access to resources and experiences that promote economic, ecological, and social vitality;
- Connecting people to the land and one another; and
- Delivering world-class science, technology, and land management.

Federal forest management dates back to 1876 when Congress created the office of Special Agent in the U.S. Department of Agriculture to assess the quality and conditions of forests in the United States. In 1881 the Department expanded the office into the Division of Forestry. A decade later Congress passed the Forest Reserve Act of 1891 authorizing the President to designate public lands in the West into what were then called "forest reserves." Responsibility for these reserves fell under the Department of the Interior until 1905 when President Theodore Roosevelt transferred their care to the Department of Agriculture's new USFS.

The agency was created on the principle of managing the nation's natural resources "for the greatest good, for the greatest number, for the longest time." In the decades leading up to the 1905 founding of the USFS, rapid expansion put the sustainability of natural resources at risk. The USFS was tasked to provide quality water and timber for the nation and protect local residents' access to forest resources. Today, the agency still provides resources and protects access to them, but America's population and the demand placed on its natural resources have grown significantly since the agency's founding. Forest and environmental science has evolved and become more robust and specific. Threats to natural resources, and expertise in addressing those threats, have increased.

Elevation data are used for land management and natural resource conservation, natural resource management, forest management and restoration, cultural heritage site protection, and natural disaster risk assessment.

The USFS requires Quality Level 1 (QL1) inland topography for all Mission Critical Activities with an average update frequency of every 4-5 years, though forestry management and natural disaster risk assessment requires more frequent updates. Respondents that required inland bathymetry generally need QL2B with an average update frequency of 6-10 years. Nearshore bathymetry was requested for natural resource management with an unknown quality level and update frequency.

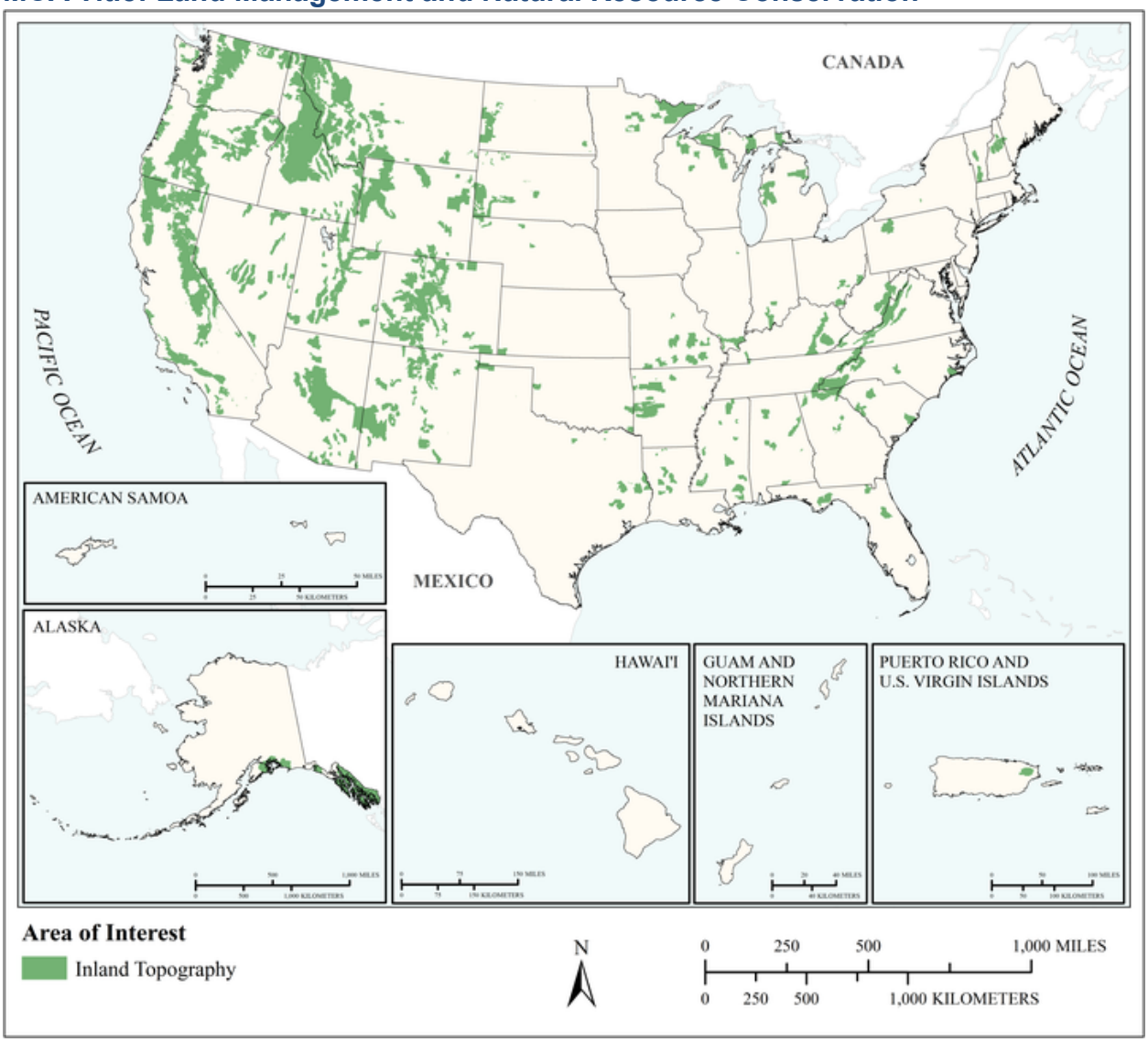
Future benefits from improved elevation data include significant time saved from reduced or avoided data errors; faster and/or avoided field visits/inspections; and through more efficient modeling, reviews, reporting, data dissemination, mapping, or other procedures. Other benefits include data acquisition costs saved, data processing avoided, mission-driven performance improvements, improved accuracy of products, and environmental and public safety benefits.

The USFS has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 04 – Forest Resource Management	USDA: U.S. Forest Service (USFS)	1066	Land Management and Natural Resource Conservation	Inland Topo	QL1	4-5 years	$70,177	$1,000	Moderate	Major	Major
BU 04 – Forest Resource Management	USDA: U.S. Forest Service (USFS)	32759	Geospatial Science for Natural Resource Management	Inland Topo	QL1	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Inland Bathy	QL1B	6-10 years	Unable to quantify	Unable to quantify	Moderate	Major	Major
				Nearshore Bathy	I don't know	I don't know	Unable to quantify	Unable to quantify	I don't know	I don't know	I don't know
BU 04 – Forest Resource Management	USDA: U.S. Forest Service (USFS)	50007	Forest Management and Restoration	Inland Topo	QL1	2-3 years	$360,000 to $450,000	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL2B	4-5 years	$40,000 to $50,000	Unable to quantify	Moderate	Moderate	Moderate
BU 14 – Cultural Resource Management	USDA: U.S. Forest Service (USFS)	50008	Protecting Cultural Heritage Sites	Inland Topo	QL1	6-10 years	$270,000 to $360,000	Unable to quantify	Moderate	Moderate	I don't know
				Inland Bathy	QL2B	>10 years	$30,000 to $40,000	Unable to quantify	Moderate	Moderate	I don't know
BU 17 – Wildfire Management	USDA: U.S. Forest Service (USFS)	50009	Natural Disaster Risk Assessment	Inland Topo	QL1	2-3 years	$200,000 to $300,000	Unable to quantify	Major	Major	Major

MCA Title: Land Management and Natural Resource Conservation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federally-owned lands nationwide, all lands of U.S. Tribes, or select large land holding agencies			
Sub Area Requirements	FS			

MCA Description	Response
Mission Critical Activity	Regional Land Management and Natural Resource Conservation activities. Natural Resource Assessments. Additional Business Uses for this MCA are BU 07 – Wildlife and Habitat Management and BU 17 – Wildfire Management.
MCA Title	Land Management and Natural Resource Conservation
MCA ID	1066
Organization Type	Federal Agencies and Commissions
Organization Name	USDA: U.S. Forest Service (USFS)
Sub-Agency or Division	
Organization Mission	Caring for the Land, Serving People. To sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations.
Program Name	Natural Resources, Vegetation and Fuels Management
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 06 - Natural Resources Conservation
Tertiary Business Use	BU 27 - Recreation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	The smallest features we would be interested in would be a road culvert or a bridge, even a trail bridge. Also individual trees.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable					
DEM for entire AOI needs to be seamless	Highly desirable					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Required			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	USGS 10 and 30 Meter DEM data. LiDAR point cloud for Forest mapping. Typically QL2, many dates.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes			
Other description	In house			

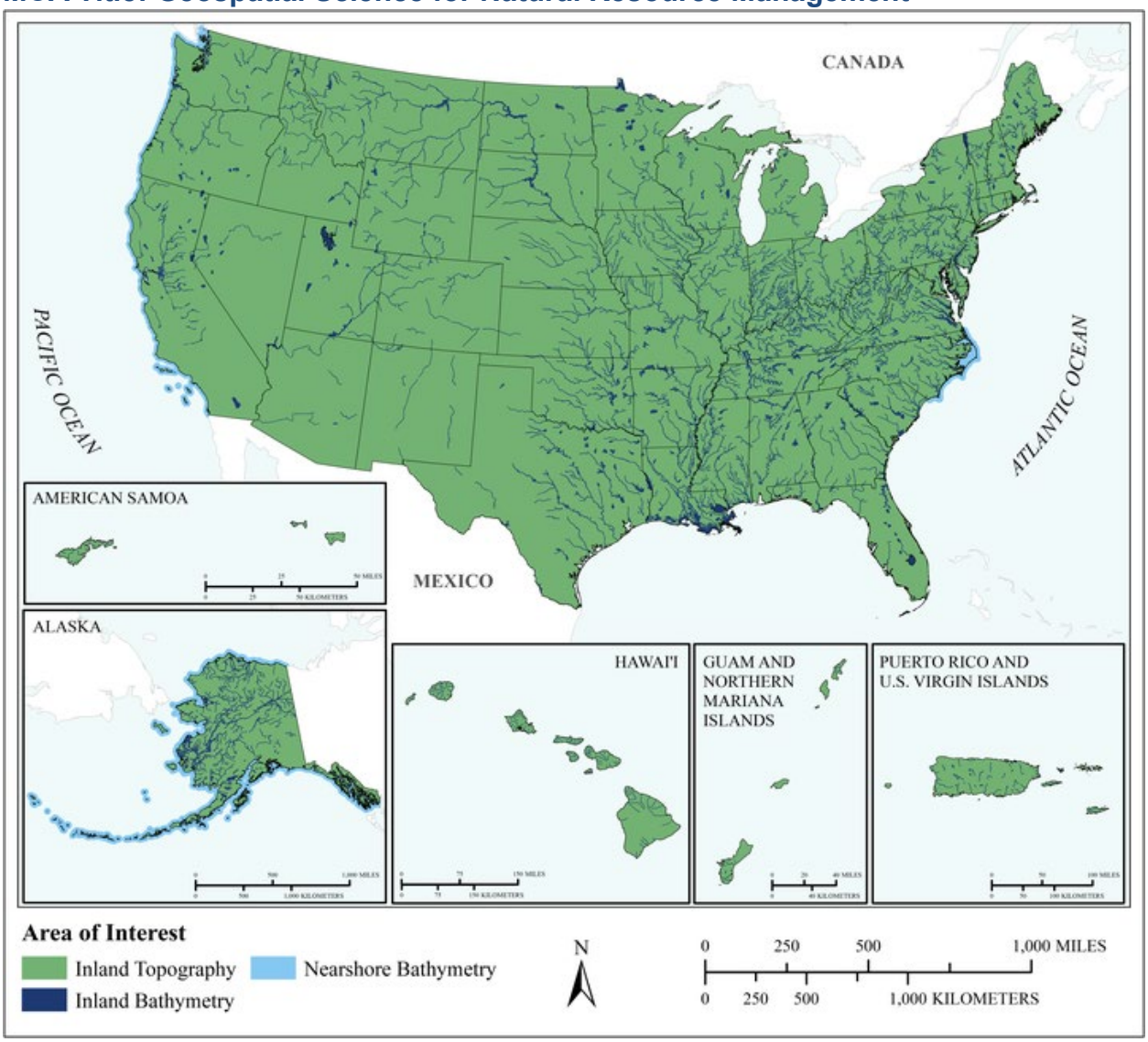
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	I don't know			
Cost avoidance	I don't know			
Increased revenues	None			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$54,270									
Cost savings/cost reduction	Major	Annual dollars saved/realized	$6,000									
Cost avoidance	Major	Annual dollars saved/realized	$7,200									
Increased revenues	Moderate	Annual dollars saved/realized	$1,200									
Increased revenues description	To be maximized it would need to be cyclical.											
Mission-driven performance improvements	Major	Annual percent improvement	30%									
Other operational benefits	Moderate	Annual dollars saved/realized	$1,508									
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Moderate	Unable to provide										
Improved response or timeliness description	Would need to be cyclical. Improved mapping services.											
Improved customer experience	Major	Unable to provide										
Improved customer experience description	However, data would be large and hard to download.											
Other customer service benefits	Major	Annual dollars saved/realized	$1,000									
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Major											
Public safety, including life and property	Major											
Other												
Other benefits	Moderate											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Geospatial Science for Natural Resource Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Highly desirable	Highly desirable	
Geographic Area Requirements	States and/or Territories	States and/or Territories	Nearshore areas along the coast off one or more states, territories, or counties (including Great Lakes states)	
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		

MCA Description	Response
Mission Critical Activity	Natural resource management.
MCA Title	Geospatial Science for Natural Resource Management
MCA ID	32759
Organization Type	Federal Agencies and Commissions
Organization Name	USDA: U.S. Forest Service (USFS)
Sub-Agency or Division	Geospatial
Organization Mission	Leading geospatial science implementation in the USDA Forest Service.
Program Name	GIS and Spatial Sciences
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 02 - Riverine Ecosystem Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual shrubs, trees, culverts, boulders, etc. Hazards to navigation.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL1B	I don't know	
Update Frequency	6-10 years	6-10 years	I don't know	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	I don't know	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	I don't know	
How far onshore needed			I don't know - not currently in use in the USFS	
How far down the beach profile needed	To MLLW		I don't know	
Tide correction requirement			I don't know	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Required	Highly desirable		Required	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Highly desirable		Required	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Highly desirable	
DTM	Required	Required	Highly desirable	
DEM	Required	Required	Highly desirable	
Raw point cloud data	Nice to have	Nice to have	Nice to have	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Not required	Not required	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Not required	Not required	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Required	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			I don't know	
Nautical and/or navigation charts			I don't know	
Acoustic imagery of the seafloor			I don't know	
Aerial and/or satellite imagery	Required	Required	I don't know	
Underwater videography			I don't know	
Bottom texture			I don't know	
Bottom type			I don't know	
Submerged features			I don't know	
Subbottom characteristics			I don't know	
Geologic and seismic data	Nice to have	Highly desirable	I don't know	
Water column properties - Physical			I don't know	
Water column properties - Chemical			I don't know	
Water column properties - Biological			I don't know	
Currents			I don't know	
Tide/wave heights			I don't know	
Sea ice conditions			I don't know	
Habitat distribution and classification			I don't know	
Boundaries			I don't know	
Routes			I don't know	
Offshore cadastral			I don't know	
Lease areas			I don't know	
Fixed obstructions			I don't know	
Floating observation/navigation systems			I don't know	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	I don't know	
Land use/land cover	Required	Required	I don't know	
Wetlands	Required	Required	I don't know	
Estuaries			I don't know	
Inland surface water features	Required	Required	I don't know	
Bridges/culverts	Required	Required		
Landmark features	Highly desirable	Highly desirable	I don't know	
Cultural resources	Required	Required	I don't know	
Coastal and riverine structures	Required	Required	I don't know	
Overhead structures			I don't know	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Terrestrial lidar - QL1 and QL2. Older 10m and 30m DEMs. 5m IfSAR in Alaska. Various dates.	Quantum Spatial collect in April 2018 - Riegl VQ-880-G - for one site in Oregon. Greater than QL1 pulse density.	None currently in use	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes		
Other description	USFS-generated	Not used extensively		

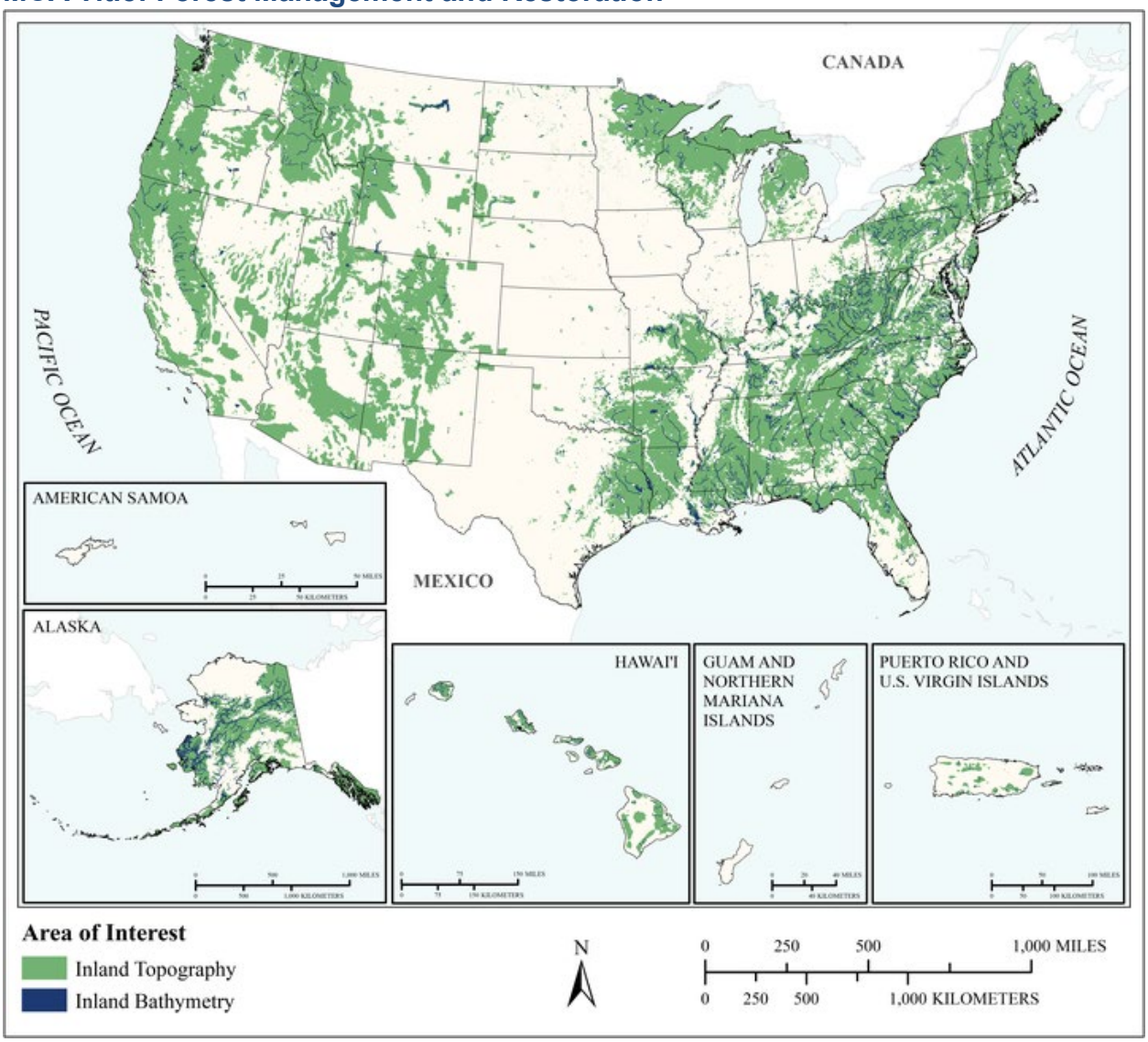
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	None	
Cost savings/cost reduction	Major	Inland bathy data not available	None	
Cost avoidance	Moderate	Inland bathy data not available	None	
Increased revenues	Minor	Inland bathy data not available	None	
Mission-driven performance improvements	Major	Inland bathy data not available	None	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	None	
Improved response or timeliness	Major	Inland bathy data not available	None	
Improved customer experience	Major	Inland bathy data not available	None	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available	None	
Environmental	Major	Inland bathy data not available	None	
Public safety, including life and property	Major	Inland bathy data not available	None	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Cost savings/cost reduction	Minor	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Increased revenues	Moderate	Unable to provide		None			I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate			I don't know					
Environmental	Major			Major			I don't know					
Public safety, including life and property	Major			Major			I don't know					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes		
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes	Yes		
Cross sections	Yes	Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes		Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Forest Management and Restoration



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Custom description	Custom description		
Sub Area Requirements	FS, DoD, FWS lands and other forested lands	FS, DoD, FWS lands and other forested lands		

MCA Description	Response
Mission Critical Activity	Characterization of forest vegetative structure in terms of height, size and density, standing inventory for planning and implementation of forest restoration treatments. Wildfire management. An additional Business Use would be BU 01- Water Supply and Quality.
MCA Title	Forest Management and Restoration
MCA ID	50007
Organization Type	Federal Agencies and Commissions
Organization Name	USDA: U.S. Forest Service (USFS)
Sub-Agency or Division	
Organization Mission	To sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations
Program Name	Forest restoration
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 04 - Forest Resources Management
Secondary Business Use	BU 17 - Wildfire Management, Planning, and Response
Tertiary Business Use	BU 07 - Wildlife and Habitat Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual trees so that we can accurately characterize vertical and horizontal distribution of vegetation and segmentation of the point cloud to identify individual tree crowns

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B		
Update Frequency	2-3 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI	QL1 data is necessary in areas and vegetation types where we have active forest restoration treatments or are planning them. Outside of these areas QL2 data should suffice.			
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 5 meters		
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Required		
DEM	Required	Required		
Raw point cloud data	Required	Nice to have		
Classified point cloud	Required	Required		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Not required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Highly desirable		
Ground control/ground truthing	Required	Required		
Other	Required	Required		
Other description	Metadata, project report	Metadata, project report		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Nice to have		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Nice to have	Nice to have		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Land use/land cover	Required	Required		
Wetlands	Required	Required		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Required	Not required		
Cultural resources	Required	Not required		
Coastal and riverine structures	Not required	Not required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			
Other	Required			
Other description	Forest health/condition assessment			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We have a mix of QL1 lidar collected for Forest Service specific acquisitions and QL2 data collected by USGS/FEMA/NRCS and local counties. Acquisitions are from 2012 to the present.			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				

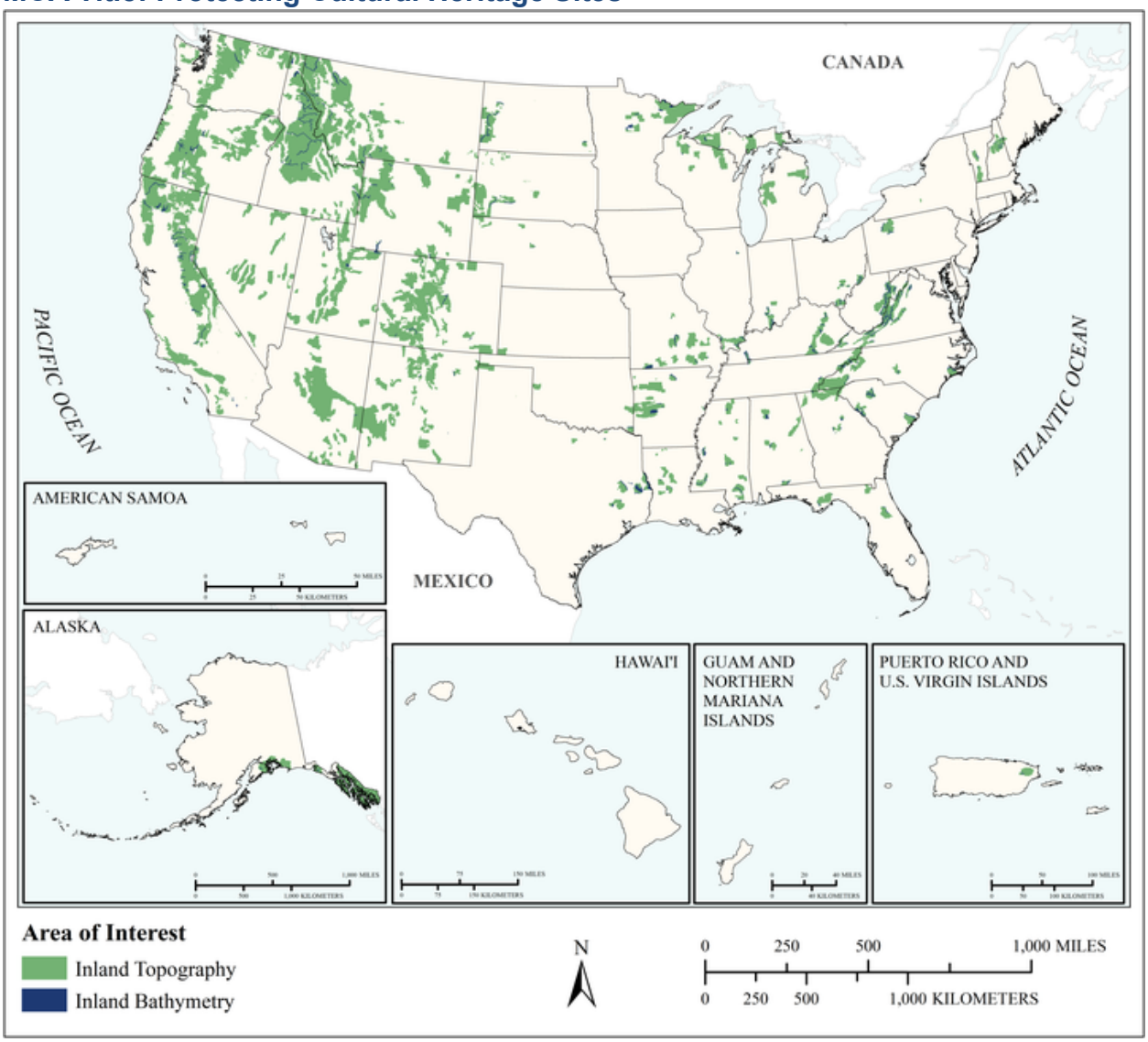
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State Repositories	Yes			
State repositories used	NM RGIS, other states as well			
Other	Yes			
Other description	Get copies of data from federal and state partner agencies,			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	I don't know		
Cost savings/cost reduction	Moderate	I don't know		
Cost avoidance	Minor	I don't know		
Increased revenues	None	I don't know		
Mission-driven performance improvements	Moderate	I don't know		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know		
Improved response or timeliness	Minor	I don't know		
Improved customer experience	Moderate	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	I don't know		
Environmental	Major	I don't know		
Public safety, including life and property	Moderate	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$360,000 to $450,000	Major	Annual dollars saved/realized	$40,000 to $50,000						
Time savings description	Decreased field work costs, more accurate estimates of disruptions to natural hydrologic flow.			Decreased field work costs, more accurate estimates of disruptions to natural hydrologic flow.								
Cost savings/cost reduction	Major	Unable to provide		I don't know	Unable to provide							
Cost savings/cost reduction description	If FS did not have to pay for QL1 lidar that would be a big savings with a large payoff.											
Cost avoidance	Moderate	Unable to provide		I don't know	Unable to provide							
Cost avoidance description	Restoration treatments supported by lidar could reduce impact of wildfires in the long term if applied over a large enough area.											
Increased revenues	Moderate	Unable to provide		I don't know	Unable to provide							
Increased revenues description	Forest restoration treatments typically do not generate much revenue since the products removed are mostly low value.											
Mission-driven performance improvements	Major	Unable to provide		I don't know	Unable to provide							
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness	Major	Unable to provide		I don't know	Unable to provide							
Improved customer experience	Major	Unable to provide		I don't know	Unable to provide							
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Moderate			Moderate								
Public safety, including life and property	Moderate			Moderate								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps				
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Protecting Cultural Heritage Sites



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	Custom description	Custom description		
Sub Area Requirements	USFS lands and National forests	USFS lands and National forests		

MCA Description	Response
Mission Critical Activity	Protecting cultural heritage sites
MCA Title	Protecting Cultural Heritage Sites
MCA ID	50008
Organization Type	Federal Agencies and Commissions
Organization Name	USDA: U.S. Forest Service (USFS)
Sub-Agency or Division	
Organization Mission	To sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations.
Program Name	Heritage program
Total Annual Program Budget	$550,000
Primary Business Use	BU 14 - Cultural Resources Preservation and Management
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B		
Update Frequency	6-10 years	>10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm		
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Highly desirable	
Entire AOI under same environmental conditions	Required	Highly desirable			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have	Nice to have			Nice to have	
DEM for entire AOI needs to be seamless	Required	Highly desirable			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	I don't know			I don't know	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required		
DTM	Required	Highly desirable		
DEM	Required	Required		
Raw point cloud data	Not required	Not required		
Classified point cloud	Required	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Nice to have		
Breaklines required for standard hydro-flattening	Required	Not required		
Additional breaklines for hydro-enforcement of culverts	Required			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required	Highly desirable		
Ground control/ground truthing	Nice to have	Highly desirable		
Other	Required			
Other description	Metadata and project report			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Land use/land cover	Nice to have	Highly desirable		
Wetlands	Not required	Highly desirable		
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Highly desirable		
Cultural resources	Required	Highly desirable		
Coastal and riverine structures	Nice to have	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	I don't know		
Cost savings/cost reduction	Moderate	I don't know		
Cost avoidance	Moderate	I don't know		
Increased revenues	Moderate	I don't know		
Mission-driven performance improvements	Moderate	I don't know		

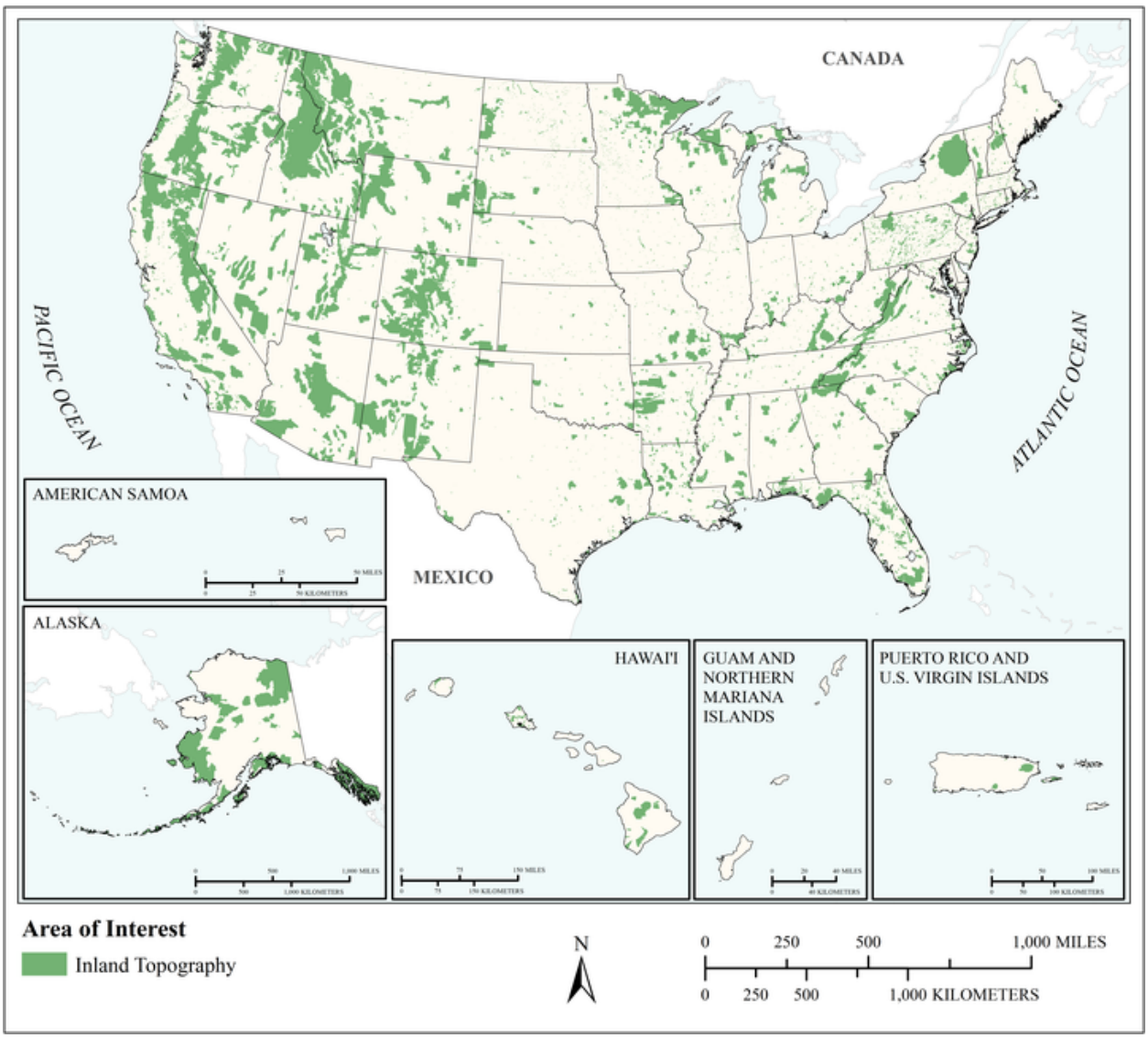
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	I don't know		
Improved response or timeliness	I don't know	I don't know		
Improved customer experience	Minor	I don't know		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	I don't know		
Environmental	I don't know	I don't know		
Public safety, including life and property	I don't know	I don't know		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$270,000 to $360,000	Major	Annual dollars saved/realized	$30,000 to $40,000						
Time savings description	Tremendous savings compared to field mapping of heritage resources in project areas.			Tremendous savings compared to field mapping of heritage resources in project areas.								
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide							
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide							
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide							
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description	Improved mission compliance.			Improved mission compliance.								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Value added to products or services description	Improved products or services.			Improved products or services.								
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide							
Improved response or timeliness description	Improved response or timeliness.			Improved response or timeliness.								
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Improved customer experience description	Improved customer experience.			Improved customer experience.								
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Moderate								
Environmental	Moderate			Moderate								
Public safety, including life and property	I don't know			I don't know								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: Natural Disaster Risk Assessment



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Custom description			
Sub Area Requirements	FS, DoD, FWS lands and State forests and parks			

MCA Description	Response
Mission Critical Activity	Natural disaster risk assessment
MCA Title	Natural Disaster Risk Assessment
MCA ID	50009
Organization Type	Federal Agencies and Commissions
Organization Name	USDA: U.S. Forest Service (USFS)
Sub-Agency or Division	
Organization Mission	To sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations.
Program Name	Aviation and fire program
Total Annual Program Budget	$10,000,000
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Required
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	2-3 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Nice to have					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Nice to have					
DEM for entire AOI needs to be seamless	Nice to have					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Required			
Ground control/ground truthing	Highly desirable			
Other	Required			
Other description	Metadata and project report, 2D and 3D building footprints			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Required			
Wetlands	Required			
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Highly desirable			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			
Other	Required			
Other description	Fuel loading, fire regime condition class			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	Minor			
Cost avoidance	Minor			
Increased revenues	Minor			
Mission-driven performance improvements	Minor			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor			
Improved response or timeliness	Minor			
Improved customer experience	Minor			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Minor			
Public safety, including life and property	Minor			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$200,000 to $300,000									
Time savings description	Accurate mapping of wildfire risks in Wildland-Urban Interface areas; Improved mapping of other natural disaster risks (flooding, storm damage).											
Cost savings/cost reduction	I don't know	Unable to provide										
Cost avoidance	I don't know	Unable to provide										
Increased revenues	I don't know	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Mission-driven performance improvements description	Improved mission compliance.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Value added to products or services description	Improved products or services.											
Improved response or timeliness	Moderate	Unable to provide										
Improved response or timeliness description	Improved response or timeliness.											
Improved customer experience	Major	Unable to provide										
Improved customer experience description	Improved customer experience.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

U.S. Geological Survey (USGS)

The USGS serves the nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.

Current status of elevation data for the USGS

The 3D Elevation Program (3DEP) is managed by the USGS National Geospatial Program on behalf of the community of federal, state, local, and other partners to respond to growing needs for high-quality topographic data and for a wide range of other three-dimensional representations of the nation's natural and constructed features. Progress towards the completion goal has accelerated each year. It is due in large part to partner investments: from FY15 - FY19, USGS funded 30% of 3DEP costs for data acquisition and data processing and management, while partners funded 66% for data acquisition, with the remaining 4% of funding coming from disaster supplemental appropriations. As we celebrate reaching the milestone of approximately 77% of the nation with 3DEP data available or in progress at the end of Fiscal Year 2020, we must also continue to look forward to the challenges of completing nationwide coverage and meeting growing needs for higher quality data, repeat coverage, and new products and services. The USGS is looking forward to the results of the 3D Nation Elevation Requirements and Benefits Study to inform the future of 3DEP.

Importance of elevation data to the USGS

The USGS is a science organization that provides impartial information on the health of our ecosystems and environment, the natural hazards that threaten us, the natural resources we rely on, the impacts of climate and land-use change, and the core science systems that help us provide timely, relevant, and useable information.

As the nation's largest water, earth, and biological science and civilian mapping agency, the USGS collects, monitors, analyzes, and provides scientific understanding about natural resource conditions, issues, and problems. The diversity of USGS scientific expertise enables it to carry out large-scale, multi-disciplinary investigations and provide impartial scientific information to resource managers, planners, and other customers.

The USGS is focused on some of the most significant issues society faces, in which natural science can make a substantial contribution to the well-being of the nation and the world, through the following Mission Areas:

- Core Science Systems;
- Ecosystems;
- Energy and Minerals;
- Environmental Health;
- Land Resources;
- Natural Hazards; and
- Water.

Visit these Fact Sheets for more information about specification applications:

- The 3D Elevation Program and Energy for the Nation
- The 3D Elevation Program—Flood risk management
- The 3D Elevation Program—Landslide recognition, hazard assessment, and mitigation support

- The 3D Elevation Program - Precision agriculture and other farm practices
- The 3D Elevation Program and America's infrastructure

High-level summary of elevation data requirements

A nationwide baseline of Quality Level 2 (QL2) topographic lidar updated every 4-5 years will meet many needs, whereas QL1 is ideal for event-driven research and hazard response. For both inland and coastal bathymetry, QL2B updated every 2-3 years is preferred to ensure the point density is sufficient for modeling and change detection, with the added benefit that the density supports the same horizontal resolution grid as existing 3DEP topographic data. The offshore bathymetric requirement varies depending on the Mission Critical Activity, ranging from Order 1b to Special Order.

High-level summary of benefits that would come from higher resolution elevation data

National-scale, higher-resolution elevation data would facilitate additional new partnerships between government at all levels, academia, and the private sector to refine research, mapping, assessment, real-time monitoring, forecasting, information management and dissemination, mitigation tools, and emergency preparedness and response. New technological advances would also enlist the expertise associated with mineral mapping, additional land resources, and hazards such as hurricanes, wildfires, landslides, floods, earthquakes, and volcanic activity, and utilize incentives for the adoption of loss reduction measures nationwide.

USGS has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

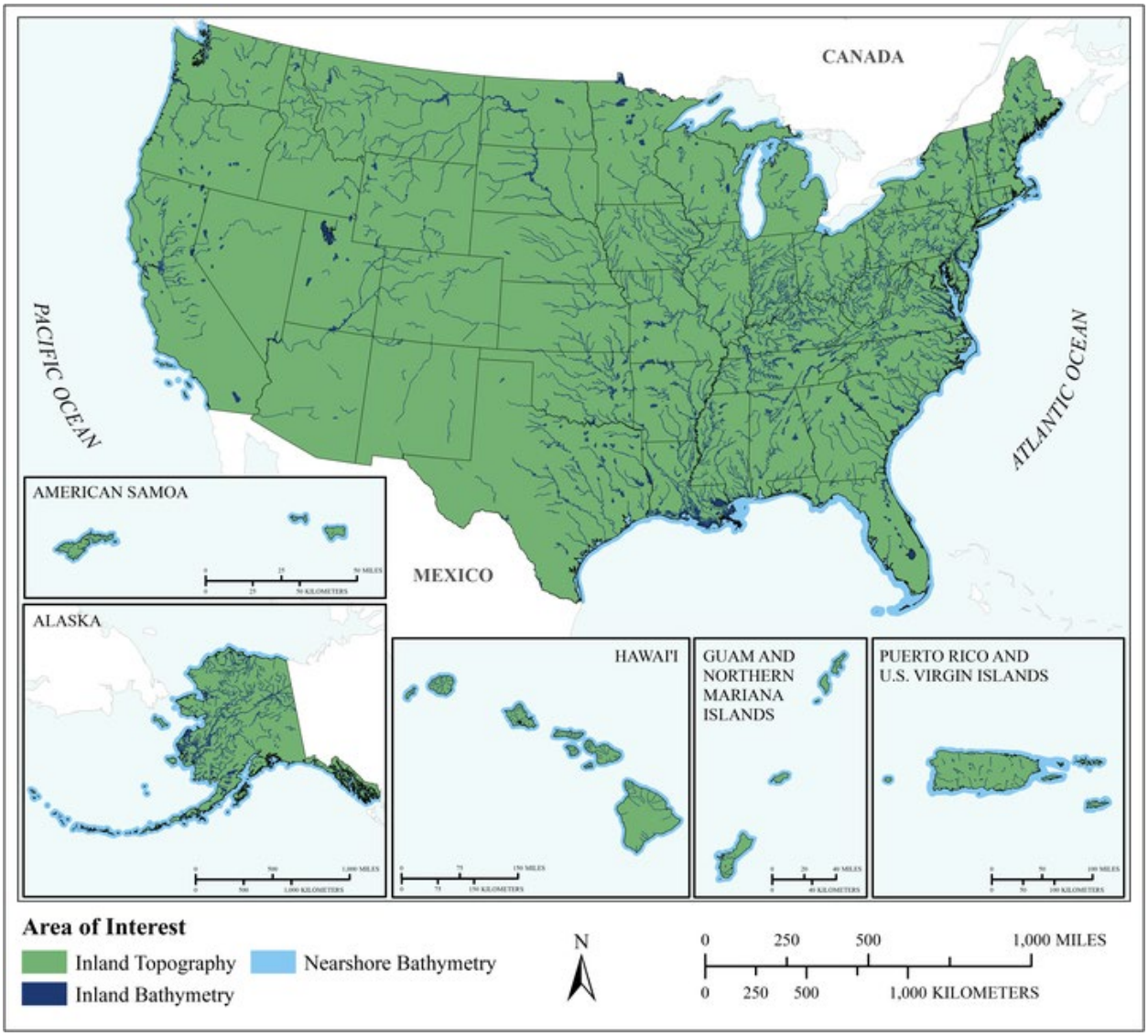
Summary Table

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 01 – Water Supply and Quality	DoI: U.S. Geological Survey (USGS)	1390	National Civilian Mapping – Water Quality	Inland Topo	QL1	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Inland Bathy	QL0B	2-3 years	$30,150	Unable to quantify	Major	Moderate	Major
				Nearshore Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	Major	Major	I don't know
BU 03 – Coastal Zone Management	DoI: U.S. Geological Survey (USGS)	1272	Frequent Coastal	Inland Topo	QL2	2-3 years	$19,296	Unable to quantify	Moderate	Major	Major
				Inland Bathy	QL1B	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Nearshore Bathy	QL1B	2-3 years	$1,251,650	$230,300	Major	Major	Major
BU 03 – Coastal Zone Management	DoI: U.S. Geological Survey (USGS)	1296	Event-Driven Coastal	Inland Topo	QL0 HD	Event driven	Unable to quantify	Unable to quantify	Major	Major	I don't know
				Inland Bathy	QL1B is often sufficient, but higher quality data is needed for high-resolution models	Event driven	Unable to quantify	Unable to quantify	Moderate	Major	I don't know
				Nearshore Bathy	QL1B	Event driven	$1,079,948	Unable to quantify	I don't know	I don't know	I don't know
				Offshore Bathy	Special Order	Event driven	Unable to quantify	Unable to quantify	Moderate	Major	I don't know
BU 03 – Coastal Zone Management	DoI: U.S. Geological Survey (USGS)	11470	National Civilian Mapping - Coastal	Inland Topo	QL2	4-5 years	$4,865,005	$1,475,000	Minor	Minor	I don't know
				Inland Bathy	QL2B	2-3 years	$1,193,055	$1,080,000	Minor	Minor	I don't know
				Nearshore Bathy	QL2B	2-3 years	$4,133,332	$1,900,000	Minor	Minor	I don't know
				Offshore Bathy	Order 2	4-5 years	$5,516,665	$1,950,000	Minor	Minor	I don't know
BU 06 – Natural Resource Management	DoI: U.S. Geological Survey (USGS)	1223	National Civilian Mapping - U.S. Topo	Inland Topo	QL2	4-5 years	$195,000	Unable to quantify	Major	Major	Major
				Inland Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
				Offshore Bathy	Order 1b	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
BU 06 – Natural Resource Management	DoI: U.S. Geological Survey (USGS)	22051	National Civilian Mapping - Land Resources	Inland Topo	QL1 HD	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	I don't know

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 07 – Wildlife and Habitat Management	DoI: U.S. Geological Survey (USGS)	1167	Habitat	Inland Topo	QL1	4-5 years	$4,409,595	$895,653	Major	Major	None
				Inland Bathy	QL2B	4-5 years	$5,528,695	$2,496,568	Moderate	Major	Major
				Nearshore Bathy	QL2B	4-5 years	$182,256	$1,670	Moderate	Major	None
BU 10 – Geologic Assessment	DoI: U.S. Geological Survey (USGS)	1073	Seafloor Mapping	Nearshore Bathy	QL1B	6-10 years	$34,250	Unable to quantify	Major	Major	Major
				Offshore Bathy	Special Order	>10 years	$61,506	Unable to quantify	Major	Major	Major
BU 10 – Geologic Assessment	DoI: U.S. Geological Survey (USGS)	1240	Earthquake	Inland Topo	(a) QL1 (b) QL2	Event driven	$100,665,516	Unable to quantify	Moderate	None	Major
				Inland Bathy	QL2B	Event driven	Unable to quantify	Unable to quantify	Moderate	None	Major
				Nearshore Bathy	QL2B	Event driven	Unable to quantify	Unable to quantify	Moderate	Minor	Major
				Offshore Bathy	Order 1b	Event driven	$10,028,944	Unable to quantify	Minor	None	Major
BU 10 – Geologic Assessment	DoI: U.S. Geological Survey (USGS)	1243	Volcano Baseline	Inland Topo	QL1	6-10 years	$100,000	Unable to quantify	Minor	Minor	Major
				Inland Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	Major
				Nearshore Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	Moderate
BU 10 – Geologic Assessment	DoI: U.S. Geological Survey (USGS)	1367	Baseline Coastal	Inland Topo	QL1	4-5 years	$36,180	Unable to quantify	I don't know	I don't know	I don't know
				Inland Bathy	QL3B	4-5 years	$31,657	Unable to quantify	I don't know	I don't know	I don't know
				Nearshore Bathy	QL3B	4-5 years	$151,657	$48,541	I don't know	I don't know	I don't know
				Offshore Bathy	Order 1b	6-10 years	$213,732	$15,678	I don't know	I don't know	I don't know
BU 10 – Geologic Assessment	DoI: U.S. Geological Survey (USGS)	21544	National Civilian Mapping - Geology	Inland Topo	QL0	Event driven	$110,873	$1,929	Major	I don't know	I don't know
BU 10 – Geologic Assessment	DoI: U.S. Geological Survey (USGS)	22307	Volcano Event Driven	Inland Topo	QL1	Event driven	$19,597	Unable to quantify	Moderate	Minor	Major
BU 12 – Renewable Energy Resources	DoI: U.S. Geological Survey (USGS)	60682	Renewable Energy Resources	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Moderate	Moderate	None
				Nearshore Bathy	QL4B	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
				Offshore Bathy	Special Order	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate

MCA Description				Requirements			Future Operational Benefits	Future Customer Service Benefits	Future Societal Benefits		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 13 – Oil and Gas Resources	DoI: U.S. Geological Survey (USGS)	60683	Oil and Gas Resources	Inland Topo	QL2	Annually	$1,578,291	Unable to quantify	Minor	Major	Major
				Inland Bathy	QL2B	2-3 years	Unable to quantify	Unable to quantify	None	Minor	Minor
				Nearshore Bathy	QL2B	2-3 years	$9,259,028	Unable to quantify	Major	Major	Major
				Offshore Bathy	Order 1a	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
BU 15 – Flood Risk Management	DoI: U.S. Geological Survey (USGS)	1444	National Civilian Mapping - Hydrography	Inland Topo	QL2	6-10 years	Unable to quantify	Unable to quantify	Major	None	None
				Inland Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	Major	None	None
BU 15 – Flood Risk Management	DoI: U.S. Geological Survey (USGS)	21587	Flood Modeling	Inland Topo	QL2	4-5 years	$6,206	Unable to quantify	Minor	Moderate	Minor
				Inland Bathy	QL3B	4-5 years	$741,650	Unable to quantify	Minor	Moderate	Minor
BU 17 – Wildfire Management	DoI: U.S. Geological Survey (USGS)	60684	Wildfire Management, Planning, and Response	Inland Topo	QL1	4-5 years	$14,787,434	Unable to quantify	Major	Major	Major
BU 22 – Infrastructure Management	DoI: U.S. Geological Survey (USGS)	22155	StreamStats	Inland Topo	QL2	6-10 years	$142,660,531	$91,455,985	None	None	None
				Inland Bathy	QL1B	6-10 years	$38,932,187	$2,432,927	None	None	None

MCA Title: National Civilian Mapping – Water Quality



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	States and/or Territories	States and/or Territories	States and/or Territories	
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	

MCA Description	Response
Mission Critical Activity	Water quality. Our primary mission critical activity (both Water Mission Area and the local science center) focuses on water quality, supply, and availability, both from an observational and modeling perspective. Mission critical activities pertain to terrestrial ground and surface waters, as well as coastal waters.
MCA Title	National Civilian Mapping – Water Quality
MCA ID	1390
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	All Regions and Water Science Centers
Organization Mission	To provide reliable, impartial, and timely information that is needed to understand and effectively manage the Nation's water resources.
Program Name	Water Resource Mission Area
Total Annual Program Budget	$750,000
Primary Business Use	BU 01 - Water Supply and Quality
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required
Other	Required
Other description	River/lake surface

General Geographic Area and Size	
Average geographic extent of day-to-day area	USGS works at all scales
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Mapping river channels for modeling application often requires detailed resolution of bottom substrates, rock, gravel, and bedforms., River bottom substrate, (i.e. rock, bed forms)

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL0B	QL2B	
Update Frequency	4-5 years	2-3 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm	Up to 30 cm	
How far onshore needed			To cover the coastal uplands	
How far down the beach profile needed	To MLLW		To MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs		Partial		
Cross section/transect requirement		In some cases. full bottom coverage is necessary. In other cases, transect, depending upon reach distances, stream width or lake area, may be sufficient. Sampling density should be on the order of one measurement per 3 linear meters and transects should be run longitudinally at distances of no more than 150 m apart.		

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Highly desirable	Nice to have		Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level		Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Required	Highly desirable	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Nice to have	
Full waveform	Nice to have	Highly desirable	Nice to have	
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Nice to have	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Required	Required	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Nice to have	
Subbottom characteristics			Highly desirable	
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	
Water column properties - Physical			Highly desirable	
Water column properties - Chemical			Highly desirable	
Water column properties - Biological			Highly desirable	
Currents			Highly desirable	
Tide/wave heights			Highly desirable	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Nice to have	
Shorelines – current, historic, change rates	Required	Highly desirable	Required	
Land use/land cover	Required	Highly desirable	Highly desirable	
Wetlands	Required	Highly desirable	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	
Inland surface water features	Required	Highly desirable	Highly desirable	
Bridges/culverts	Required	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Nice to have	
Cultural resources	Highly desirable	Highly desirable	Nice to have	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy

Current dataset used	Multiple types including Bare earth DEMs derived from QL2 and QL3 lidar. Various dates; 10 foot resolution Digital Elevation Model (DEM) developed from many separate major LiDAR collection projects. Bare earth points from the original point clouds were re-sampled to create 10 foot resolution bare earth models for each individual project. Horizontal accuracy is variable (based on accuracy of the 12 individual projects) and vertical accuracy = 0.292 ft (comparison with surveyed ground check at 450 points)	Bathymetric data currently used is a 10-m resolution continuous terrain model that utilizes a combination of data sources including boat-borne multibeam bathymetric and EAARL-B Lidar data collected during 2011-13 with terrestrial Lidar derived DEM (National Map) as well as data from historical NOAA surveys (H05615, H05893, H05870, H02616) collected between 1934 and 1936. Additionally, USGS Coastal National Elevation Database (CoNED) Project - Topobathymetric Digital Elevation Model (TBDEM), CoNED Topobathymetric Digital Elevation Model Data Products. Finally, any data that meet these specs: Multibeam SONAR +/- 10 cm vertical accuracy, +/- 5 cm horizontal accuracy Topographic LiDAR +/- 10 cm vertical accuracy, +/- 5 cm horizontal accuracy Bathymetric LiDAR +/- 10 cm vertical accuracy, +/- 5 cm horizontal accuracy, +/- 5 cm horizontal accuracy Topographic Lidar +/- 10 cm vertical accuracy, +/- 5 cm horizontal accuracy	Data from the NOAA bathymetry viewer and other data sets used include the Bathymetric Digital Elevation Grid. These data are generated using point data having x, y and z spatial coordinates obtained from The National Ocean & Atmospheric Administration (NOAA), National Geophysical Data Center (NGDC), Coastal Relief Model Development Program.	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
		Bathymetric Lidar +/- 10 cm vertical accuracy		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI	Yes		Yes	
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes		Yes	
State repositories used	I contact USGS National Map Liaisons in other states to acquire data. Additionally, the New Jersey Geographic Information Network is used.		New Jersey Geographic Information Network	
Other		Yes	Yes	
Other description		EarthExplorer or CoNED site	USGS Data Series	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Moderate	Moderate	
Cost savings/cost reduction	Moderate	Moderate	Moderate	
Cost avoidance	Moderate	Moderate	Moderate	
Increased revenues	Moderate	Moderate	Moderate	
Mission-driven performance improvements	Moderate	Moderate	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Major	Major	
Improved response or timeliness	Moderate	Moderate	Moderate	
Improved customer experience	Moderate	Major	Major	

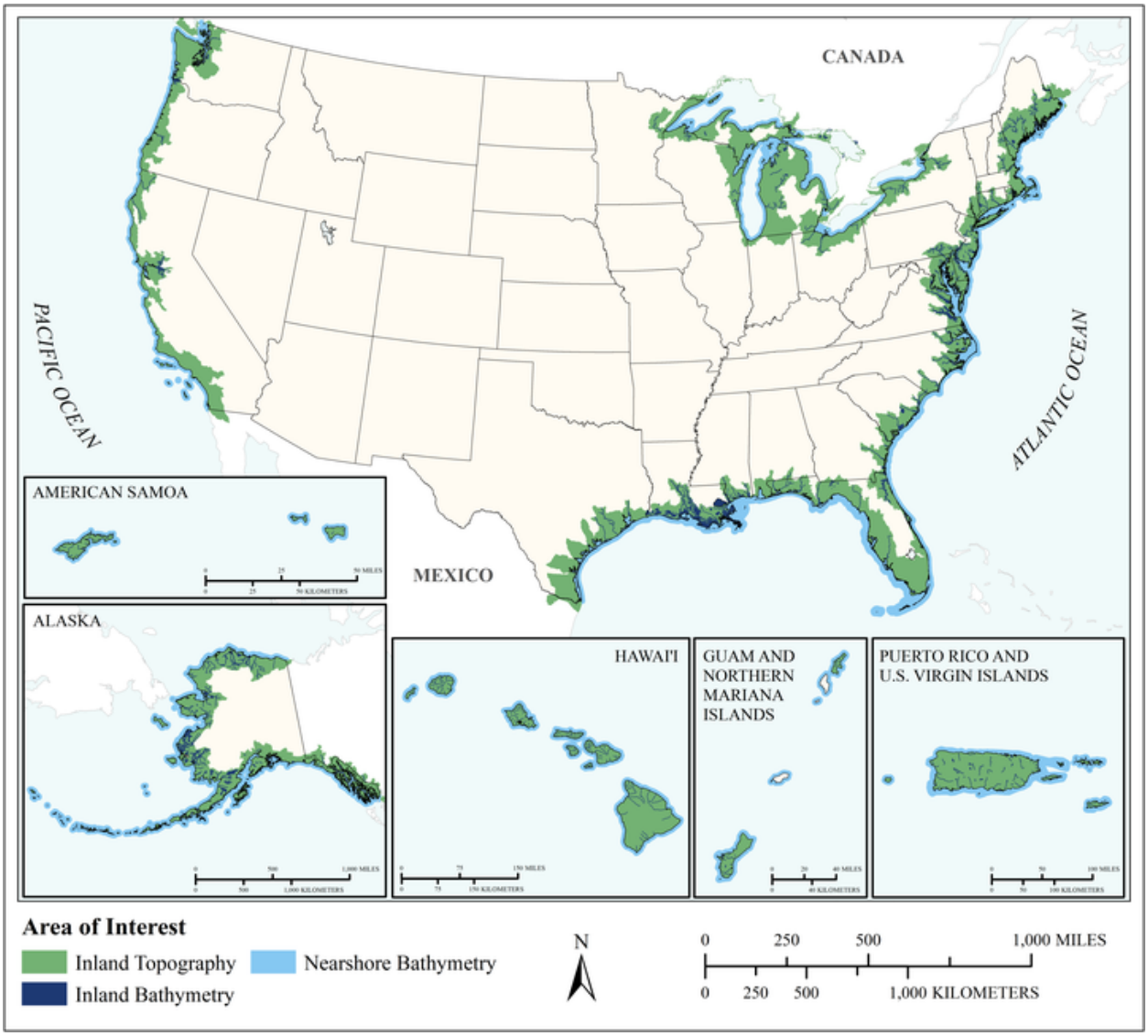
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Major	Moderate	
Environmental	Major	Major	Major	
Public safety, including life and property	Moderate	Major	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Moderate	Annual dollars saved/realized	$30,150	Major	Unable to provide				
Cost savings/cost reduction	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide				
Mission-driven performance improvements	Major	Unable to provide		Major	Annual percent improvement	75%	Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Improved customer experience	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major					
Education or outreach description				Spatially explicit data sets are more effective for communication to the public.								
Environmental	Moderate			Moderate			Major					
Environmental description				Perhaps some improved conservation would result from this data being publicly available.								
Public safety, including life and property	Moderate			Major			I don't know					
Public safety, including life and property description				Better data can lead to better models which can lead to better management decisions.								
Other												
Other benefits	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	
Height-Above-Ground maps		Yes		
Viewshed maps				
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes		Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Frequent Coastal



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more Hydrologic Units (HUC8s)	States and/or Territories	
Sub Area Requirements			Areas not shown on map: U.S. Minor Outlying Islands	

MCA Description	Response
Mission Critical Activity	Coastal change hazard assessment. Frequent coastal change hazard and resource mapping, assessment, and analysis. Enhanced elevation data will save time and money and improve our products. Those savings are directed toward more or better products. A consistent need is more temporal resolution in dynamic coastal regions. Complete and consistent data saves time and reduces errors.
MCA Title	Frequent Coastal
MCA ID	1272
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	Coastal and Marine Geology Program
Organization Mission	The U.S. Geological Survey was established by an act of Congress on March 3, 1879, to provide a permanent Federal agency to conduct the systematic and scientific "classification of the public lands, and examination of the geological structure, mineral resources, and products of the national domain.
Program Name	Coastal and Marine Geology Program
Total Annual Program Budget	$35,000,000
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Small, subtle elevation variations along the coast or in the nearshore, e.g. sand bars, oyster reefs, beach scarps, tidal marsh channel networks (~ 1-10 m)

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Required

Inland Bathy Feature Size Requirements	Response
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B	QL1B	
Update Frequency	2-3 years	2-3 years	2-3 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 10 cm	Less than 10 cm	Up to 20 cm	
How far onshore needed			To cover the coastal uplands; at least 1km inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MSL	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Required		Highly desirable	Required
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required		Highly desirable	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Highly desirable		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	
DTM	Highly desirable	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Nice to have	Highly desirable	Highly desirable	
Classified point cloud	Nice to have	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Required	
Full waveform	Nice to have	Highly desirable	Highly desirable	
Bathymetric Attributed Grid (BAG)		Highly desirable	Nice to have	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Not required	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	
Ground control/ground truthing	Required	Required	Required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Highly desirable	
Aerial and/or satellite imagery	Highly desirable	Required	Required	
Underwater videography			Highly desirable	
Bottom texture			Highly desirable	
Bottom type			Required	
Submerged features			Highly desirable	
Subbottom characteristics			Required	
Geologic and seismic data	Not required	Highly desirable	Required	
Water column properties - Physical			Required	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Required	
Tide/wave heights			Required	
Sea ice conditions			Nice to have	
Habitat distribution and classification			Highly desirable	
Boundaries			Highly desirable	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Highly desirable	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Required	Required	
Land use/land cover	Highly desirable	Required	Required	
Wetlands	Required	Required	Required	
Estuaries			Required	
Inland surface water features	Highly desirable	Required	Required	
Bridges/culverts	Nice to have	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Not required	Nice to have	Nice to have	
Coastal and riverine structures	Highly desirable	Required	Required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	NED	Mixture of coastal relief models, random lidar surveys, swath data, etc. various levels of quality and dates.	Center-collected lidar and multibeam bathy surveys in small AOIs, quality level supports 1m DEM	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				

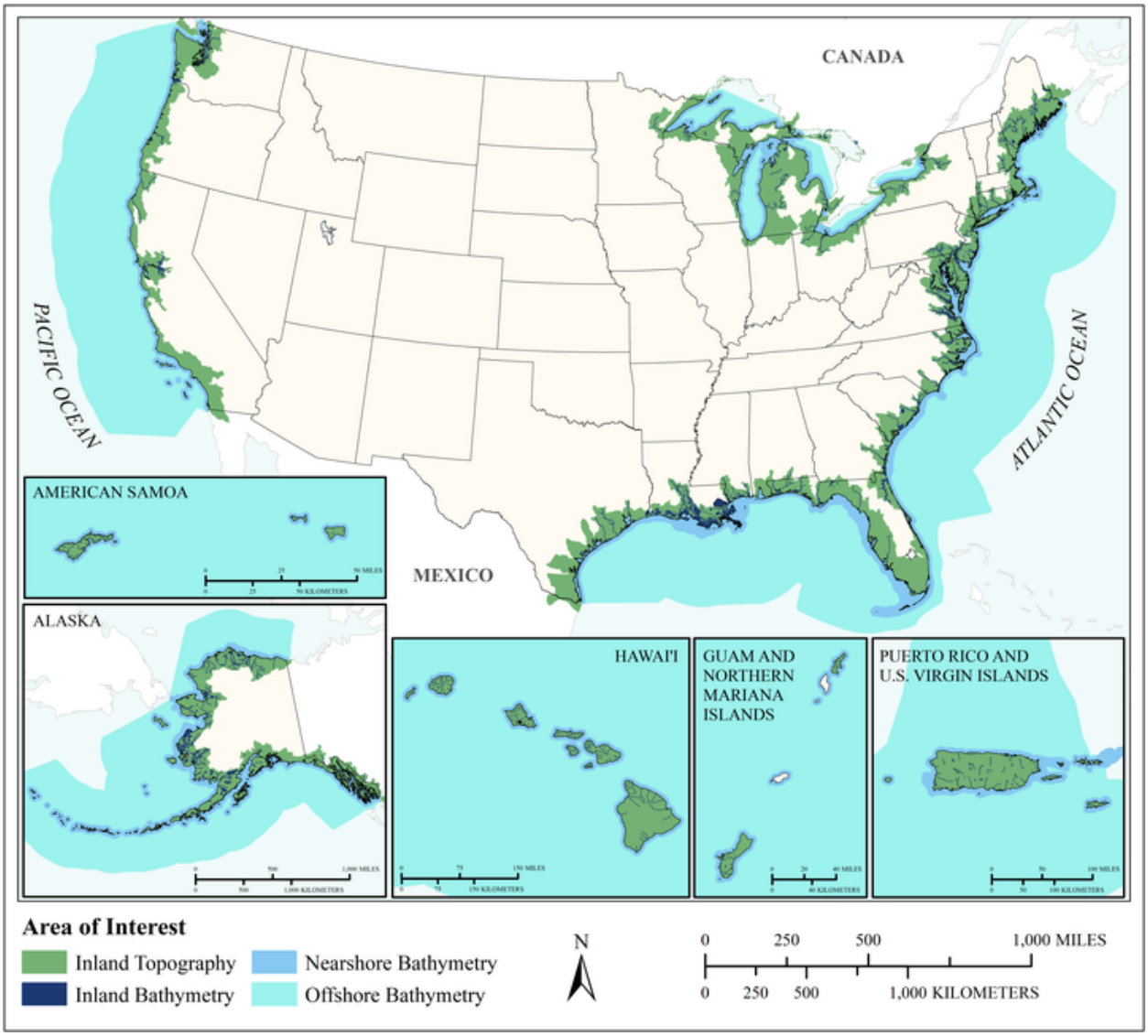
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	
Cost savings/cost reduction	Major	Major	Major	
Cost avoidance	Major	Major	Major	
Increased revenues	None	None	None	
Mission-driven performance improvements	Major	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	
Improved response or timeliness	Major	Major	Major	
Improved customer experience	Major	Major	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Major	Major	
Environmental	Moderate	Major	Major	
Public safety, including life and property	Moderate	Major	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$19,296	Major	Unable to provide		Major	Annual dollars saved/realized	$331,650			
Time savings description	Less time needed to coordinate data collection. Less time needed to merge various data sets. Less time needed to correct datum errors between data sets.						Cost of salary for field planning. Several multiple-person field survey activities per year. Potential cost of salary to reprocess due to data error.					
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Annual dollars saved/realized	$700,000			
Cost savings/cost reduction description	Huge savings to our program to not lead data collection.						Several multiple-person field survey activities per year.					
Cost avoidance	I don't know	Unable to provide		Major	Unable to provide		Major	Annual dollars saved/realized	$220,000			
Cost avoidance description							Salary saved from avoiding error fixes. Several processors working throughout the year, just on this.					
Increased revenues	None			None			None					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Annual percent improvement	45%			
Mission-driven performance improvements description							Would allow researchers to focus more time on critical data analysis and peer-review science. As above, would give staff and researchers more time to focus on science to carry out mission.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Annual dollars saved/realized	$170,000			
Improved response or timeliness description							Could run existing models without having to first collect & process data. Help to communicate science with visualizations more quickly after an event.					
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Annual dollars saved/realized	$60,300			
Improved customer experience description							Staff could focus on improving apps and tools rather than data collection & processing.					
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate			Major			Major					
Education or outreach description							More efficiency in communicating science to public					
Environmental	Major			Major			Major					
Public safety, including life and property	Major			Major			Major					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades			Yes	
Slope maps			Yes	
Aspect maps				
Curvature maps				
Cross sections			Yes	
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	1
Update frequency	2

MCA Title: Event-Driven Coastal



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more Hydrologic Units (HUC8s)	All study waters	All study waters
Sub Area Requirements				

MCA Description	Response
Mission Critical Activity	Analysis of coastal erosion and inundation; erosion and inundation hazard assessment and mitigation analysis. Hurricane storm surge and wave modeling and assessment. Coastal elevation and bathymetry mapping. Coastal hazard modeling, mapping and assessment. Coastal hazard mitigation analysis. Tsunami modeling. Tsunami hazard assessment. Land use. Coastal resiliency. Wind, wave, current, water-level and sediment-transport modeling. Oil spill modeling. Water quality modeling. Coastal and wetland ecosystem modeling. Analysis of coastal and wetland response to sea-level change. Assessment of coastal and marine sources and sinks of greenhouse gases. Littoral zone management including dunes and beaches. Identification and conservation of critical coastal, marine, and wetland habitats. Coastal archaeological site protection assessment. Coastal resource. Monitoring sand as a local resource. Seabed resources. Littoral sediment budget analysis. Enhanced elevation data will save time and money and improve our products. Those savings are directed toward more or better products. A consistent need is more temporal resolution in dynamic coastal regions. Complete and consistent data saves time and reduces errors.
MCA Title	Event-Driven Coastal
MCA ID	1296
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	Coastal and Marine Geology Program
Organization Mission	Conduct coastal and marine science to inform the Nation on relevant issues. Some of the issues include: Analysis of coastal erosion and inundation; erosion and inundation hazard assessment and mitigation analysis. Hurricane storm surge and wave modeling and assessment. Coastal elevation and bathymetry mapping. Coastal hazard modeling, mapping and assessment. Coastal hazard mitigation analysis. Tsunami modeling. Tsunami hazard assessment. Land use. Coastal resiliency. Wind, wave, current, water-level and sediment-transport modeling. Oil spill modeling. Water quality modeling. Coastal and wetland ecosystem modeling. Analysis of coastal and wetland response to sea-level change. Assessment of coastal and marine sources and sinks of greenhouse gases. Littoral zone management including dunes and beaches. Identification and conservation of critical coastal, marine, and wetland habitats. Coastal archaeological site protection assessment. Coastal resource. Monitoring sand as a local resource. Seabed resources. Littoral sediment budget analysis.
Program Name	Coastal and Marine Geology Program
Total Annual Program Budget	$35,000,000
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Highly desirable

What Needs to be Measured in 3D	Response
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Any feature that will influence flow of water at scales of ~0.25 m. Large cobbles, patches of sediment or vegetation with scales ~1m. However, we sometimes need finer information (e.g., imagery with 2 - 5 cm resolution) to successfully identify and characterize features at larger scales.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0 HD	QL1B is often sufficient, but higher quality data is needed for high-resolution models	QL1B	Special Order
Update Frequency	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.
Event type(s)	Earthquake, wildfire, landslide, or volcanic eruption.	Earthquake, wildfire, landslide, or volcanic eruption.	Earthquake, wildfire, landslide, or volcanic eruption.	Earthquake, wildfire, landslide, or volcanic eruption.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level and/or update frequency variability across AOI	Interest is mostly restricted to inland regions adjacent to coasts, estuaries, and Great Lakes.		Coarser and/or less frequent data is suitable for most studies, but detailed process studies need high quality data for smaller (project-specific) regions.	Special quality is needed on continental shelves. 1a data is usually suitable in deeper water, except for special study areas.
Acceptable Horizontal Error	Less than 20 cm	Up to 1 meter	Less than 50 cm	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error	Less than 5 cm	Less than 10 cm	Less than 10 cm	Less than 1 meter
How far onshore needed			To cover the coastal uplands; at least 500m inland	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Required	Nice to have	Nice to have	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Nice to have	Nice to have	Highly desirable
Other			Required			
Other description			In nearshore environments, the contiguous data must be collected with short time window (e.g., days)			
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Nice to have	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DTM	Highly desirable	Highly desirable	Highly desirable	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Highly desirable	Required
Full waveform	Not required	Nice to have	Nice to have	Highly desirable
Bathymetric Attributed Grid (BAG)		Highly desirable	Highly desirable	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Required
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Required	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery	Required	Highly desirable	Required	Nice to have
Underwater videography			Highly desirable	Nice to have
Bottom texture			Highly desirable	Highly desirable
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Highly desirable	Highly desirable
Geologic and seismic data	Not required	Nice to have	Required	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Highly desirable	Nice to have
Tide/wave heights			Highly desirable	Nice to have
Sea ice conditions			Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Habitat distribution and classification			Required	Highly desirable
Boundaries			Required	Highly desirable
Routes			Highly desirable	Nice to have
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Highly desirable	Nice to have
Floating observation/navigation systems			Highly desirable	Nice to have
Shorelines – current, historic, change rates	Nice to have	Nice to have	Required	
Land use/land cover	Highly desirable	Highly desirable	Required	Highly desirable
Wetlands	Highly desirable	Highly desirable	Required	Not required
Estuaries			Required	Not required
Inland surface water features	Required	Highly desirable	Required	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Required	Highly desirable	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We mostly use gridded data at the highest resolution and QL available. This includes lidar and topo-bathy lidar, RGB, and multispectral imagery. Recent data, and time series of data are important.	We use the best available, most-current topo-bathy lidar and/or sounding data. This is often insufficient for modeling, so we must collect our own data.	We use the best and most current data available. As the available data are often sparse or outdated, we often collect our own data.	Best available.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast		Yes	Yes	Yes
NCEI	Yes	Yes	Yes	

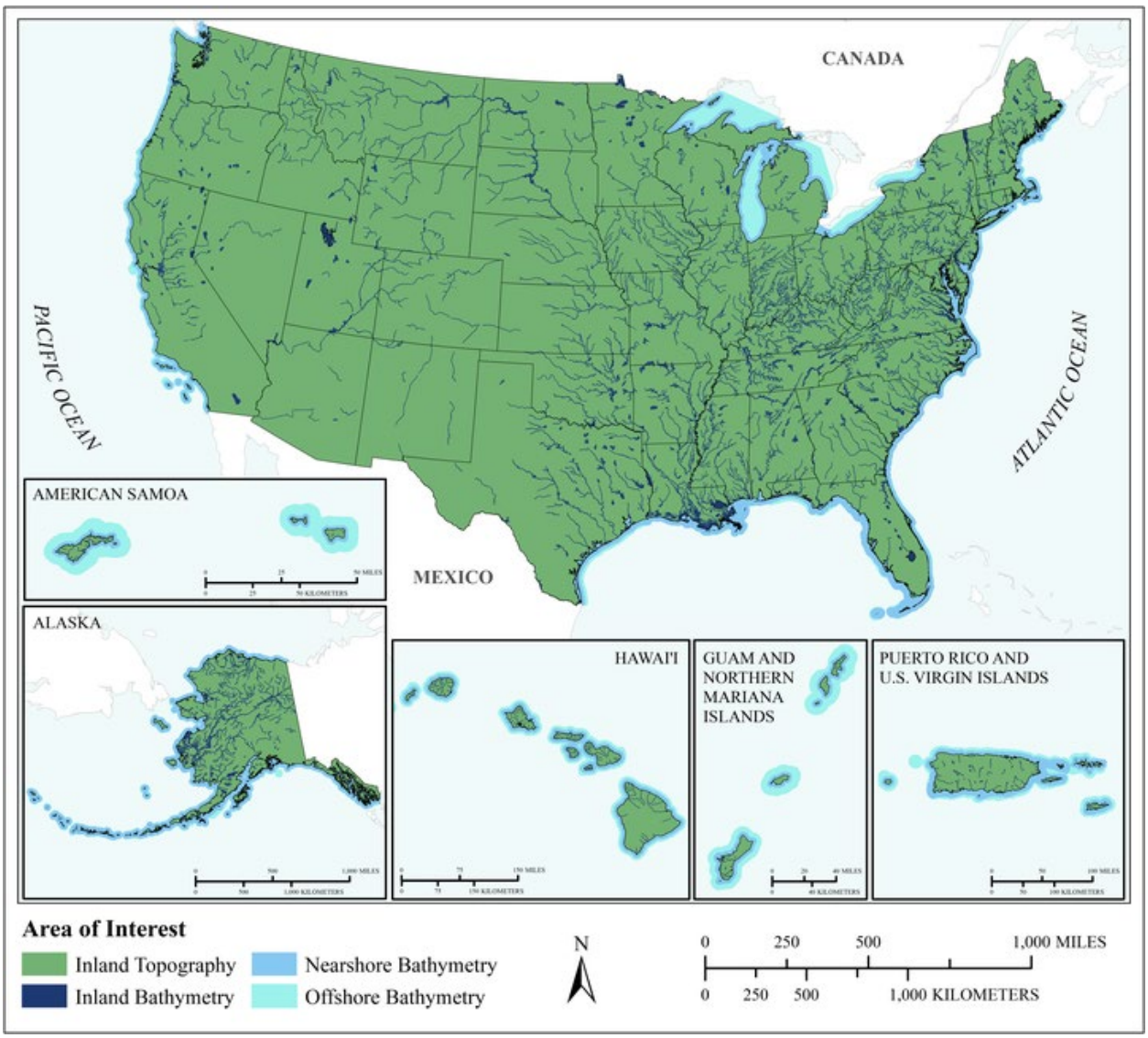
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS			Yes	Yes
State Repositories	Yes	Yes	Yes	
State repositories used	Various	Various	Various	
Other		Yes		
Other description		Data we or our collaborators collect		
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Major
Cost savings/cost reduction	Major	Major	Major	Major
Cost avoidance	Major	Major	Major	Major
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Major
Improved response or timeliness	Major	Major	Major	Major
Improved customer experience	Major	Major	Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Moderate	Moderate	Moderate
Environmental	Major	Major	Major	Major
Public safety, including life and property	Major	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Annual dollars saved/realized	$69,948	Major	Unable to provide	
Time savings description	For all of these activities, the availability of 3D data usually means we don't have to acquire data through other means, or that we can perform activities that we could not otherwise perform.						Reduced time writing permits or agreements. Reduced QC time. Reduced in-the-field time to collect similar data. Reduced emails and meetings for planning purposes. Reduced transformation time and DEM creation time. Reduced in-house review and data publication procedures.					
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Annual dollars saved/realized	$1,000,000	Major	Unable to provide	
Cost savings/cost reduction description							4 projects x 250k in surveys.					
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Minor	Annual dollars saved/realized	$10,000	Major	Unable to provide	
Cost avoidance description							2 processors, 62.5 each hourly with overhead, 80 hours.					
Increased revenues	I don't know	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Increased revenues description	We may develop new apps/products using 3D data.											
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Minor	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Value added to products or services description	Good 3D data will greatly assist our hazards assessments in many areas.											
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness description	The time savings in data collection, processing, and QA will be invested in more/better products. Up-to-data 3D data will help in hazard prediction. To the extent we provide post-event analysis, accurate, up-to-date 3D data is critical.											
Improved customer experience	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			I don't know			Moderate		
Education or outreach description	Easily accessible and accurate 3D data will streamline and improve our outreach products.											
Environmental	Major			Major			I don't know			Major		
Environmental description	Improved assessment of habitats and response to environmental stressors			Improved land use and habitat assessments								
Public safety, including life and property	I don't know			I don't know			I don't know			I don't know		
Public safety, including life and property description	Not directly...but indirectly through improved hazard assessments.											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps				
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	
Building footprints	Yes	Yes	Yes	
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes	Yes	Yes	

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: National Civilian Mapping - Coastal



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	States and/or Territories	States and/or Territories	States and/or Territories	States and/or Territories
Sub Area Requirements	Areas not shown on map: Federated States of Micronesia, Marshall Islands	Areas not shown on map: Federated States of Micronesia, Marshall Islands	Areas not shown on map: Federated States of Micronesia, Marshall Islands	Areas not shown on map: Federated States of Micronesia, Marshall Islands

MCA Description	Response
Mission Critical Activity	Coastal National Elevation Database (CoNED), Topobathymetric Digital Elevation Models (TBDEMs). CoNED constructs regional integrated elevation models in the coastal zone by assimilating the land surface topography with littoral zone and continental shelf bathymetry. These TBDEMs are used widely for mapping inundation zones from riverine flood events, hurricanes, and sea-level rise and for other Earth science applications, such as sediment transport, erosion, and storm impact models. These regional TBDEMs are intended to fulfill the pressing needs of decision makers establishing policies for hazard mitigation and emergency preparedness, coastal managers tasked with coastal and marine spatial planning to support coastal zone decision support applications, and scientists investigating processes of coastal geomorphic change.
MCA Title	National Civilian Mapping - Coastal
MCA ID	11470
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	USGS Coastal-Marine Hazards and Resources Program
Organization Mission	The USGS Coastal-Marine Hazards and Resources Program (CMHRP) collects, interprets, and analyzes spatial data to provide a solid foundation for understanding coastal disasters (e.g., storms, oil spills, tsunamis) and chronic change (long-term coastal erosion, climate variability). As a project of CMHRP, the USGS Coastal National Elevation Database (CoNED) Applications Project supports coastal and marine spatial planning by constructing at select focus regions a CoNED high-resolution integrated topobathymetric digital elevation model (tbdem) thereby establishing the fundamental baseline for regional scientific investigations and applications. CoNED enhances the USGS 3D Elevation Program (3DEP) by providing coastal communities with integrated elevation information for coastal zone decision support applications on the U.S. ocean coasts and the Great Lakes.
Program Name	USGS CoNED Applications Project
Total Annual Program Budget	$700,000
Primary Business Use	BU 03 - Coastal Zone Management
Secondary Business Use	BU 16 - Sea Level Rise and Subsidence
Tertiary Business Use	BU 11 - Geologic Resource Mining and Extraction

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	200,000 sq mi - 2 million sq mi (e.g. large state, large multi-state region such as the Great Basin, standard Federal region, etc.)

General Geographic Area and Size	
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Large cobbles, patches of sediment or vegetation with scales ~1m.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Not required
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	Order 2
Update Frequency	4-5 years	2-3 years	2-3 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	Up to 1 meter
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Up to 30 cm
How far onshore needed			To the fall line	
How far down the beach profile needed	To MLLW		Below MLLW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Nice to have	Nice to have	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Required	Highly desirable	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required	Not required	Not required
DTM	Required	Required	Required	Required
DEM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Required	Required	Required	Highly desirable
Bathymetric Attributed Grid (BAG)		Required	Required	Required
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Highly desirable	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	Nice to have
Ground control/ground truthing	Required	Highly desirable	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Nice to have	Nice to have
Aerial and/or satellite imagery	Required	Required	Highly desirable	Required
Underwater videography			Nice to have	
Bottom texture			Required	Required
Bottom type			Nice to have	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Required	Required
Geologic and seismic data	Nice to have	Highly desirable	Nice to have	Nice to have
Water column properties - Physical			Nice to have	Not required
Water column properties - Chemical			Nice to have	Not required
Water column properties - Biological			Nice to have	Not required
Currents			Not required	Not required
Tide/wave heights			Not required	Highly desirable
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Not required	Not required
Boundaries			Highly desirable	Required
Routes			Not required	Not required
Offshore cadastral			Nice to have	Highly desirable
Lease areas			Not required	Nice to have
Fixed obstructions			Nice to have	Nice to have
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Nice to have	Nice to have	Nice to have	Nice to have
Wetlands	Highly desirable	Highly desirable	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Nice to have	Not required	Nice to have	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Linear-mode lidar, QL2	Whatever is available	Topobathymetric lidar from multiple sensors, including CZMIL, Riegl VQ-880G, Riegl VQ-820, Chiroptera II - QL1b and QL2b for the most part (0 to 10m water depth) Nearshore acoustic sonar surveys using multibeam and singlebeam systems QL1b	Whatever is available
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI		Yes	Yes	Yes
Open Topography	Yes			
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes		Yes
USGS Inland Waters server		Yes		
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories			Yes	

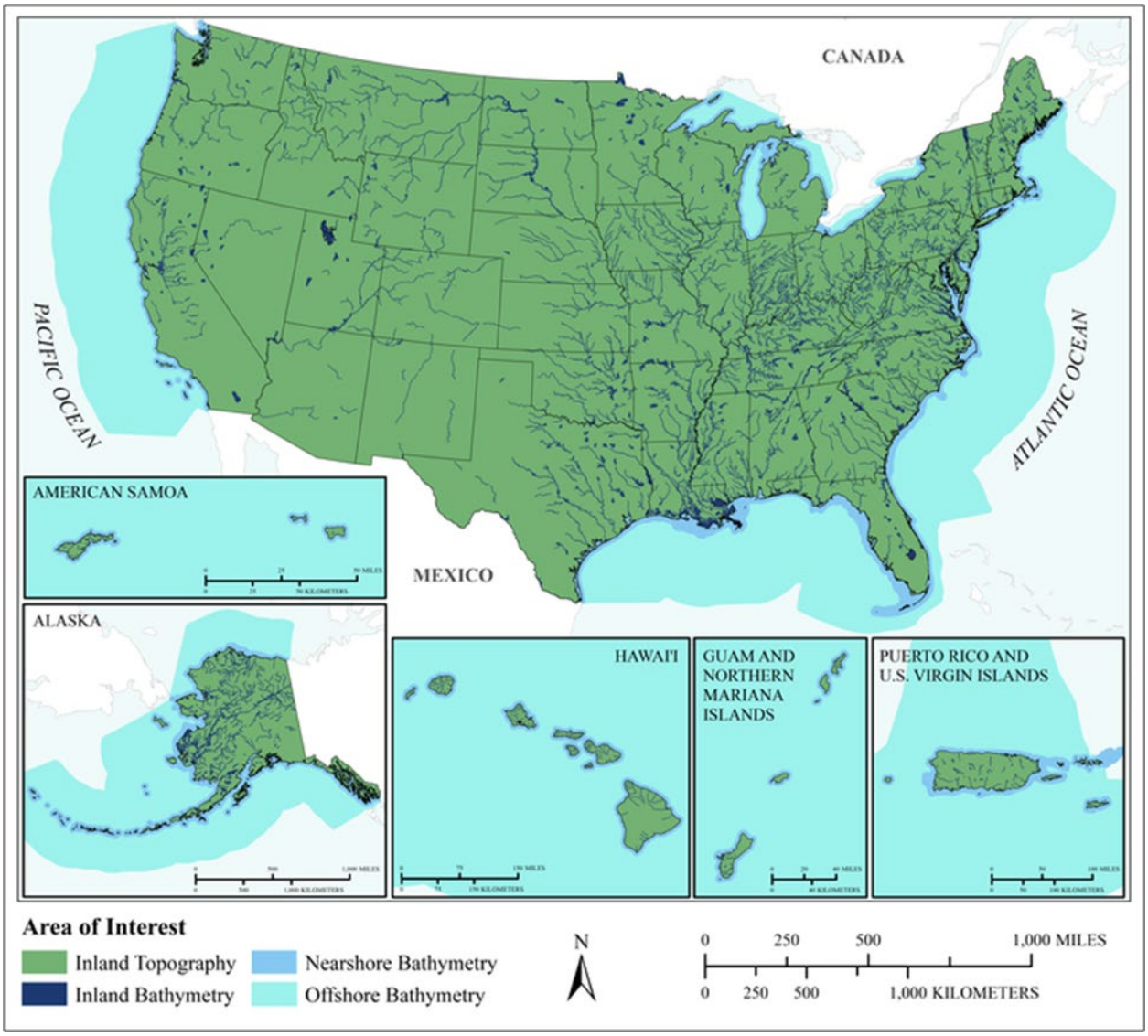
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State repositories used			WA DNR Lidar Portal http://lidarportal.dnr.wa.gov	
Other			Yes	Yes
Other description			National Center for Airborne Laser Mapping (NCALM) and Open Topography	USGS Coastal-Marine Hazards and Resources Program, Seafloor Mapping Data
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Moderate
Cost savings/cost reduction	Major	Major	Major	Moderate
Cost avoidance	Major	Major	Major	Moderate
Increased revenues	Major	Major	Major	Moderate
Mission-driven performance improvements	Moderate	Moderate	Major	Moderate
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate	Moderate	Major	Moderate
Improved response or timeliness	Moderate	Moderate	Minor	Minor
Improved customer experience	Minor	Moderate	Minor	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	Minor	Minor	Minor
Environmental	Minor	Moderate	Moderate	Minor
Public safety, including life and property	I don't know	I don't know	I don't know	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$202,005	Major	Annual dollars saved/realized	$111,555	Major	Annual dollars saved/realized	$167,332	Major	Annual dollars saved/realized	$334,665
Time savings description	3 Hours Per Dataset * 100 = 300. 24 Hours Per Dataset * 100 = 2400. 24 Hours Per Dataset * 100 = 2400. 16 Hours Per Dataset * 100 = 1600.			10 Hours Per Dataset * 50 Datasets = 500 Hours. 16 Hours Per Dataset * 50 Datasets = 800 Hours. 24 Hours Per Dataset * 50 Datasets = 1200 Hours. 24 Hours Per Dataset * 50 Datasets = 1200 Hours.			10 Hours Per Dataset * 75 Datasets = 750 Hours. 16 Hours Per Dataset * 75 Datasets = 1200 Hours. 24 Hours Per Dataset * 75 Datasets = 1800 Hours. 24 Hours Per Dataset * 75 Datasets = 1800 Hours.			10 Hours Per Dataset * 150 Datasets = 1500 Hours. 24 Hours Per Dataset * 150 Datasets = 3600 Hours. 24 Hours Per Dataset * 150 Datasets = 3600 Hours. 16 Hours Per Dataset * 150 Datasets = 2400 Hours.		
Cost savings/cost reduction	Major	Annual dollars saved/realized	$3,125,000	Major	Annual dollars saved/realized	$937,500	Major	Annual dollars saved/realized	$2,500,000	Major	Annual dollars saved/realized	$3,750,000
Cost savings/cost reduction description	10 Projects * $312.500 (Avg cost per project) = $3,125,000.			3 Projects * $312.500 (Avg cost per project) = $937,500.			8 Projects * $312,500 (Avg cost per project) = $2,500,000.			12 Projects * $312,500 (Avg cost per project) = $3,750,000.		
Cost avoidance	Major	Annual dollars saved/realized	$288,000	Major	Annual dollars saved/realized	$144,000	Major	Annual dollars saved/realized	$216,000	Major	Annual dollars saved/realized	$432,000
Cost avoidance description	2400 Hours * $60 Per Hour = $144,000. 2400 Hours * $60 Per Hour = $144,000.			1200 Hours * $60 (Avg Per Hour) = $72,000. 1200 Hours * $60 (Avg Per Hour) = $72,000.			1800 Hours * $60 Per Hour = $108,000. 1800 Hours * $60 Per Hour = $108,000			3600 Hours * $60 Per Hour = $216,000. 3600 Hours * $60 Per Hour = $216,000.		
Increased revenues	Major	Annual dollars saved/realized	$1,250,000	I don't know	Unable to provide		Major	Annual dollars saved/realized	$1,250,000	Major	Annual dollars saved/realized	$1,000,000
Increased revenues description	5 New Products / Apps * $250,000 Per Product/App = $1,250,000.						5 New Products / Apps * $250,000 Per Product/App = $1,250,000.			4 New Products / Apps * $250,000 Per Product/App = $1,000,000.		
Mission-driven performance improvements	Major	Annual percent improvement	25%	Major	Annual percent improvement	25%	Major	Annual percent improvement	27%	Major	Annual percent improvement	25%
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Annual dollars saved/realized	$800,000	Moderate	Annual dollars saved/realized	$400,000	Moderate	Annual dollars saved/realized	$1,250,000	Major	Annual dollars saved/realized	$1,100,000
Improved response or timeliness description							5 Products * $250,000 (Avg Prod Dev Cost) = $1,250,000.					
Improved customer experience	Major	Annual dollars saved/realized	$675,000	Major	Annual dollars saved/realized	$680,000	Major	Annual dollars saved/realized	$650,000	Major	Annual dollars saved/realized	$850,000
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor			Minor		
Environmental	Minor			Minor			Minor			Minor		
Public safety, including life and property	I don't know			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes		Yes	
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps				
Curvature maps	Yes	Yes	Yes	Yes
Cross sections			Yes	
Height-Above-Ground maps	Yes			
Viewshed maps	Yes		Yes	
Hydrologic Flow Direction Grids	Yes		Yes	
Hydrologic Flow Accumulation Grids	Yes		Yes	
Hydrologic networks (e.g. streams, lakes)	Yes		Yes	
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes			
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: National Civilian Mapping - U.S. Topo



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	States and/or Territories	States and/or Territories	All study waters	All study waters
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		

MCA Description	Response
Mission Critical Activity	Provision of nationwide 1:24,000-scale U.S. topographic maps freely available for download in geospatial PDF; multi-scale topographic base mapping in multiple formats, including web services.
MCA Title	National Civilian Mapping - U.S. Topo
MCA ID	1223
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	National Geospatial Program
Organization Mission	The National Geospatial Program provides a foundation of digital geospatial data representing the topography, natural landscape, and built environment of the United States. These data and derived products and services can be accessed through The National Map Data Download and Visualization Services.
Program Name	National Geospatial Program
Total Annual Program Budget	$3,200,000
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	BU 27 - Recreation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	Groups of trees to identify aggregate type; building footprints; landmark features

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	Order 1b
Update Frequency	4-5 years	4-5 years	4-5 years	4-5 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 1 meter	Up to 1 meter	Up to 1 meter
Acceptable Vertical Error	Up to 1 meter	Up to 40 cm	Up to 40 cm	Less than 1 meter
How far onshore needed			To MHW	
How far down the beach profile needed	To MHW		To MHW	
Tide correction requirement			MHW	MHW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Not required	Not required	Not required	Not required
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Not required	Not required	Not required
Full waveform	Not required	Not required	Not required	Not required
Bathymetric Attributed Grid (BAG)		Not required	Not required	Not required

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Not required	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Not required
Intensity imagery/sidescan imagery	Required	Not required	Not required	Not required
Ground control/ground truthing	Required	Not required	Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Not required	Not required
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Not required	Not required
Bottom texture			Not required	Not required
Bottom type			Not required	Not required
Submerged features			Not required	Not required
Subbottom characteristics			Not required	Not required
Geologic and seismic data	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Water column properties - Physical			Not required	Not required
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Not required	Not required
Boundaries			Not required	Not required
Routes			Not required	Not required
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Not required	Not required
Floating observation/navigation systems			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Highly desirable	Highly desirable	Highly desirable
Wetlands	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Required	Required	Required	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	10m DEMs to generate contours, QL 2 (?)	None	None	None
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	I don't know	Inland bathy data not available	None	None

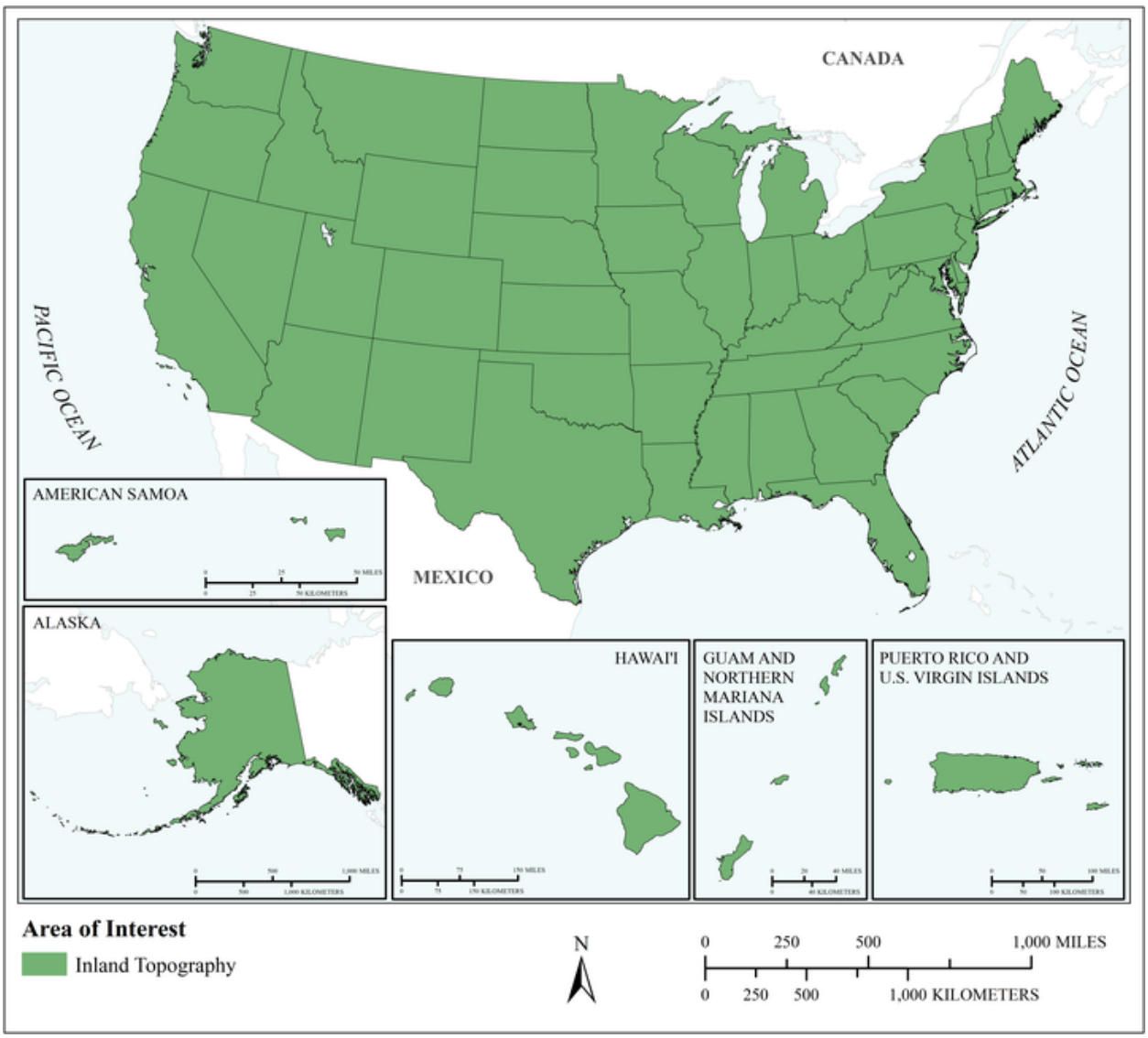
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	I don't know	Inland bathy data not available	None	None
Cost avoidance	I don't know	Inland bathy data not available	None	None
Increased revenues	I don't know	Inland bathy data not available	None	None
Mission-driven performance improvements	Major	Inland bathy data not available	None	None
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	None	None
Improved response or timeliness	Major	Inland bathy data not available	None	None
Improved customer experience	Major	Inland bathy data not available	None	None
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available	None	None
Environmental	Major	Inland bathy data not available	None	None
Public safety, including life and property	Major	Inland bathy data not available	None	None

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	I don't know	Unable to provide		None			None			None		
Cost savings/cost reduction	Major	Annual dollars saved/realized	$195,000	None			None			None		
Cost savings/cost reduction description	Collect hi-res lidar for roughly 25% of AK that is flat coastal delta. $3.9M over a 20 year period.											
Cost avoidance	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		None		
Increased revenues	None			Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Higher quality datasets to support contour and shaded relief generation.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Minor			Minor		
Environmental	Major			Moderate			Minor			Minor		
Public safety, including life and property	Major			Moderate			Minor			Minor		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: National Civilian Mapping - Land Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	States and/or Territories			
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau			

MCA Description	Response
Mission Critical Activity	The Land Resources Mission Area addresses many of the BU/MCAs listed in FAQ #1 and data is used to support the National Land Cover Database (NLCD) and LANDFIRE Program.
MCA Title	National Civilian Mapping - Land Resources
MCA ID	22051
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	Land Resources
Organization Mission	Understanding a changing world and how it affects our natural resources, livelihoods, and communities. Science plays an essential role in helping communities and resource managers understand the local to global implications of change, anticipate the effects of change, prepare for change, and reduce the risks associated with decision-making in a changing environment.
Program Name	USGS's Land Resources Mission Area
Total Annual Program Budget	$150,000,000
Primary Business Use	BU 06 - Natural Resources Conservation
Secondary Business Use	BU 04 - Forest Resources Management
Tertiary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	Less than 1 sq mi (e.g. plot, acre, small study area)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	GSD 3-5 cm

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1 HD			
Update Frequency	4-5 years and certain events.			
Event type(s)	Hazard event, such as landslide or volcanic eruption			
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	Below MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable			
DTM	Highly desirable			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Nice to have			
Ground control/ground truthing	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable			
Land use/land cover	Required			
Wetlands	Highly desirable			
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Highly desirable			
Landmark features	Highly desirable			
Cultural resources	Highly desirable			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	NED			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	None			

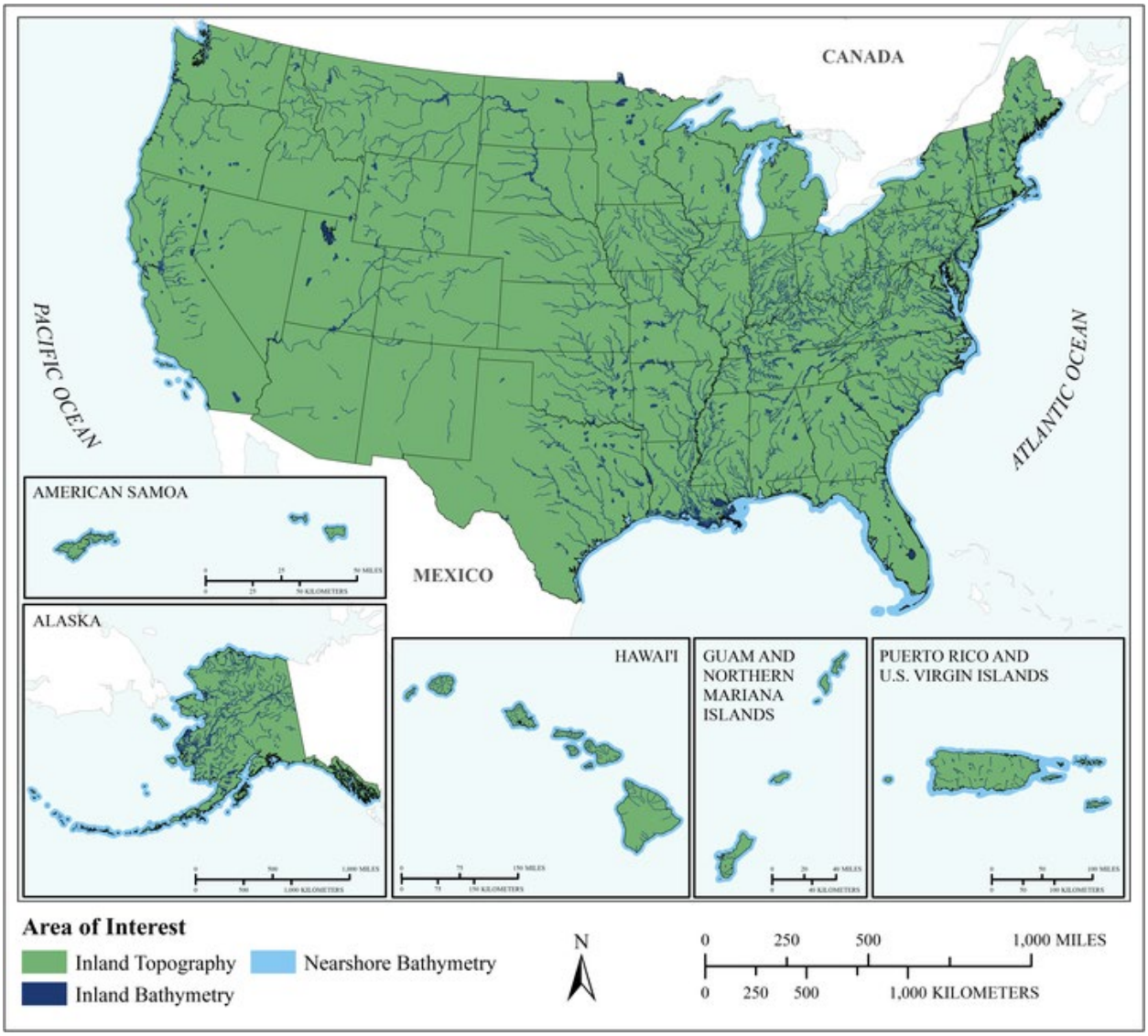
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Moderate			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate			
Improved response or timeliness	Moderate			
Improved customer experience	Moderate			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor			
Environmental	Moderate			
Public safety, including life and property	Moderate			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Moderate	Unable to provide										
Cost savings/cost reduction	Moderate	Unable to provide										
Cost avoidance	Minor	Unable to provide										
Increased revenues	Major	Unable to provide										
Mission-driven performance improvements	I don't know	Unable to provide										
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	I don't know	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor											
Environmental	Minor											
Public safety, including life and property	I don't know											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes			
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps	Yes			
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	3
Update frequency	2

MCA Title: Habitat



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	States and/or Territories	States and/or Territories	States and/or Territories	
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	

MCA Description	Response
Mission Critical Activity	Habitat mapping and assessment to answer scientific questions shaped by the environments of the United States and our products provide rigorous, objective, and timely information and guidance for the management and conservation of biological systems
MCA Title	Habitat
MCA ID	1167
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	Forest and Rangeland Ecosystem
Organization Mission	Biological research science primarily for ecosystems and toxicological research mission areas, specifically factors impacting the distribution of aquatic and terrestrial organisms
Program Name	Ecosystems Mission Area; also includes tasks from Toxicology and Renewable Energy, primarily solar and wind energy effects on wildlife and habitats.
Total Annual Program Budget	$158,647,000
Primary Business Use	BU 07 - Wildlife and Habitat Management
Secondary Business Use	BU 09 - Fisheries Management and Aquaculture
Tertiary Business Use	BU 02 - Riverine Ecosystem Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Required
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual tree canopies, small stream channels

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Required
10 - 50 ft	Required
51 - 100 ft	Required
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Required

Inland Bathy Feature Size Requirements	Response
½ - 1 acre	Required
1.1 – 2 acres	Required
2.1 – 5 acres	Required
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL2B	
Update Frequency	4-5 years and certain events.	4-5 years and certain events.	4-5 years and certain events.	
Event type(s)	Flood or rain events.	Flood or rain events.	Flood or rain events.	
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	Less than 50 cm	Up to 1 meter	
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	To MLLW		Below MLLW	
Tide correction requirement			MLLW	
Cross sections and/or transects meet needs	Partial			
Cross section/transect requirement	Cross sections of small streams at 5m intervals MAY be sufficient for some studies of stream morphology			

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Required
Hydro-conditioning	Highly desirable
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Required	Highly desirable		Highly desirable	Not required
Entire AOI under same environmental conditions	Highly desirable	Required	Required		Required	Required
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Nice to have		Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Required	Highly desirable		Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Not required	Not required	
DTM	Required	Required	Required	
DEM	Required	Required	Required	
Raw point cloud data	Required	Required	Required	
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Not required	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	
Other	Nice to have			
Other description	RGB imagery			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Not required	
Submerged features			Nice to have	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Nice to have	Nice to have	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Nice to have	
Routes			Highly desirable	
Offshore cadastral			Highly desirable	
Lease areas			Nice to have	
Fixed obstructions			Nice to have	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Land use/land cover	Not required	Nice to have	Nice to have	
Wetlands	Nice to have	Nice to have	Highly desirable	
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Highly desirable	Nice to have	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Nice to have	Nice to have	Nice to have	
Cultural resources	Nice to have	Not required	Nice to have	
Coastal and riverine structures	Nice to have	Highly desirable	Nice to have	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	The majority of the high resolution 3D data currently used is from either the Oregon Lidar Consortium or the Puget Sound Lidar Consortium and would mostly be considered QL1. Additional sources include 10m NED, QL2 and QL3 lidar point clouds and derived DEM, DSM	We have tried constructing bathymetry for several reservoirs of interest using historic and current satellite imagery and ground collected GPS (not survey quality). Additional sources include EAARL-A/B, side-scan sonar, RTK river bottom elevations	A variety of bathymetric sources are used in these coastal waterbodies (Columbia R. and Puget Sound) and some areas have very detailed data, others are less so. Very project dependent.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	
NCEI				
Open Topography				
NOAA nautical charts			Yes	
USACE navigation charts			Yes	
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
State Repositories	Yes	Yes		
State repositories used	WV GIS Technical Center, Maryland iMAP, Virginia VGIN, extensive collection of data that has been jointly captured by USGS and the state of Oregon provided by Geospatial Liaison, repository that is maintained at our State University (Oregon State University), housed at the College of Engineering.	Somewhat old set of bathymetric data has been available through the state university for OR lakes.		
Other	Yes	Yes		
Other description	NRCS Geospatial Data Gateway	Custom collection		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate	Major	I don't know	
Cost savings/cost reduction	Major	Major	I don't know	
Cost avoidance	Major	Major	I don't know	
Increased revenues	Moderate	I don't know	I don't know	
Mission-driven performance improvements	Major	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	
Improved response or timeliness	Major	Moderate	Moderate	
Improved customer experience	Major	I don't know	Minor	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Moderate	Minor	
Environmental	Major	Major	Major	
Public safety, including life and property	I don't know	I don't know	None	

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major			
Other description	Applications of research that were not available before this technology arrived, i.e., subcanopy descriptions of extensive forested regions			

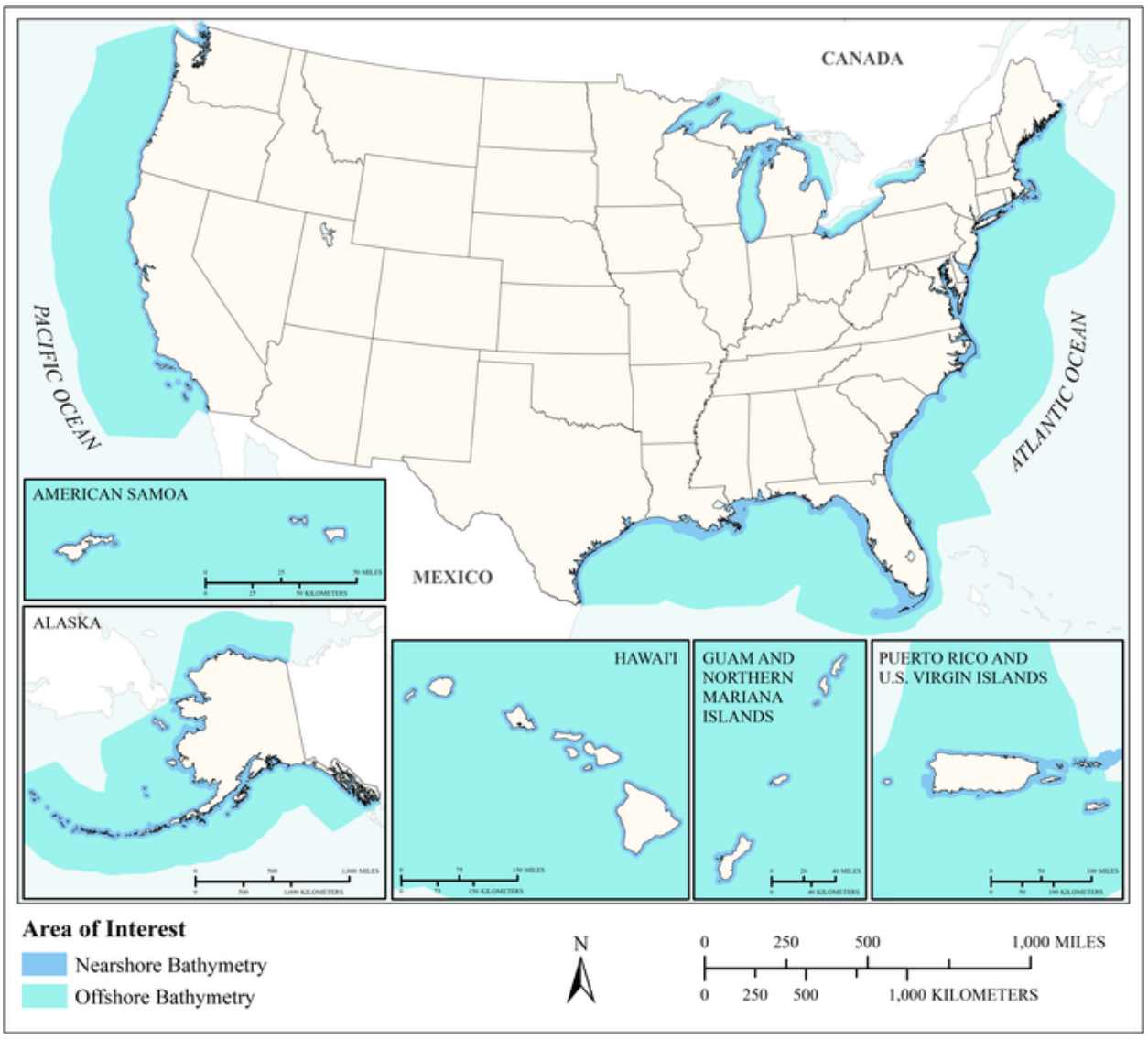
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Time savings description	Increased accuracy particularly for hydrological applications save time and speeds delineation processes. I still do spend a lot of time on different projection/datum issues with 3D data. Unknown hours saved but improved estimation of wetland perimeters resulted from high resolution bare ground DEM usage. Our modeling of vegetation in forest and shrub biomes could not have been done without lidar data, so it is difficult to provide comparisons to time/cost benefits.			Major cost of bathymetric lidar surveys is the lidar data processing from point cloud to DEM. If this were provided as a product instead, estimate huge savings. We currently have a lot of field work conducted in remote inland stream sites so this could be a significant savings. Field estimation of riverine habitat is very time consuming and expensive. Measuring attributes with geospatial data would be a major savings. In particular having data collected under consistent water elevation levels would improve consistency. Accurate and reliable bathymetric data could save QA/QC time. In-office modeling of river and stream habitats for fisheries studies would be huge. A complete bathymetry would allow a greatly expanded range of modeling opportunities for our scientists. 2D hydrodynamic models to estimate hydraulic habitats require wall-to-wall bathymetric data which is expensive and time consuming to collect.								
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost savings/cost reduction description	Our involvement with agencies in modeling potential habitat restorations benefits greatly from being able to model current and alternative landscape designs.			A very large effort now required for this, often not done due to costs. Man hours saved from field work collecting habitat attributes would be substantial.								
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Cost avoidance description	Errors resulting from mismatched levels of data accuracy data would greatly benefit our projects. We often have specialized approaches to data pre-processing, would not want to lose flexibility.			Accurate and reliable bathy data could save man hours in QA/QC. Would clearly be a great cost avoidance to have consistent data and if point clouds were classified correctly by vendor, this would save a lot of analysis time.			Could be significant if VDatum corrections already applied.					
Increased revenues	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Increased revenues description	We continue to have customers interested in forest wildlife and fisheries habitat applications developed using 3D resources.			Would expedite more extensive modeling results compared to more site based models currently being developed.			Improved modeling of fisheries and aquatic habitat quality.					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Mission-driven performance improvements description	We are asked by customers to extend our modeling throughout our region so it must helpful for their decision making processes. Greatly improves our forest visualization and mapping. We are able to develop new perspectives on wildlife/habitat interactions through a 3D perspective.			New and more detailed research questions about structuring of aquatic habitats could be explored. Ecosystems research using more detailed geospatial data on riverine systems could be more effective. This would be significant for some of our programs that inform other agencies about habitat issues related to both stream temperature and water availability; studies using high-res bathy could have greater management relevance.			Improved modeling of fisheries and aquatic habitat quality.					

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future annual operational benefits added during validation		Annual dollars saved/ realized	$4,409,595		Annual dollars saved/ realized	$5,528,695		Annual dollars saved/ realized	$182,256			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide		I don't know	Unable to provide				
Value added to products or services description				Since bank-to-bank inland bathy data is largely lacking, there is a great opportunity for new products and services, but it is very difficult to quantify unforeseen benefits. Improved prediction of fisheries habitat quality for reproduction and recruitment; improved accuracy of data products would have major benefits to customers of geospatial data.								
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		None					
Improved response or timeliness description				Improved representation of model results such as surface water availability or habitat quality; next-generation of bathy data services could shorten turnaround of high quality riverine habitat assessment. Improved river flooding models would have major benefits. May improve our ability to get necessary permits for project with species at risk.								
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience description				Accurate depictions of riverine habitats could bring in lots of new users (i.e. fishermen, kayakers, etc.). There is a huge opportunity for new DEM products 'between the blue lines'.			Improved quality of modeling and estimation for fisheries. I expect there could be new applications of modeling results to the public.					
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$895,653		Annual dollars saved/ realized	$2,496,568		Annual dollars saved/ realized	$1,670			
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Moderate			Moderate					
Education or outreach description	We have already had organizations reach out for assistance in applying our lidar based forest research											
Environmental	Major			Major			Major					
Environmental description	Assists our client agencies in managing complex land ownership/management issues			Improved water temperature/availability estimation for interior areas at risk of loss of fisheries would be significant for society and for local/regional economies; improved data would enhance fisheries management			Nearshore and estuarine habitat modeling from our scientists could provide increased reliability in fisheries					
Public safety, including life and property	None			Major			None					
Public safety, including life and property description				Better flood inundation and flood modeling potential								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes	Yes		
Cross sections		Yes		
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids	Yes	Yes		
Hydrologic Flow Accumulation Grids	Yes	Yes		
Hydrologic networks (e.g. streams, lakes)	Yes	Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Seafloor Mapping



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type			Required	Required
Geographic Area Requirements			Custom description	Custom description
Sub Area Requirements			States and Territories	States and Territories out to the EEZ

MCA Description	Response
Mission Critical Activity	Seafloor mapping; mapping of marine geohazards; and geologic mapping and classification of seabed geologic substrates for use by fishery ecologists, planners, managers of ocean development, and the public. The submerged margins of the U.S. comprise half the land area of the Nation. They provide a range of essential services, including: biological habitats for fisheries; mineral, aggregate, and hydrocarbon resources; waste disposal; cable and pipeline routes; and renewable energy resources. An understanding of the geology of the sea floor and the processes that shape it is necessary for the safe, productive, and sustainable use of America's submerged lands. However, much of the U.S. continental margin has not been mapped at the resolution required for marine planning and decision making. High-resolution bathymetric and backscatter surveys and interpretations of small areas in the last ten years have illustrated its spatial and temporal complexity, and a methodology has been developed for mapping these poorly-known lands in an efficient manner.
MCA Title	Seafloor Mapping
MCA ID	1073
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	Coastal and Marine Geology Program

Organization Mission	The U.S. Geological Survey was established by an act of Congress on March 3, 1879, to provide a permanent Federal agency to conduct the systematic and scientific "classification of the public lands, and examination of the geological structure, mineral resources, and products of the national domain." An integral part of that mission includes publishing and disseminating the earth-science information needed to understand, to plan the use of, and to manage the Nation's energy, land, mineral, and water resources. Since 1879, the research and fact-finding role of the USGS has grown and been modified to meet the changing needs of the Nation it serves. As part of the evolution, the USGS has become the Federal Government's largest earth-science research agency, the Nation's largest civilian mapmaking agency, the primary source of data on the Nation's surface- and ground-water resources, and the employer of the largest number of professional earth scientists. Today's programs serve a diversity of needs and users. To accomplish its mission, the USGS: -- Conducts and sponsors basic and applied research in geology, hydrology, mapping, and related sciences. -- Produces and updates geographic, cartographic, and remotely sensed information in graphic and digital forms. -- Describes the onshore and offshore geologic framework and develops an understanding of its formation and evolution. -- Assesses energy and mineral resources, determines their origin and manner of occurrence, and develops techniques for their discovery. -- Collects and analyzes data on the quantity and quality of surface water and ground water, on water use, and on quality of precipitation. -- Assesses water resources and develops an understanding of the impact of human activities and natural phenomena on hydrologic systems. -- Evaluates hazards associated with earthquakes, volcanoes, floods, droughts, toxic, materials, landslides, subsidence, and other ground failures, and develops methods for hazards prediction. -- Participates in the exploration of space and prepares geologic and other maps of the planets and their satellites. -- Publishes thousands of reports and maps each year, establishes and maintains earth-science data bases, and disseminates earth-science data and information. -- Provides scientific and technical assistance for the effective use of earth-science techniques, products, and information. -- Coordinates topographic, geologic, and land-use mapping, digital cartography, and water-data activities. -- Develops new technologies for the collection, coordination, and interpretation of earth-science data. -- Provides scientific support and technical advice for legislative, regulatory, and management decisions. -- Cooperates with more than 900 Federal, State, and local agencies, and with academia and industry. Along with its continuing commitment to meet the growing and changing earth-science needs of the Nation, the USGS remains dedicated to its original mission to collect, analyze, interpret, publish, and disseminate information about the natural resources of the Nation-providing "Earth Science in the Public Service."
Program Name	Coastal/Marine Hazards and Resources Program
Total Annual Program Budget	$1,700,000
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 20 - Marine and Riverine Navigation and Safety
Tertiary Business Use	BU 03 - Coastal Zone Management

What Needs to be Measured in 3D	Response
Bare earth ground	Not required
Tops of buildings, structures, objects	Not required

What Needs to be Measured in 3D	Response
Tops of vegetation	Not required
Tops of submerged structures, objects	Required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Seafloor bedrock exposures

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order			QL1B	Special Order
Update Frequency			6-10 years	>10 years
Event type(s)				
Quality Level and/or update frequency variability across AOI			Work involves both regional and local mapping and research. Higher resolution data are needed in areas where local research and mapping are done.	Research is conducted on both local and regional scales. Local work generally requires higher resolution data.
Acceptable Horizontal Error			Up to 1 meter	The best horizontal accuracy achievable for the vertical accuracy I need
Acceptable Vertical Error			Up to 20 cm	Less than 1 meter
How far onshore needed			1 kilometer inland	
How far down the beach profile needed			Below MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season			Highly desirable	Highly desirable		Nice to have
Entire AOI under same environmental conditions			Nice to have	Nice to have		Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless			Highly desirable	Required		Highly desirable
DEM for entire AOI needs to be seamless			Required	Required		Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness			I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer		Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM			Highly desirable	Nice to have
DTM			Highly desirable	Nice to have
DEM			Required	Required
Raw point cloud data			Nice to have	Highly desirable
Classified point cloud			Nice to have	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform			Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)			Highly desirable	Highly desirable

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening				
Additional breaklines for hydro-enforcement of culverts				
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	Required
Tide Predictions			Highly desirable	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery			Required	Required
Ground control/ground truthing			Highly desirable	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Required
Nautical and/or navigation charts			Highly desirable	Nice to have
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery			Highly desirable	Highly desirable
Underwater videography			Highly desirable	Required
Bottom texture			Highly desirable	Required
Bottom type			Required	Required
Submerged features			Highly desirable	Required
Subbottom characteristics			Required	Required
Geologic and seismic data			Required	Required
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Not required	Not required
Water column properties - Biological			Not required	Not required
Currents			Not required	Not required
Tide/wave heights			Not required	Not required
Sea ice conditions			Not required	Not required
Habitat distribution and classification			Highly desirable	Required
Boundaries			Required	Required
Routes			Not required	Nice to have
Offshore cadastral			Nice to have	Not required
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Required	Nice to have
Floating observation/navigation systems			Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates			Required	
Land use/land cover			Nice to have	Nice to have
Wetlands			Nice to have	Nice to have
Estuaries			Nice to have	Nice to have
Inland surface water features			Nice to have	
Bridges/culverts				
Landmark features			Nice to have	
Cultural resources			Nice to have	
Coastal and riverine structures			Required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used			Primarily using multibeam, interferometric sidescan, and topobathy lidar, collected in support of the California Seafloor Mapping Program (https://walrus.wr.usgs.gov/mapping/csmp/) between 2008 and 2015.	Primarily using multibeam and interferometric sidescan data collected for the California Seafloor Mapping Program between 2008 and 2015; multibeam sonar bathymetric and backscatter data collected with Kongsberg Simrad EM1000 in water depths pf 20 to 200m. Horizontal and vertical resolution are <~1m. Data collected in 1993-1996 in the westrn Gulf of Maine off Massachusetts. Area surveyed ~4000 km sq.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast			Yes	Yes

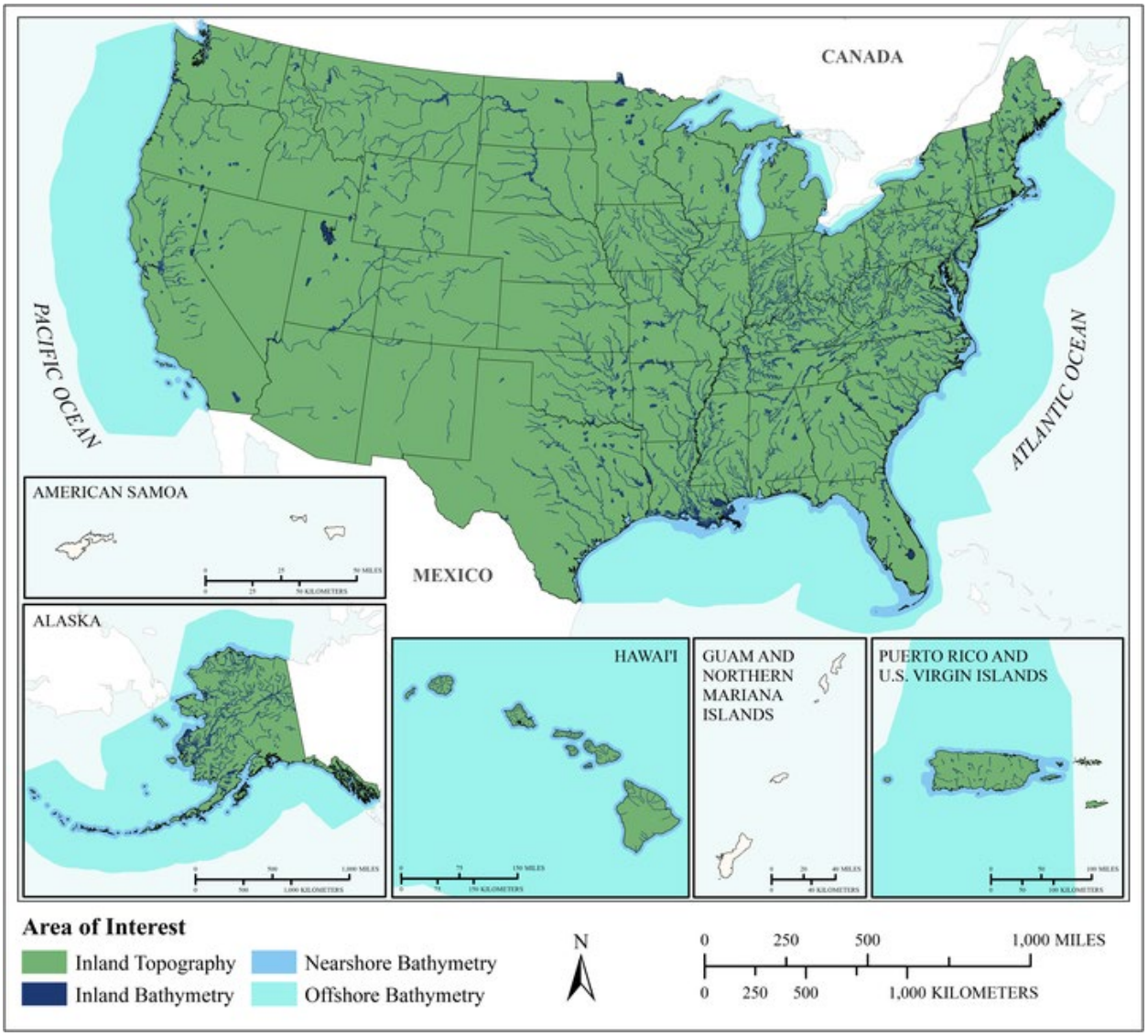
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other			Yes	Yes
Other description			USGS archives, Cal State University at Monterey Bay Data Catalog	USGS Data Archives, California State University at Monterey Bay Seafloor Mapping Data Catalog
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings			Major	Major
Cost savings/cost reduction			Major	Major
Cost avoidance			Major	Major
Increased revenues			None	I don't know
Mission-driven performance improvements			Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services			Major	Major
Improved response or timeliness			Major	Major
Improved customer experience			Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach			Major	Major
Environmental			Major	Major
Public safety, including life and property			Moderate	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings							Moderate	Annual dollars saved/realized	$34,250	Major	Annual dollars saved/realized	$61,506
Time savings description										Efficiency and productivity would be increased greatly if we didn't have to collect bathy data; more time would be spent on the interpretation of the data.		
Cost savings/cost reduction							Major	Unable to provide		Major	Unable to provide	
Cost avoidance							Moderate	Unable to provide		Major	Unable to provide	
Increased revenues							I don't know	Unable to provide		I don't know	Unable to provide	
Increased revenues description										Hard to quantify as we serve the public and our data and products are freely available to all.		
Mission-driven performance improvements							Major	Unable to provide		Major	Unable to provide	
Mission-driven performance improvements description										Availability of bathymetric and backscatter data would greatly increase productivity.		
Other operational benefits							Major	Unable to provide				
Other operational benefits description												
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services							Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness							Major	Unable to provide		Major	Unable to provide	
Improved customer experience							Major	Unable to provide		Major	Unable to provide	
Other customer service benefits							Major	Unable to provide				
Other customer service benefits description												
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach							Major			Major		
Environmental							Major			Major		
Public safety, including life and property							Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours			Yes	Yes
Hillshades			Yes	Yes
Slope maps			Yes	Yes
Aspect maps			Yes	Yes
Curvature maps			Yes	Yes
Cross sections			Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Earthquake



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Area split by varying quality level or update frequency	Nationwide, inland areas	Custom description	Custom description
Sub Area Requirements	All States and Puerto Rico		States and Puerto Rico	States and Puerto Rico out to the EEZ

MCA Description	Response
Mission Critical Activity	The US Geological Survey's Earthquake Hazard Program Mission Critical Activity is earthquake hazard assessment and mitigation.
MCA Title	Earthquake
MCA ID	1240
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	Earthquake Hazards Program
Organization Mission	To reduce the fatalities, injuries and property losses caused by earthquakes. This is accomplished by providing earth science data and assessments essential for land-use planning, engineering design, and emergency preparedness decisions
Program Name	Earthquake Hazards Program
Total Annual Program Budget	$84,300,000
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Earthquake research relies on the ability to detect features at a range of scales. For example, topography at the scale of small rocks can be used to identify the location of earthquake-capable faults. For change-detection studies, even higher resolution measurements (e.g, curb margin) can be used to determine rates of fault creep or fault afterslip.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Not required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Highly desirable

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	(a) QL1 (b) QL2	QL2B	QL2B	Order 1b
Update Frequency	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.	Event driven only – Data need to coincide with a specific event.
Event type(s)	One baseline dataset for the nation is suitable. However, following an earthquake with surface rupture, event-driven data (post earthquake) are needed in the epicentral area.	Single baseline dataset is sufficient. Then post-earthquake in epicentral region.	Single acquisition (baseline) sufficient, with follow-on focused acquisition following off-shore surface-rupturing earthquake.	Single baseline acquisition sufficient; with follow-up acquisition in targeted areas following ground-deforming earthquakes
Quality Level and/or update frequency variability across AOI	Higher-resolution datasets (QL1) are required across known active faults (e.g., Western US). QL2 data are sufficient elsewhere (e.g., Central and Eastern US + Alaska).			
Acceptable Horizontal Error	Up to 80 cm	Up to 2 meters	Up to 2 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm	Up to 30 cm	Up to 2 meters
How far onshore needed			To Mean Lower Low Water (MLLW)	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			No requirement for tide correction	No requirement for tide correction
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Nice to have

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required	Nice to have	Nice to have	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	I don't know

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Required	Highly desirable	Highly desirable
DEM	Required	Required	Required	Required
Raw point cloud data	Required	Required	Highly desirable	Required
Classified point cloud	Required	Required	Required	
Edited/cube XYZ		Not required	Not required	Required
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	Nice to have

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Not required	Nice to have
Tide Predictions			Not required	Nice to have
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Not required	Nice to have
Ground control/ground truthing	Nice to have	Nice to have	Highly desirable	Nice to have

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	Nice to have
Nautical and/or navigation charts			Nice to have	Nice to have
Acoustic imagery of the seafloor			Nice to have	Highly desirable
Aerial and/or satellite imagery	Required	Highly desirable	Nice to have	Nice to have
Underwater videography			Not required	Not required
Bottom texture			Not required	Nice to have
Bottom type			Not required	Nice to have
Submerged features			Not required	Nice to have
Subbottom characteristics			Not required	Nice to have
Geologic and seismic data	Required	Highly desirable	Nice to have	Highly desirable
Water column properties - Physical			Not required	Nice to have
Water column properties - Chemical			Not required	Nice to have
Water column properties - Biological			Not required	Nice to have
Currents			Not required	Nice to have
Tide/wave heights			Not required	Highly desirable
Sea ice conditions			Not required	Nice to have
Habitat distribution and classification			Not required	Not required
Boundaries			Not required	Nice to have
Routes			Not required	Nice to have
Offshore cadastral			Not required	Not required
Lease areas			Not required	Not required
Fixed obstructions			Not required	Not required
Floating observation/navigation systems			Nice to have	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Not required	
Land use/land cover	Nice to have	Not required	Nice to have	Nice to have
Wetlands	Not required	Not required	Nice to have	Nice to have
Estuaries			Nice to have	Nice to have
Inland surface water features	Highly desirable		Not required	
Bridges/culverts	Nice to have	Not required		
Landmark features	Nice to have	Nice to have	Not required	
Cultural resources	Not required	Not required	Nice to have	
Coastal and riverine structures	Nice to have	Not required	Nice to have	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy

Current dataset used	The Earthquake Hazard Program conducts a range of activities that utilize high-resolution 3D topographic data. Here are some examples: Fault mapping - The identification and mapping of faults is highly dependent on high resolution (ideally QL1) 3D topographic data. The USGS utilizes the highest-resolution datasets available. For example, in California, the B4 lidar dataset is a crucial dataset for mapping the San Andreas fault. In Utah, the Wasatch front LiDAR dataset (QL1) [https://gis.utah.gov/data/elevation-and-terrain/2013-2014-lidar/] has proved essential for locating and mapping the Wasatch and other subsidiary faults. And in western Tennessee, the ARRA-funded New Madrid lidar dataset (QL1) has proved essential for identifying ground-deformation features. In all cases, QL1 data best support our requirements, though we'll use whatever is best available. Site specific studies - For site specific paleoseismic investigations, we rely on	Limited inland bathymetric data are available that are useful for fault source characterization related to earthquake hazard investigations. Therefore, these data are used only in limited cases where USGS researchers conduct boat-based bathymetric surveys. Future priority areas for data collection include the Great Salt Lake (Utah) and Utah Lake (Utah).	Nearshore bathymetry data currently used for tsunami modeling. I don't know the details of those efforts and the scope of the data being used.	Bathymetric data off coast of California being used extensively to locate and map earthquake-capable offshore faults.

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
	QL1 or better data. We are usually interested in high internal accuracy (<10 cm), though absolute accuracy of less importance. We sometimes generate these datasets using field-based topographic surveys using differential GPS or UAS (drone) stereophotogrammetric methods (e.g., SfM).			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Various			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available	I don't know	Minor
Cost savings/cost reduction	Major	Inland bathy data not available	I don't know	Minor
Cost avoidance	Major	Inland bathy data not available	I don't know	Minor
Increased revenues	None	Inland bathy data not available	I don't know	None

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Mission-driven performance improvements	Major	Inland bathy data not available	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available	Moderate	Major
Improved response or timeliness	Major	Inland bathy data not available	Moderate	Minor
Improved customer experience	Major	Inland bathy data not available	I don't know	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available	I don't know	Minor
Environmental	Moderate	Inland bathy data not available	I don't know	None
Public safety, including life and property	Major	Inland bathy data not available	Moderate	Moderate

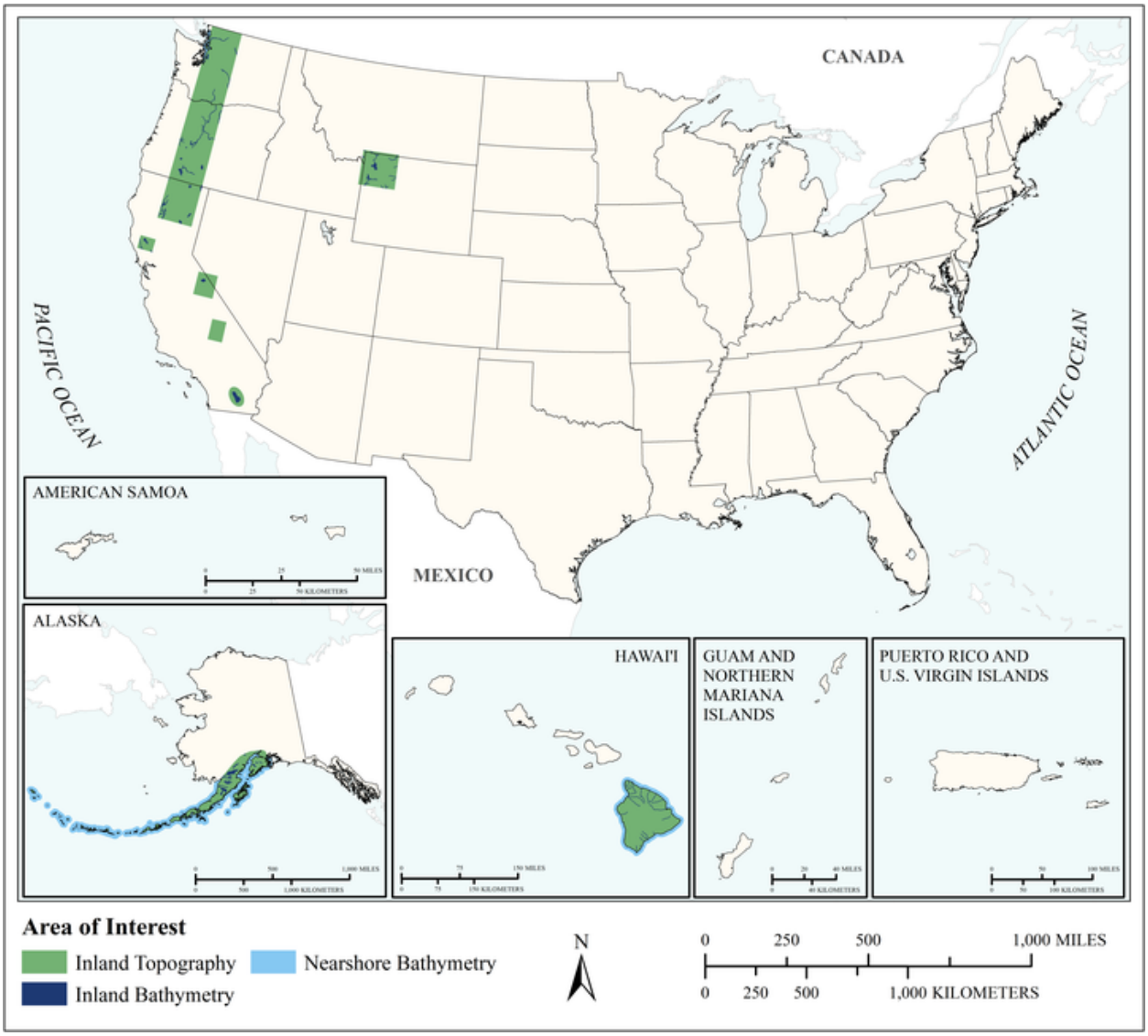
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$465,516	Major	Unable to provide		Major	Unable to provide		Major	Annual dollars saved/realized	$28,944
Time savings description	80 researchers * 2 hr/mo. saved. 80 researchers * 5 hr/mo saved. 40 fewer field-based topographic surveys per year @ 50 hr/survey. 80 researchers * 2 hr/mo saved. 80 researchers * 5 hr/mo saved thru high precision and accuracy fault mapping. 80 researchers * 2 hr/mo. saved.									More efficient and accurate fault mapping (8 geologists, 10 hr/month).		
Cost savings/cost reduction	Major	Annual dollars saved/realized	$100,000	Moderate	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide	
Cost savings/cost reduction description	Estimated expenditure of $100k/yr for new lidar data acquisition (current) won't be necessary when baseline data available for entire nation.			Avoid costly watercraft-based bathymetric surveys.								
Cost avoidance	Major	Annual dollars saved/realized	$100,100,000	Major	Unable to provide		Major	Unable to provide		Major	Annual dollars saved/realized	$10,000,000
Cost avoidance description	Estimate. Based on annualized loss of $4.4 Billion from earthquakes (source: FEMA). Improved hazard mitigation possible with high-res. 3D topo. to locate faults and improve source characterization.			Potential for seismic hazard mitigation due to improved seismic source characterization.						Significant reduction in annual loss due to more accurate seismic hazard models.		
Increased revenues	None			Moderate	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Increased revenues description	N/A. USGS doesn't sell data -- it's in public domain.			New/better located earthquake fault location information.								
Mission-driven performance improvements	Major	Annual percent improvement	20%	Major	Annual percent improvement	20%	Major	Annual percent improvement	20%	Major	Annual percent improvement	20%
Mission-driven performance improvements description	Improved hazard mitigation products (e.g., USGS National Seismic Hazard Map). Far more efficient and effective fault identification and source characterization possible. Estimate. Improved source characterization results in better hazard mitigation products.						Improved bathymetric data lead to better tsunami modeling data and reduced losses.			Improved accuracy of National Seismic Hazard Model.		
Other operational benefits							Major	Unable to provide				
Other operational benefits description							Improved bathymetric data lead to better tsunami modeling data and reduced losses.					
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Value added to products or services description	New/better USGS products (e.g., USGS fault database) and improved customer satisfaction.			Improved accuracy of USGS National Seismic Hazard Model.			Improved bathymetric data lead to better tsunami modeling data and reduced losses.					
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness description	As stated previously, up to $100 M cost savings in reduced losses due to earthquakes based on higher accuracy seismic hazard estimates. Improved accuracy of products and hazard estimates. Dependent on events. But post-earthquake response reliant on pre-earthquake topography.			In the event of earthquake, better positioned to identify causative fault and conduct damage assessment.						Improved accuracy of National Seismic Hazard Model. Improved ability to identify causative earthquake-responsible fault.		
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide		Minor	Unable to provide	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Societal Benefits	**Benefits**	**Benefits**	**Benefits**	**Benefits**
Education or outreach	Moderate	Moderate	Moderate	Minor
Environmental	None	None	Minor	None
Public safety, including life and property	Major	Major	Major	Major
Public safety, including life and property description	Improved seismic hazard estimates lead to increased public safety and reduction in risk to life and property.			Improved accuracy of National Seismic Hazard Model

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Volcano Baseline



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase	Respondent provided own shapefile, KML, or geodatabase	
Sub Area Requirements	Volcano Hazard Zones	Volcano Hazard Zones	Volcano Hazard Zones	

MCA Description	Response
Mission Critical Activity	Geologic mapping and geophysical monitoring of volcanoes, researching eruptive processes and deposits, delineating and determining volcano hazards and risk, and responding to restless or erupting volcanoes
MCA Title	Volcano Baseline
MCA ID	1243
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	Volcano Science Center
Organization Mission	National Hazards Mission. Volcano Hazards Program. The USGS Volcano Science Center conducts volcano monitoring and research at five U.S. volcano observatories and seeks to advance our understanding of active volcanism and its impacts. Our work enables the volcano observatories to provide information about and warnings of volcanic activity in the United States. Each observatory is assigned a geographic area of responsibility and issues formal notices of activity for volcanoes in those regions. The observatories and their partner organizations operate real-time volcano monitoring networks, disseminate forecasts and notifications of significant activity, assess volcano hazards, conduct scientific research into volcanic processes, and work with communities to prepare for volcanic eruptions. (modified from our website: volcanoes.usgs.gov)
Program Name	USGS Volcano Hazards Program
Total Annual Program Budget	$42,600,000
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	BU 21 - Aviation Navigation and Safety

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Highly desirable
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1,000 sq mi - 24,999 sq mi (e.g. large county, small state, intrastate region [e.g. a multi-county region such as the San Francisco Bay Area, Tri-County Council, etc.])
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)

General Geographic Area and Size	
Description of smallest 3D features	We are interested in features down to ~0.5 m in order to capture small volcanic features, such as the largest ballistic blocks thrown out of a volcano, lava flow textures (hornitos, tube skylights, etc), etc. We also use high resolution topography for modeling lava flows, debris flows (lahars), and pyroclastic flows, so we must capture the minimum scale capable of re-directing a flow.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Not required
10 - 50 ft	Not required
51 - 100 ft	Not required
101 - 500 ft	Not required
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL2B	QL2B	
Update Frequency	6-10 years	6-10 years	6-10 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 30 cm	Up to 1 meter	Up to 1 meter	
Acceptable Vertical Error	Up to 10 cm	Up to 20 cm	Up to 20 cm	
How far onshore needed			To MHW	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable

Hydrologic Processing Required	Response
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Nice to have	Nice to have		Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Nice to have	Nice to have		Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Required		Required	Required
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required	Required	Required	
DTM	Required	Highly desirable	Highly desirable	
DEM	Required	Required	Required	
Raw point cloud data	Not required	Not required	Not required	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Nice to have	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Nice to have	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	
Tide Predictions			Nice to have	
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable	Highly desirable	
Ground control/ground truthing	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Nice to have	
Nautical and/or navigation charts			Nice to have	
Acoustic imagery of the seafloor			Nice to have	
Aerial and/or satellite imagery	Highly desirable	Nice to have	Highly desirable	
Underwater videography			Nice to have	
Bottom texture			Highly desirable	
Bottom type			Highly desirable	
Submerged features			Highly desirable	
Subbottom characteristics			Not required	
Geologic and seismic data	Highly desirable	Nice to have	Nice to have	
Water column properties - Physical			Not required	
Water column properties - Chemical			Not required	
Water column properties - Biological			Not required	
Currents			Not required	
Tide/wave heights			Not required	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Not required	
Routes			Not required	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Not required	
Floating observation/navigation systems			Not required	
Shorelines – current, historic, change rates	Nice to have	Highly desirable	Nice to have	
Land use/land cover	Not required	Nice to have	Not required	
Wetlands	Not required	Not required	Not required	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Not required	
Inland surface water features	Nice to have	Highly desirable	Not required	
Bridges/culverts	Not required	Not required		
Landmark features	Not required	Not required	Not required	
Cultural resources	Not required	Not required	Not required	
Coastal and riverine structures	Nice to have	Highly desirable	Not required	
Overhead structures			Not required	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Lidar National Elevation Dataset, Digital Globe, Structure from Motion, InSAR	Project-specific data shared between scientists	Project-specific data shared between scientists	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Other	Yes	Yes	Yes	
Other description	Other data collected by contractors or USGS personnel	Other data collected by contractors or USGS personnel	Other data collected by contractors or USGS personnel	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Moderate	

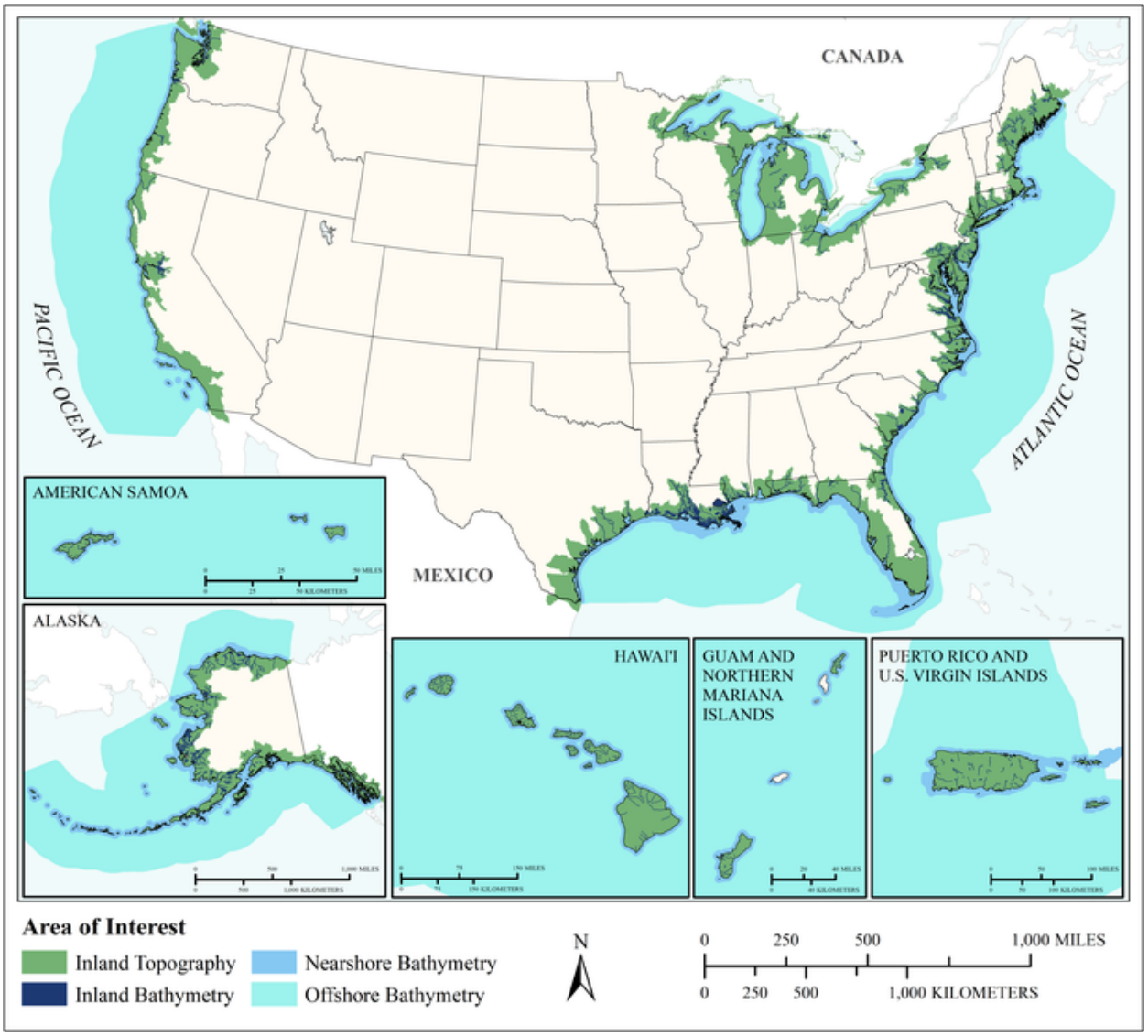
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost savings/cost reduction	Minor	None	None	
Cost avoidance	Minor	None	Minor	
Increased revenues	Minor	I don't know	Minor	
Mission-driven performance improvements	Major	Major	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	
Improved response or timeliness	Moderate	Moderate	Moderate	
Improved customer experience	Moderate	Major	Moderate	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Minor	
Environmental	Moderate	Minor	Minor	
Public safety, including life and property	Major	Major	Major	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Moderate	Annual dollars saved/realized	$100,000	Minor	Unable to provide		Minor	Unable to provide				
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance description	This is all potential, until something happens. Need good risk estimate to get solid numbers.											
Increased revenues	None			Moderate	Unable to provide		None					
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Moderate	Unable to provide				
Improved customer experience	Major	Unable to provide		Moderate	Unable to provide		Moderate	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Minor					
Environmental	Minor			Minor			Minor					
Public safety, including life and property	Major			Major			Moderate					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes	Yes	
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Baseline Coastal



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	One or more Hydrologic Units (HUC8s)	One or more Hydrologic Units (HUC8s)	Custom description	Custom description
Sub Area Requirements			States and Territories	States and Territories out to the EEZ

MCA Description	Response
Mission Critical Activity	Baseline coastal resource mapping, modeling, assessment, and analysis. Investigating processes related to coastal and marine environments and societal implications related to natural hazards, resource sustainability, and environmental change.
MCA Title	Baseline Coastal
MCA ID	1367
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	Coastal and Marine Geology Program
Organization Mission	To provide timely, relevant, and useful information about the Earth and its processes
Program Name	Coastal and Marine Geology Program
Total Annual Program Budget	$2,500,000
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 03 - Coastal Zone Management
Tertiary Business Use	BU 16 - Sea Level Rise and Subsidence

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Required
Sea surface	Required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Coastal geomorphic features such as sand ridges, barrier islands, sub-meter change in land or seafloor surface

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Highly desirable
101 - 500 ft	Required
501 - 2,500 ft	Highly desirable
Greater than 2,500 ft	Highly desirable
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Not required
½ - 1 acre	Not required
1.1 – 2 acres	Nice to have

Inland Bathy Feature Size Requirements	Response
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Highly desirable
Greater than 10 acres	Highly desirable

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1	QL3B	QL3B	Order 1b
Update Frequency	4-5 years	4-5 years	4-5 years	6-10 years and certain events.
Event type(s)				Underwater eruption, earthquake, landslide, or hurricane/tsunami that could cause geomorphic change
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need	Up to 1 meter	Up to 1 meter
Acceptable Vertical Error	Up to 10 cm	Up to 1 meter	Up to 40 cm	Less than 1 meter
How far onshore needed			To the fall line	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MLLW	MLLW
Cross sections and/or transects meet needs			Partial	Partial
Cross section/transect requirement			Transects up to 100 meter spacing at up to +/-50cm vertical accuracy	100 meter transect spacing with up to 50 cm vertical accuracy

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have	Not required
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Nice to have	Nice to have	Nice to have
Other	Required					
Other description	Regardless, dates of acquisition must be known					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Nice to have	Nice to have	Not required
DEM for entire AOI needs to be seamless	Required	Required	Required	Required	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Required	Required	Required
DTM	Nice to have	Required	Required	Required
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Nice to have	Nice to have	Nice to have

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Classified point cloud	Required	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Highly desirable	Nice to have
Full waveform	Nice to have	Nice to have	Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)		Required	Required	Highly desirable
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)			Required	Required
Tide Predictions			Required	Required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Nice to have
Intensity imagery/sidescan imagery	Required	Required	Required	Required
Ground control/ground truthing	Highly desirable	Required	Required	Required
Other	Highly desirable			
Other description	Coincident georeferenced or geolocated imagery			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Required	Required
Aerial and/or satellite imagery	Highly desirable	Not required	Required	Nice to have
Underwater videography			Nice to have	Not required
Bottom texture			Required	Required
Bottom type			Required	Required
Submerged features			Nice to have	Highly desirable
Subbottom characteristics			Required	Required
Geologic and seismic data	Not required	Not required	Required	Required
Water column properties - Physical			Highly desirable	Nice to have
Water column properties - Chemical			Nice to have	Not required
Water column properties - Biological			Nice to have	Not required
Currents			Nice to have	Highly desirable
Tide/wave heights			Highly desirable	Required
Sea ice conditions			Not required	Not required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Habitat distribution and classification			Highly desirable	Required
Boundaries			Highly desirable	Highly desirable
Routes			Nice to have	Highly desirable
Offshore cadastral			Highly desirable	Highly desirable
Lease areas			Highly desirable	Highly desirable
Fixed obstructions			Highly desirable	Highly desirable
Floating observation/navigation systems			Highly desirable	Highly desirable
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Required	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	Not required
Wetlands	Highly desirable	Highly desirable	Highly desirable	Not required
Estuaries			Highly desirable	Not required
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Highly desirable	
Coastal and riverine structures	Nice to have	Nice to have	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Nice to have			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	3DEP and SfM	Currently available hydro data	Currently using single beam, interferometric, and multi beam data collected over the past decade by the USGS, and comparing it to NOAA hydrographic data, and/or soundings data digitized from H-sheets from the past century. Quality Level covers the spectrum depending on age of data.	Single beam, interferometric and multibeam bathymetric data collected over the past decade by the USGS. NOAA BAG data and hydrographic data available online from the past 50 years, and data digitized from H-sheets over the past century. Data uncertainty is dependent on age of data collection.

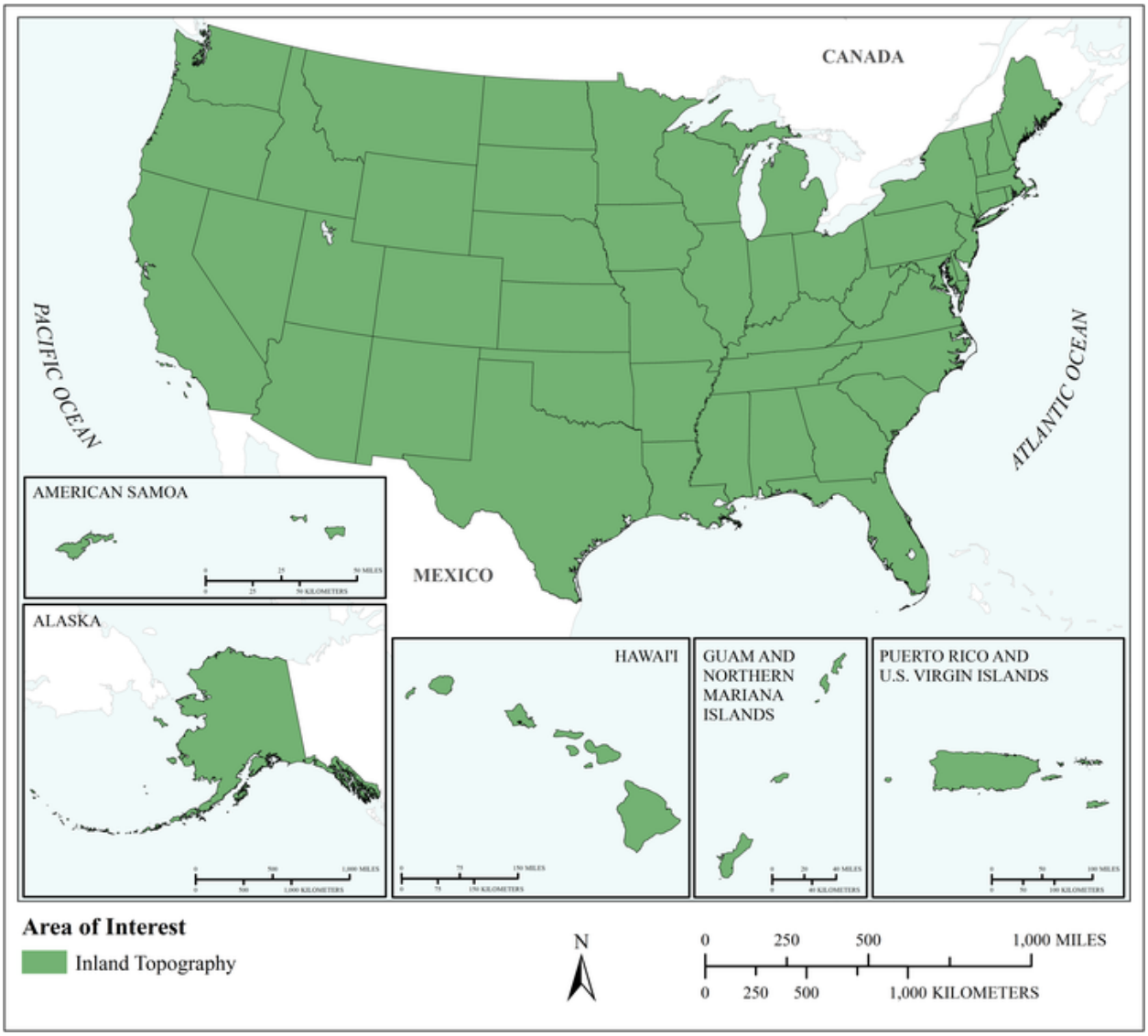
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	Yes
NCEI	Yes		Yes	Yes
Open Topography				
NOAA nautical charts			Yes	Yes
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS			Yes	Yes
State Repositories				
State repositories used				
Other	Yes	Yes		
Other description	Contracted acquisitions; Arctic DEM	No central repository...projects share hard drives, Etc		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Moderate
Cost savings/cost reduction	None	Moderate	Moderate	Moderate
Cost avoidance	Major	Minor	Minor	Minor
Increased revenues	None	Moderate	Moderate	Minor
Mission-driven performance improvements	I don't know	Moderate	Moderate	Minor
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	Minor
Improved response or timeliness	Major	Major	Major	Minor
Improved customer experience	I don't know	I don't know	Major	Minor
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Minor	I don't know
Environmental	Major	Minor	Minor	I don't know
Public safety, including life and property	Major	Moderate	Moderate	I don't know

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$36,180	Major	Annual dollars saved/realized	$31,658	Major	Annual dollars saved/realized	$31,658	Major	Annual dollars saved/realized	$46,732
Time savings description				Some hours still necessary for reporting purposes. If data already processed to acceptable quality. If not necessary to collect new bathymetric data.			Some hours still necessary for reporting purposes. If data already processed to acceptable quality. If not necessary to collect new bathymetric data.			Hours to conduct small offshore bathymetric survey (these are not collected annually). Hours to process/report above bathymetric survey.		
Cost savings/cost reduction	I don't know	Unable to provide		I don't know	Unable to provide		Major	Annual dollars saved/realized	$70,000	Major	Annual dollars saved/realized	$80,000
Cost savings/cost reduction description							Cost of typical small bathymetric survey.			Cost to conduct small offshore survey (these are not collected annually).		
Cost avoidance	I don't know	Unable to provide		I don't know	Unable to provide		Major	Annual dollars saved/realized	$50,000	Major	Annual dollars saved/realized	$87,000
Cost avoidance description							Cost of above survey data processing and reporting.			Cost to process/report above survey.		
Increased revenues	I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide		I don't know	Unable to provide	
Mission-driven performance improvements	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Annual percent improvement	25%	Moderate	Annual percent improvement	10%
Mission-driven performance improvements description							Amount of time annually to conduct bathymetric surveys can be applied to research. See above.			Time available to carry our research instead of data acquistion. See above.		
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Annual dollars saved/realized	$4,824	Minor	Unable to provide	
Value added to products or services description							Estimate amount of hours necessary to QA/QC other datasets.					
Improved response or timeliness	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Annual dollars saved/realized	$36,180	Moderate	Annual dollars saved/realized	$9,648
Improved response or timeliness description							Quicker response for storm impact assessment. Improved damage assessment. Improved storm impact modeling.			Improved impact assessment due to existing data.		
Improved customer experience	I don't know	Unable to provide		I don't know	Unable to provide		Moderate	Annual dollars saved/realized	$7,538	Moderate	Annual dollars saved/realized	$6,030
Improved customer experience description							Improved capability for storm impact assessment.			Efficient data use.		
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	I don't know			I don't know			I don't know			I don't know		
Environmental	I don't know			I don't know			I don't know			I don't know		
Public safety, including life and property	I don't know			I don't know			I don't know			I don't know		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes		Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: National Civilian Mapping - Geology



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	States and/or Territories			
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau			

MCA Description	Response
Mission Critical Activity	Geologic mapping, modeling, and analysis. Constructing geologic histories, establishing geologic frameworks, and assessing geologic hazards through analysis and modeling of geologic data, including geologic maps.
MCA Title	National Civilian Mapping - Geology
MCA ID	21544
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	Mineral Resources Program and National Cooperative Geologic Mapping Program.
Organization Mission	The following text is taking from the websites of the two programs listed above. National Cooperative Geologic Mapping Program: The National Cooperative Geologic Mapping Program (NCGMP) is the primary source of funds for the production of geologic maps in the United States and provides accurate geologic maps and three-dimensional framework models that help to sustain and improve the quality of life and economic vitality of the Nation and to mitigate natural hazards. Mineral Resources Program: The Mineral Resources Program (MRP) supports data collection and research on a wide variety of nonfuel mineral resources that are important to the Nation's economic and national security. The Program's science portfolio encompasses the full spectrum of mineral resource science, allowing for a comprehensive understanding of the complete life cycle of nonfuel mineral resources and materials; this includes resource formation, discovery, production, consumption, use, recycling, and reuse, as well as an understanding of environmental issues of concern throughout the life cycle.
Program Name	Mineral Resources Program and National Cooperative Geologic Mapping Program. The budget of the National Cooperative Geologic Mapping program has been ~$25 Million in recent years. The mission critical activity of this program is producing geologic maps to support resource assessment and geologic hazards interpretation.
Total Annual Program Budget	$25,000,000
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)

General Geographic Area and Size	
Smallest 3D features needed	Small features (e.g. individual shrub, tree, car, mooring anchor, small dock, etc.)
Description of smallest 3D features	Individual debris flow bars, which are often about ~1m across and 1m tall. Because these landforms are rough and often below vegetation, multiple ground return points per square meter in lidar surveys are required to resolve them.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0			
Update Frequency	Event driven only – Data need to coincide with a specific event.			
Event type(s)	Landslide, volcanic eruption, or earthquake.			
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Not required
Hydro-enforcement	Not required
Hydro-conditioning	Not required
No Treatment	Required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Other	Required					
Other description	Point cloud and DEM need to be accessible as seamless files, not as patchwork of grid.					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	The data should be reprocessed together and uncertainties handled appropriately. Shifting the data within some prescribed confidence level is still a shift to the data.					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Required			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Not required			
Additional breaklines for hydro-enforcement of culverts	Not required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			
Other	Required			
Other description	Appropriate navigational data for collection so that intensity field can be corrected for path lengths.			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Not required			
Wetlands	Not required			
Estuaries				
Inland surface water features	Not required			
Bridges/culverts	Not required			
Landmark features	Not required			
Cultural resources	Not required			
Coastal and riverine structures	Not required			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	QL2 lidar data			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	I don't know			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	I don't know			
Public safety, including life and property	Major			

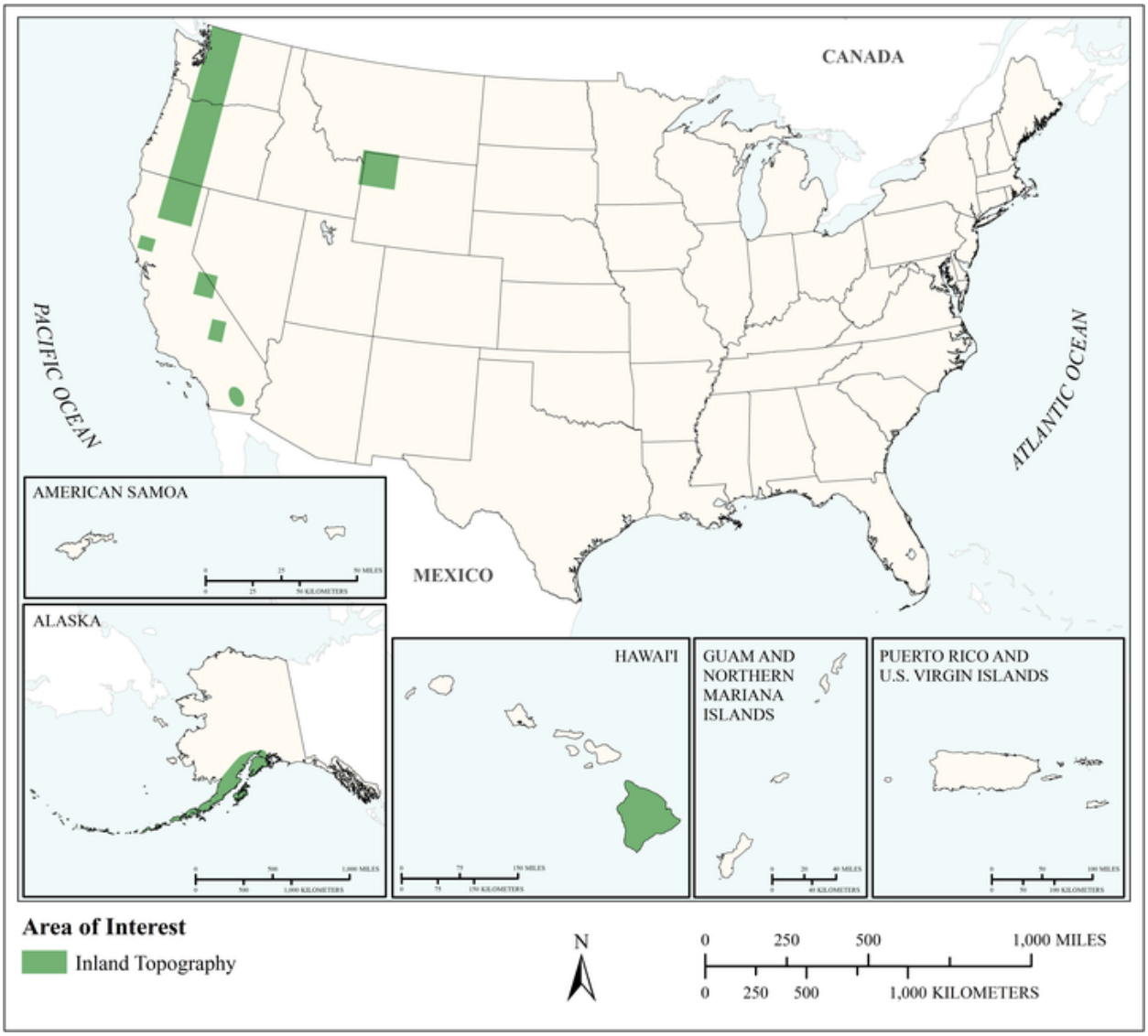
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$30,874									
Time savings description	Multi-day field work is conducted about 2 times each year. High-resolution topographic data saves ~3 days of in the field scouting each trip. Most of the time, problems can be solved from previously unrecognized data errors in a 5 day, uninterrupted work week. If each of the ~3 topographically focused projects worked on each year didn't have any data problems this would save about 120 hours over a year. Estimate from one project: Ability to map alluvial fan surfaces remotely based on surface form saved at least 2 weeks of field time. Compiling data for a new project ~4 times a year takes ~2-3 hours each time when the data is consistent. If it were inconsistent and needed manipulation this would take 2-3 days each time. Estimate from one project: Quantifying variability in fault scarp morphology to characterize paleoseismology along an 80 mile active range front. Two of the necessary transects could have been constructed each day, measuring them within a mile of one another. This means what took a day would have taken 80. Similar savings were realized recently for a project on the alluvial fans.											
Cost savings/cost reduction	Major	Unable to provide										
Cost savings/cost reduction description	Is this costs saved vs. having to the acquisition for topographic data on our own? Or costs we save on our own data collection (e.g. geologic mapping) through a reduction in field time? With clarification I could provide an estimate. This question does not seem targeted to my role as a researcher, but perhaps I don't understand it.											
Cost avoidance	Major	Annual dollars saved/realized	$80,000									
Cost avoidance description	Without ready access to pre-processed data, scientists would need to process it themselves and would probably spend ~1/2 time on processing data, which would then leave ~1/2 duties incomplete. This cost is an exampleyearly salary.											
Increased revenues	Major	Unable to provide										
Increased revenues description	High-resolution topographic data is depended upon to write research papers, with which tools are often released (e.g. more recently for classification of how recently active debris flows were on fan surfaces). Approximately1-3 of these are written per year.											
Mission-driven performance improvements	Major	Annual percent improvement	100%									

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Mission-driven performance improvements description	Higher quality elevation data improves the ability to accurately place contacts and elucidate geologic relationships. With ~10x the spatial resolution I am able to compare landscape simulations to observations with 10x the constraints. In well vegetated areas ability to characterize bare-earth topography highlights hard to recognize geology; this at least doubles productivity.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	I don't know	Unable to provide										
Improved response or timeliness	I don't know	Unable to provide										
Improved customer experience	Major	Annual dollars saved/realized	$1,930									
Improved customer experience description	Tools that allowed the creation of standard elevation derivatives directly during download (hillshades, slope mapes, drainage accumulation) would save ~4 days a year doing this manually. ~4 times a year a day is spent compiling and mosaicking datasets. A tool that merged and clipped data for me would save these days.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Education or outreach description	When talking to the public, it is high-resolution topographic images that often garner the most interest and enthusiasm.											
Environmental	I don't know											
Public safety, including life and property	I don't know											
Other												
Other benefits	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps	Yes			
Cross sections	Yes			
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Volcano Event Driven



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Respondent provided own shapefile, KML, or geodatabase			
Sub Area Requirements	Volcano Hazard Zones			

MCA Description	Response
Mission Critical Activity	Volcano hazard assessment and mitigation (including geologic mapping, hazard modeling, volcano monitoring, hazard mitigation)
MCA Title	Volcano Event Driven
MCA ID	22307
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	Volcano Science Center
Organization Mission	National Hazards Mission. Volcano Hazards Program. The USGS Volcano Science Center conducts volcano monitoring and research at five U.S. volcano observatories and seeks to advance our understanding of active volcanism and its impacts. Our work enables the volcano observatories to provide information about and warnings of volcanic activity in the United States. Each observatory is assigned a geographic area of responsibility and issues formal notices of activity for volcanoes in those regions. The observatories and their partner organizations operate real-time volcano monitoring networks, disseminate forecasts and notifications of significant activity, assess volcano hazards, conduct scientific research into volcanic processes, and work with communities to prepare for volcanic eruptions. (modified from our website: volcanoes.usgs.gov)
Program Name	USGS Volcano Hazards Program
Total Annual Program Budget	$42,600,000
Primary Business Use	BU 10 - Geologic Assessment and Hazard Mitigation
Secondary Business Use	BU 18 - Homeland Security, Law Enforcement, Disaster Response, and Emergency Management
Tertiary Business Use	BU 21 - Aviation Navigation and Safety

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	We are interested in features down to ~0.5 m in order to capture small volcanic features, such as the largest ballistic blocks thrown out of a volcano, lava flow textures (hornitos, tube skylights, etc), etc. We also use high resolution topography for modeling lava flows, debris flows (lahars), and pyroclastic flows, so we must capture the minimum scale capable of re-directing a flow.

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	Event driven only – Data need to coincide with a specific event.			
Event type(s)	Volcanic disturbance, eruption, or lahar (mud and debris flow).			
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 80 cm			
Acceptable Vertical Error	Up to 10 cm			
How far onshore needed				
How far down the beach profile needed	To MHW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Highly desirable
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Highly desirable					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have			
DTM	Required			
DEM	Required			
Raw point cloud data	Highly desirable			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Nice to have			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Highly desirable			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Required			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Required			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Required			
Land use/land cover	Highly desirable			
Wetlands	Nice to have			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Nice to have			
Bridges/culverts	Required			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Highly desirable			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	High resolution DEMs, orthos, and point clouds generated by oblique and vertical photogrammetry, satellite stereogrammetry and LiDAR, 3DEP and NCALM 1-meter lidar at some volcanoes, 5-meter IfSAR in Alaska and Hawaii, NED 10-meter DEMs, satellite DEMs (ASTER, SRTM, TanDEM-X), structure-from-motion and other high-resolution photogrammetric DEMs			
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography	Yes			
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				

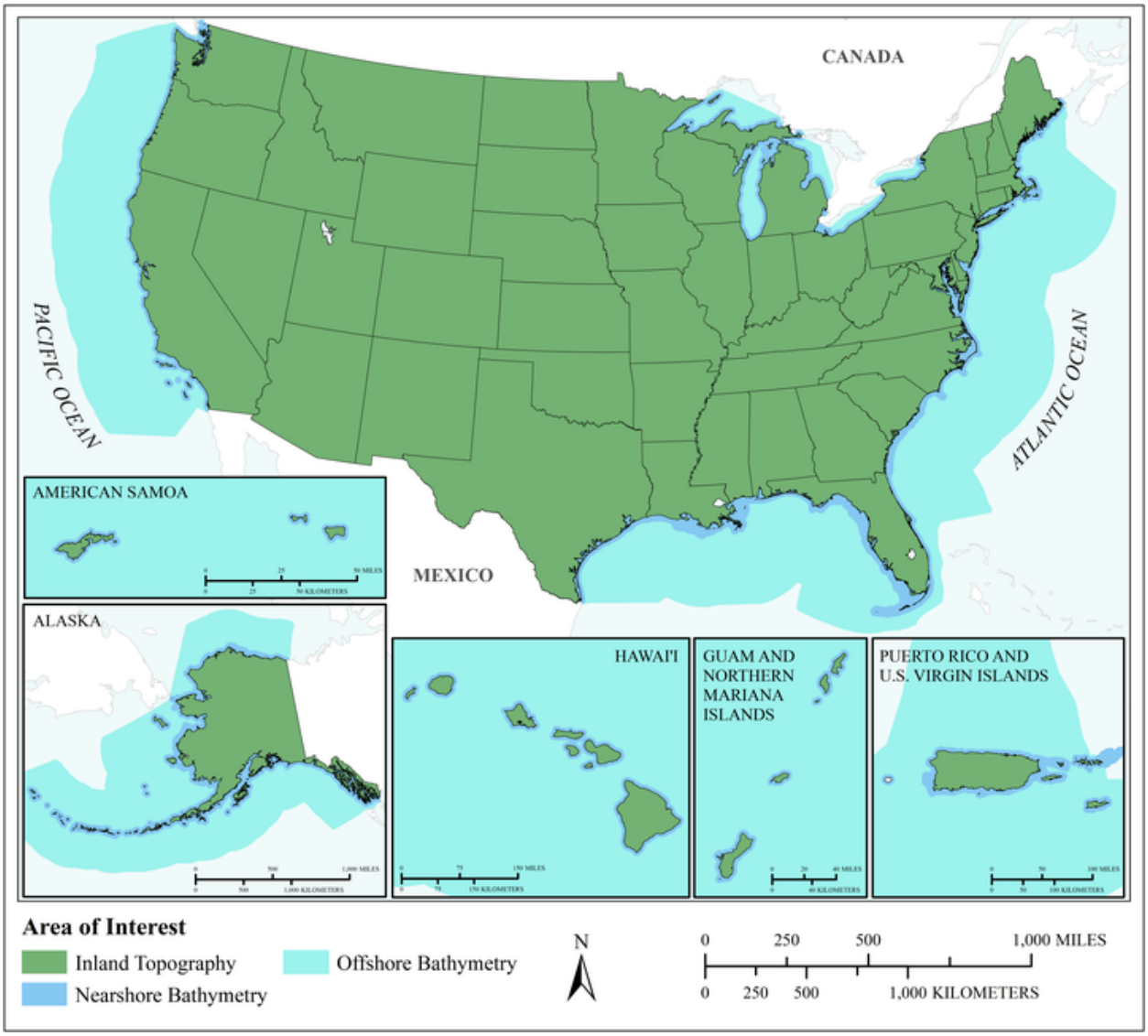
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	LiDAR consortiums			
Other	Yes			
Other description	I create the data; Earthexplorer, International space agencies			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major			
Cost savings/cost reduction	Major			
Cost avoidance	Major			
Increased revenues	I don't know			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			
Improved response or timeliness	Major			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$19,598									
Time savings description	Not having to fight through heavily vegetated forest to identify volcanic deposits on foot is a major time savings. SDE storage really helps with this. Permitting processes are a nightmare - with or without lidar.											
Cost savings/cost reduction	None											
Cost avoidance	Major	Unable to provide										
Increased revenues	None											
Mission-driven performance improvements	Major	Annual percent improvement	42%									
Other operational benefits	Major	Unable to provide										
Other operational benefits description	Enhanced modeling for risk assessment.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved response or timeliness description	Only thing that might improve permitting is an act of Congress. Recent example: potential lava flow path modeling for Lower East Rift Zone of Kilauea. Always better to start with pre-eruptive/pre-event topography before something happens. Opens so many scientific doors.											
Improved customer experience	Major	Unable to provide										
Other customer service benefits	Major	Unable to provide										
Other customer service benefits description	New, more accurate models of volcanic flowage hazards.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate											
Environmental	Minor											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes			
Hillshades	Yes			
Slope maps	Yes			
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Renewable Energy Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required		Required	Required
Geographic Area Requirements	Federal Review AOIs		Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas		All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Alternate energy development – solar, tidal, wind, wave, and ocean current. Assessment of rooftops for solar energy potential. Analysis of wind energy potential and turbine placement. Low head power potential for hydropower.
MCA Title	Renewable Energy Resources
MCA ID	60682
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 12 - Renewable Energy Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Nice to have
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Required
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2		QL4B	Special Order
Update Frequency	6-10 years		2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter		Up to 10 meters	Up to 2 meters
Acceptable Vertical Error	Up to 20 cm		Up to 50 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable		Highly desirable	Highly desirable		Highly desirable
Entire AOI under same environmental conditions	Highly desirable		Highly desirable	Highly desirable		Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required		Highly desirable	Highly desirable		Highly desirable
DEM for entire AOI needs to be seamless	Required		Required	Highly desirable		Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required		Highly desirable	Required
DTM	Required		Required	Required
DEM	Required		Required	Required
Raw point cloud data	Highly desirable		Highly desirable	Nice to have
Classified point cloud	Highly desirable		Highly desirable	
Edited/cube XYZ			Nice to have	Nice to have
Full waveform	Nice to have		Nice to have	Nice to have
Bathymetric Attributed Grid (BAG)			Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Not required	Not required
Tide Predictions			Nice to have	Not required
Tidal Constituent And Residual Interpolation (TCARI)			Nice to have	Not required
Intensity imagery/sidescan imagery	Not required		Highly desirable	Highly desirable
Ground control/ground truthing	Highly desirable		Highly desirable	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required		Highly desirable	Highly desirable
Underwater videography			Nice to have	Nice to have
Bottom texture			Nice to have	Nice to have
Bottom type			Highly desirable	Highly desirable
Submerged features			Highly desirable	Highly desirable
Subbottom characteristics			Required	Highly desirable
Geologic and seismic data	Not required		Highly desirable	Highly desirable
Water column properties - Physical			Nice to have	Nice to have
Water column properties - Chemical			Nice to have	Nice to have
Water column properties - Biological			Nice to have	Nice to have
Currents			Nice to have	Highly desirable
Tide/wave heights			Highly desirable	Highly desirable
Sea ice conditions			Highly desirable	Highly desirable
Habitat distribution and classification			Nice to have	Nice to have
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Required	Required
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Nice to have		Highly desirable	
Land use/land cover	Highly desirable		Required	Highly desirable
Wetlands	Nice to have		Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Highly desirable
Inland surface water features	Nice to have		Required	
Bridges/culverts	Nice to have			
Landmark features	Nice to have		Not required	
Cultural resources	Not required		Highly desirable	
Coastal and riverine structures	Nice to have		Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map				
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate		Major	Moderate
Cost savings/cost reduction	Major		Moderate	Moderate
Cost avoidance	Minor		Moderate	Moderate
Increased revenues	None		Major	Major
Mission-driven performance improvements	Moderate		Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Moderate		Major	Major

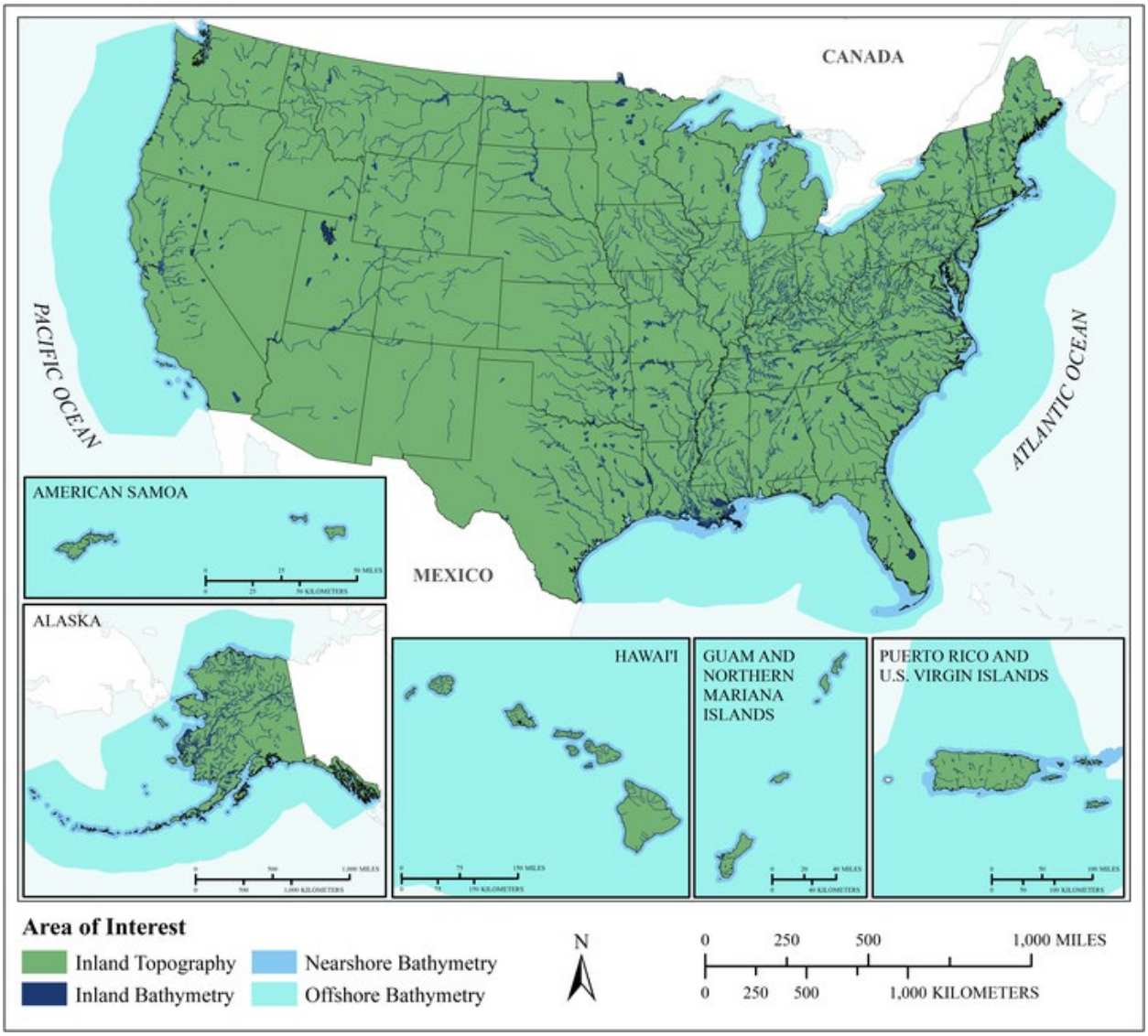
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	None		Major	Major
Improved customer experience	None		Major	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor		Major	Moderate
Environmental	Major		Major	Major
Public safety, including life and property	Minor		Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Minor	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Cost avoidance	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide					Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Minor	Unable to provide					Moderate	Unable to provide		Moderate	Unable to provide	
Improved customer experience	Major	Unable to provide					Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Moderate						Minor			Minor		
Environmental	Moderate						Moderate			Moderate		
Public safety, including life and property	None						Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours	Yes		Yes	Yes
Hillshades	Yes		Yes	Yes
Slope maps	Yes		Yes	Yes
Aspect maps	Yes		Yes	Yes
Curvature maps			Yes	Yes
Cross sections			Yes	Yes
Height-Above-Ground maps	Yes		Yes	Yes
Viewshed maps	Yes		Yes	Yes
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness	Yes		Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: Oil and Gas Resources



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs	Federal Review AOIs
Sub Area Requirements	All study land areas	All study land areas	All nearshore study waters	All offshore study waters

MCA Description	Response
Mission Critical Activity	Oil and gas exploration and production. Pipeline and route selection. Facility siting to mitigate geologic hazards. Construction planning. Environmental impact assessment and mitigation. Regulatory compliance.
MCA Title	Oil and Gas Resources
MCA ID	60683
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 13 - Oil and Gas Resources
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B	QL2B	Order 1a
Update Frequency	Annually	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 5 meters	Up to 5 meters	Up to 5 meters
Acceptable Vertical Error	Up to 20 cm	Up to 40 cm	Up to 40 cm	Less than 1 meter
How far onshore needed				
How far down the beach profile needed				
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Not required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Nice to have	
Temporal Seamlessness						
Entire AOI in same acquisition season	Required	Highly desirable	Highly desirable	Highly desirable	Nice to have	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Nice to have	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have
DEM for entire AOI needs to be seamless	Required	Highly desirable	Nice to have	Nice to have	Nice to have	Nice to have
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level	Up to triple the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Highly desirable	Highly desirable	Highly desirable
DTM	Required	Highly desirable	Required	Highly desirable
DEM	Required	Highly desirable	Required	Highly desirable
Raw point cloud data	Highly desirable	Nice to have	Required	Nice to have
Classified point cloud	Nice to have	Nice to have	Nice to have	
Edited/cube XYZ		Not required	Nice to have	Nice to have
Full waveform	Nice to have	Not required	Not required	Nice to have
Bathymetric Attributed Grid (BAG)		Not required	Nice to have	Nice to have
Breaklines required for standard hydro-flattening	Nice to have	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Nice to have	Nice to have
Tide Predictions			Nice to have	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Not required	Nice to have
Intensity imagery/sidescan imagery	Nice to have	Nice to have	Nice to have	Nice to have
Ground control/ground truthing	Highly desirable	Nice to have	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Highly desirable	Highly desirable
Nautical and/or navigation charts			Highly desirable	Highly desirable
Acoustic imagery of the seafloor			Highly desirable	Required
Aerial and/or satellite imagery	Highly desirable	Nice to have	Highly desirable	Highly desirable
Underwater videography			Nice to have	Required
Bottom texture			Nice to have	Highly desirable
Bottom type			Nice to have	Highly desirable
Submerged features			Required	Required
Subbottom characteristics			Nice to have	Required
Geologic and seismic data	Highly desirable	Nice to have	Highly desirable	Required
Water column properties - Physical			Nice to have	Highly desirable
Water column properties - Chemical			Nice to have	Highly desirable
Water column properties - Biological			Nice to have	Highly desirable
Currents			Nice to have	Nice to have
Tide/wave heights			Nice to have	Nice to have
Sea ice conditions			Nice to have	Nice to have
Habitat distribution and classification			Nice to have	Highly desirable
Boundaries			Highly desirable	Required
Routes			Highly desirable	Required
Offshore cadastral			Highly desirable	Required
Lease areas			Highly desirable	Required
Fixed obstructions			Highly desirable	Required
Floating observation/navigation systems			Highly desirable	Required
Shorelines – current, historic, change rates	Nice to have	Nice to have	Required	
Land use/land cover	Nice to have	Nice to have	Highly desirable	Highly desirable
Wetlands	Highly desirable	Nice to have	Required	Highly desirable

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	Highly desirable
Inland surface water features	Nice to have	Nice to have	Highly desirable	
Bridges/culverts	Nice to have	Nice to have		
Landmark features	Nice to have	Nice to have	Highly desirable	
Cultural resources	Nice to have	Nice to have	Nice to have	
Coastal and riverine structures	Nice to have	Nice to have	Highly desirable	
Overhead structures			Nice to have	
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Minor	None	Moderate	Major
Cost savings/cost reduction	Minor	None	Moderate	Moderate
Cost avoidance	Minor	None	Moderate	Minor
Increased revenues	None	None	None	Minor
Mission-driven performance improvements	Minor	Minor	Moderate	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Minor	Moderate	Major

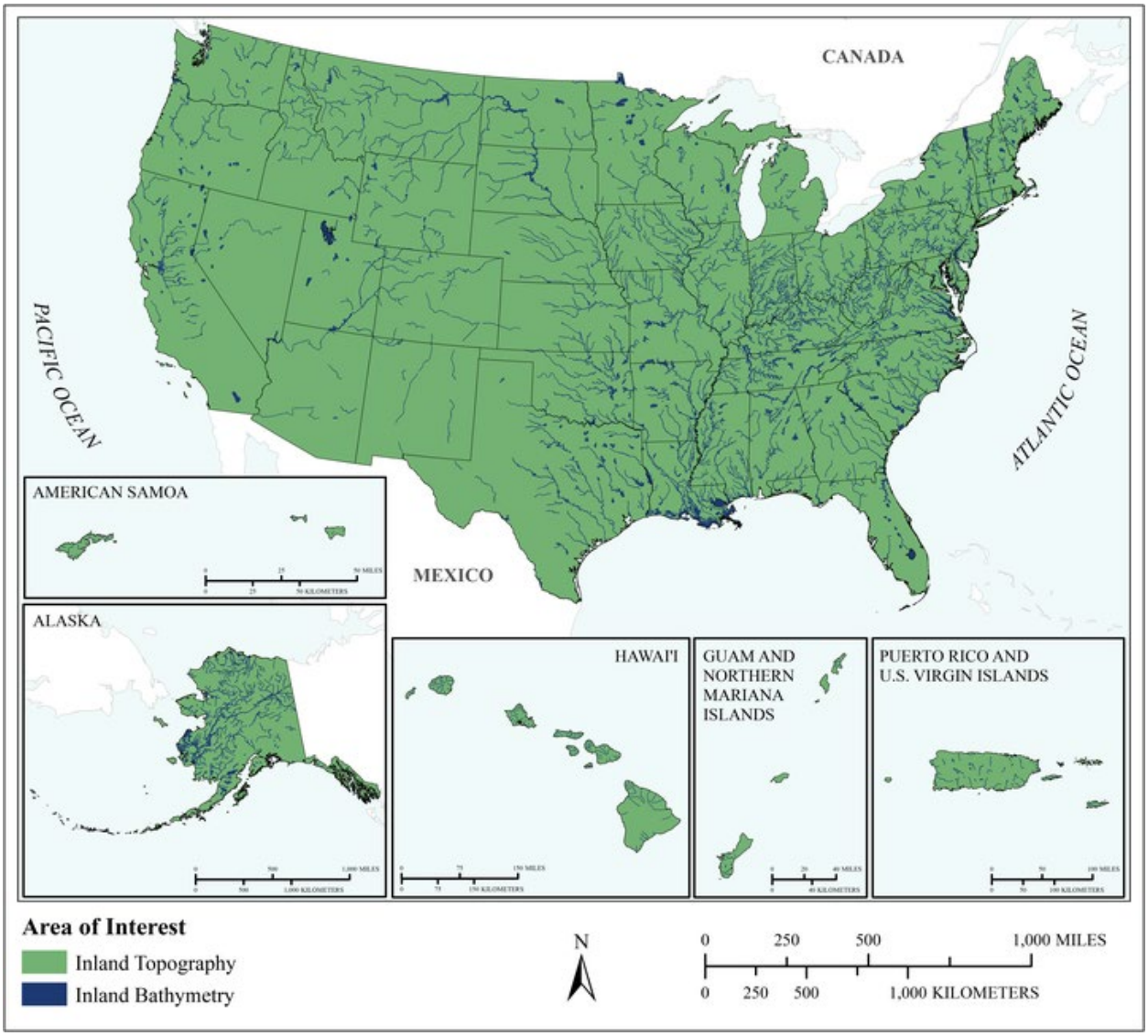
Benefits of Currently Used Elevation Data	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Improved response or timeliness	Moderate	None	None	Major
Improved customer experience	Minor	None	None	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Minor	None	Moderate	Major
Environmental	Minor	Minor	Major	Major
Public safety, including life and property	Minor	Minor	Major	Major

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Minor	Unable to provide		I don't know	Unable to provide		Major	Unable to provide	
Cost savings/cost reduction	Moderate	Unable to provide		None			Major	Unable to provide		None		
Cost avoidance	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Increased revenues	None			None			I don't know	Unable to provide		Moderate	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future annual operational benefits added during validation		Annual dollars saved/ realized	$1,578,291					Annual dollars saved/ realized	$9,259,028			
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved response or timeliness	Moderate	Unable to provide		Minor	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Minor	Unable to provide		None			I don't know	Unable to provide		Moderate	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			None			Major			Major		
Environmental	Major			Minor			Major			Major		
Public safety, including life and property	Major			Minor			Major			Major		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)			Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps			Yes	Yes
Curvature maps			Yes	Yes
Cross sections	Yes		Yes	Yes
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness			Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: National Civilian Mapping - Hydrography



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	States and/or Territories	States and/or Territories		
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		

MCA Description	Response
Mission Critical Activity	National Hydrography Dataset and Watershed Boundary Dataset framework development. Providing a geospatial hydrography framework for the Nation.
MCA Title	National Civilian Mapping - Hydrography
MCA ID	1444
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	National Geospatial Program
Organization Mission	The National Geospatial Program provides a foundation of digital geospatial data representing the topography, natural landscape, and built environment of the United States.
Program Name	National Geospatial Program, National Hydrography Program Area
Total Annual Program Budget	$10,000,000
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 01 - Water Supply and Quality
Tertiary Business Use	BU 02 - Riverine Ecosystem Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Not required
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	Larger than 2 million sq mi (e.g. National)
Smallest 3D features needed	Large features (e.g. groups of trees, house, building, road, underwater wreck, large commercial pier, etc.)
Description of smallest 3D features	.25 acre lakes and 1 foot wide streams

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Highly desirable
½ - 1 acre	Highly desirable
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL2B		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Up to 2 meters		
Acceptable Vertical Error	Up to 20 cm	Up to 30 cm		
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Nice to have	Not required			Not required	
Entire AOI under same environmental conditions	Highly desirable	Required			Required	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Not required			Not required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Not required	Not required		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Required	Nice to have		
Edited/cube XYZ		Not required		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Required	Required		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable	Highly desirable		
Ground control/ground truthing	Highly desirable	Highly desirable		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required	Required		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Highly desirable	Highly desirable		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Required	Required		
Land use/land cover	Highly desirable	Required		
Wetlands	Required	Required		
Estuaries				
Inland surface water features	Required	Required		
Bridges/culverts	Required	Required		
Landmark features	Not required	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Required	Required		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	3DEP lidar and IfSAR	None		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Major	Inland bathy data not available		
Increased revenues	None	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Major	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Inland bathy data not available		
Environmental	None	Inland bathy data not available		
Public safety, including life and property	None	Inland bathy data not available		

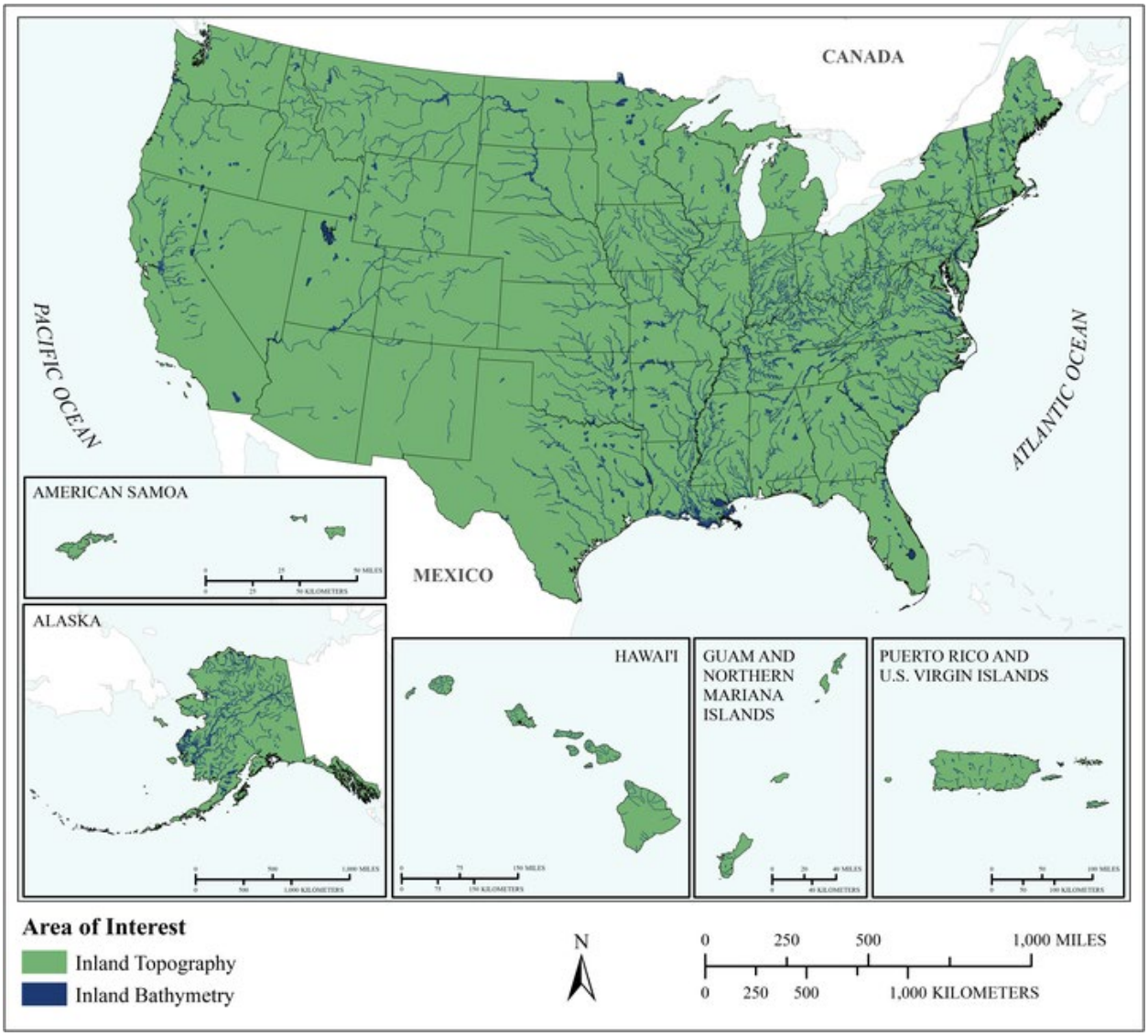
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide							
Time savings description	Seamless national 3DEP lidar coverage availability reduces processing time to build national hydrography datasets. Full national 3DEP lidar coverage and increased integration with other datasets reduces workload when building national hydrography datasets. Full national 3DEP lidar coverage improves current nationwide DEMs and decreases errors in data when building national hydrography datasets.											
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide							
Cost savings/cost reduction description	Completed national 3DEP lidar coverage would avoid program funds being spent to collect those data.											
Cost avoidance	Major	Unable to provide		Major	Unable to provide							
Cost avoidance description	Reduced workload when building national hydrography datasets due to data processing avoided. Reduced workload when building national hydrography datasets due to data errors avoided.											
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide							
Mission-driven performance improvements description	Better national hydrography data can be created by full 3DEP national lidar coverage and increased alignment with other datasets.											
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide		Major	Unable to provide							
Value added to products or services description	New hydrography products could be created with full 3DEP national lidar coverage and increased alignment with other datasets. Hydrography products would be more accurate if with full 3DEP national lidar coverage and increased alignment with other datasets.											
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide							
Improved response or timeliness description	Full nationwide 3DEP lidar coverage allows for additional hydrography products and services to be created.											
Improved customer experience	Major	Unable to provide		Major	Unable to provide							
Improved customer experience description	Full 3DEP lidar national coverage and improved integration with other datasets allows for additional hydrography products and services to be created. 3DEP lidar improved accuracy and precision over current national DEMs increases customer confidence.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Major								

Future Benefits if Elevation Data Requirements Are Met	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Education or outreach description	Increased ability to communicate to the public about the program through visualizations			
Environmental	None	None		
Public safety, including life and property	None	None		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades	Yes	Yes		
Slope maps	Yes	Yes		
Aspect maps	Yes			
Curvature maps	Yes			
Cross sections	Yes	Yes		
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids	Yes			
Hydrologic Flow Accumulation Grids	Yes			
Hydrologic networks (e.g. streams, lakes)	Yes			
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes			
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Flood Modeling



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	States and/or Territories	States and/or Territories		
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		

MCA Description	Response
Mission Critical Activity	National flood and water modeling, as well as flood risk and inundation mapping
MCA Title	Flood Modeling
MCA ID	21587
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	Water Mission Area
Organization Mission	The USGS serves the Nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.
Program Name	Water Mission Area
Total Annual Program Budget	$3,000,000
Primary Business Use	BU 15 - Flood Risk Management
Secondary Business Use	BU 14 - Cultural Resources Preservation and Management
Tertiary Business Use	BU 01 - Water Supply and Quality

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Required
Tops of submerged structures, objects	Nice to have
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required
Other	Highly desirable
Other description	Wetland saturation and vegetation density.

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Survey-level features (specifically, critical points on structures and in riverbeds measured within a tenth of a vertical foot) and Features that will act as barriers to flow such as ditches, roadway barriers, buildings, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required
Greater than 2,500 ft	Required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL3B		
Update Frequency	4-5 years	4-5 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	Not applicable			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable			Nice to have	
Entire AOI under same environmental conditions	Highly desirable	Highly desirable			Highly desirable	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Highly desirable			Nice to have	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have		
DTM	Nice to have	Nice to have		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Highly desirable		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Nice to have		
Ground control/ground truthing	Not required	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Highly desirable	Highly desirable		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable		
Cultural resources	Highly desirable	Highly desirable		
Coastal and riverine structures	Highly desirable	Highly desirable		
Overhead structures				
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Data currently used are the best available within each New England watershed's footprint according to the USIEI. The most recent data in each watershed are used primarily and supplemented in any gaps with older data. Most are QL2 or better and collected since 2011 but some are still QL3 or older than 2011. The latest 3DEP DEM is used for flood inundation modeling and high resolution hydrologic modeling. An older 30meter NED is used for national hydrologic unit construction. For each individual project at the time it is funded, best available data (i.e., highest QL or lowest TVU) as found in USIEI or, where multiple datasets of the same or similar quality overlap, most recent data. In Hydrologic Region 01, most such data are at QL2 or better and currently less than 5 years old.	Inland bathymetry is currently not available as desired. Field collection of cross-sections for one-dimensional hydraulic models is currently the best we can do. No bathymetric data is currently available on some study reaches. It is obtained in cross-section form via field survey. We have very little bathymetry available for use at the national scale. It is a patchwork at best. In many cases we use regression to estimate channel properties.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes			
NCEI				
Open Topography				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes			
State repositories used	Any available			
Other	Yes			
Other description	FEMA archives			
Data that meet my needs are not available		Yes		
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Inland bathy data not available		
Cost savings/cost reduction	Major	Inland bathy data not available		
Cost avoidance	Major	Inland bathy data not available		
Increased revenues	Moderate	Inland bathy data not available		
Mission-driven performance improvements	Major	Inland bathy data not available		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Inland bathy data not available		
Improved response or timeliness	Major	Inland bathy data not available		
Improved customer experience	Major	Inland bathy data not available		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Inland bathy data not available		
Environmental	Minor	Inland bathy data not available		
Public safety, including life and property	Minor	Inland bathy data not available		

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Other Current Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Other	Major			
Other description	Program existence (not feasible without 3D data)			

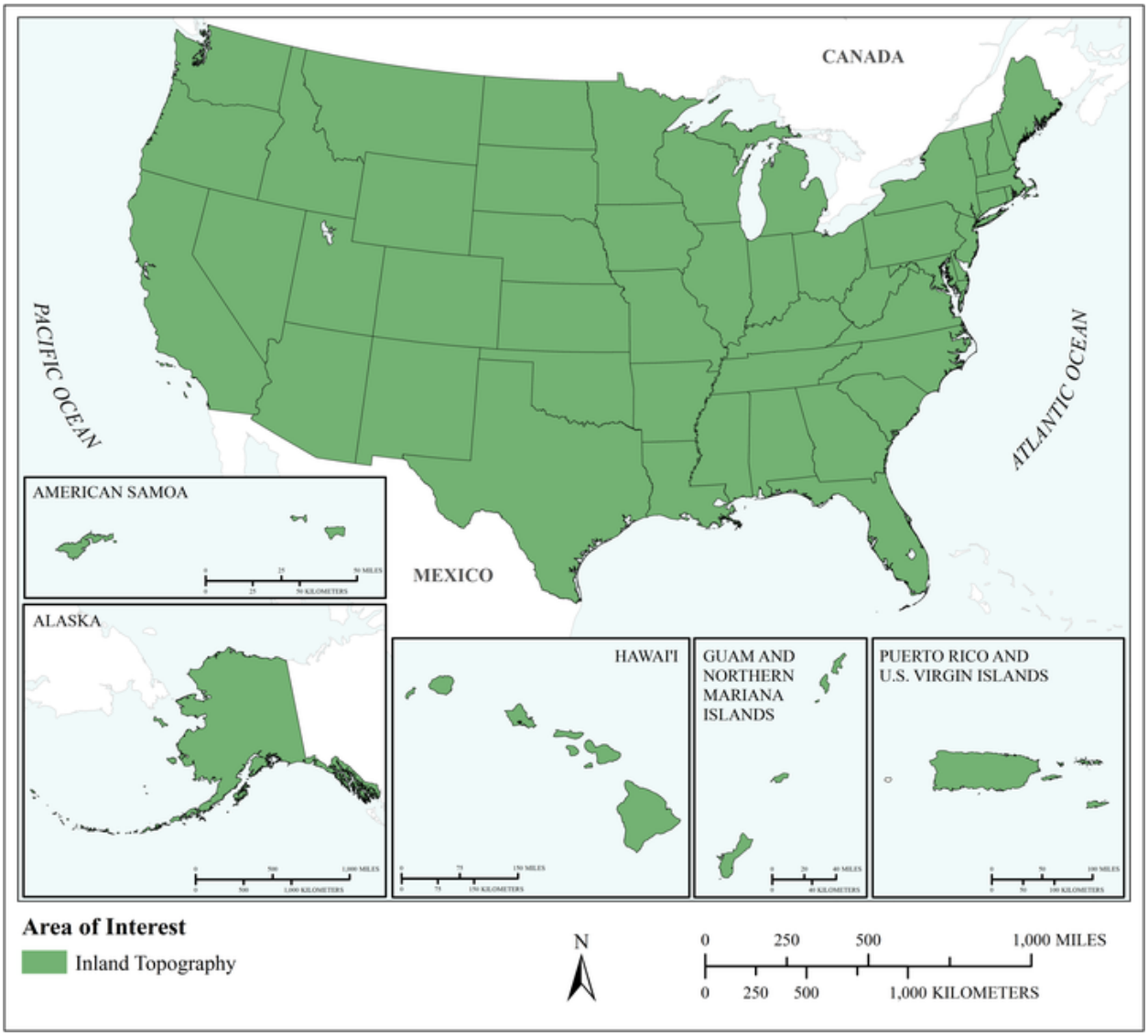
Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$1,206	Major	Annual dollars saved/realized	$331,650						
Time savings description	Manual hydro-flattening wouldn't be needed, but program is driven by customer need and has no regular monthly or annual time demands. Our program wouldn't exist without a national elevation product. Estimated number of hours spent annually combining adjacent datasets of different resolutions and epochs. Modeling and mapping would be more efficient, but program is driven by customer need and has no regular monthly or annual time demands.			Estimated number of hours spent annually entering field survey data into models. Estimated as corresponding time spent planning and supervising the surveying that could be avoided in answer above. Errors from field surveys of underwater cross-sections could be avoided entirely, but program is driven by irregular customer need and has no recurring or stable annual or monthly time or cost. About 9,000 hours or more spent each year surveying underwater cross-sections that could be avoided if inland bathymetry were available. Estimated number of hours spent annually modeling and reviewing models.								
Cost savings/cost reduction	Major	Unable to provide		Major	Annual dollars saved/realized	$400,000						
Cost savings/cost reduction description				Estimated cost corresponding to the 9,000 hours of field survey avoided.								
Cost avoidance	Major	Annual dollars saved/realized	$5,000	Major	Annual dollars saved/realized	$10,000						
Cost avoidance description	Estimated cost of quality control and hydrotreatment.			Estimated cost of quality control on field surveys avoided. Errors from field surveys of underwater cross-sections could be avoided entirely, but program is driven by irregular customer need and has no recurring or stable annual or monthly time or cost.								
Increased revenues	None			None								
Mission-driven performance improvements	Major	Unable to provide		Moderate	Annual percent improvement	10%						
Mission-driven performance improvements description				Estimated potential increase in number (and quality) of reaches modeled thanks to avoided field survey hours (and more complete spatial data).								
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		Minor	Unable to provide							
Value added to products or services description	Flood inundation maps would be more accurate, but program is driven by customer need and has no regular monthly or annual time demands; Maps would be more accurate and precise. Flood inundation maps could be developed in more communities, but program is driven by customer need and has no regular monthly or annual time demands.			Flood modeling could be improved by use of 2D models, but program is driven by irregular customer need and has no recurring or stable annual or monthly time or cost.								
Improved response or timeliness	Moderate	Unable to provide		Moderate	Unable to provide							

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Improved response or timeliness description	Flood inundation risk identification would be improved, but program is driven by customer need and has no regular monthly or annual time demands; Projections of flood-risk locations would be improved. Evacuation plans and response to forecasted floods would be improved, but program is driven by customer need and has no regular monthly or annual time demands. Flood inundation maps would be more up to date, but program is driven by customer need and has no regular monthly or annual time demands.			With seamless inland topobathy, constant flood hazard mapping budget could be spread across more river miles to provide updated flood hazard maps for more reaches and communities. Projections of flood-risk locations would be improved and expanded to more areas.								
Improved customer experience	Moderate	Unable to provide		Moderate	Unable to provide							
Improved customer experience description	Flood inundation maps could be developed in more communities, but program is driven by customer need and has no regular monthly or annual time demands.											
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor								
Education or outreach description	Flood inundation maps could be developed in more communities, enabling education of more at-risk stakeholders regarding risk											
Environmental	Moderate			Moderate								
Public safety, including life and property	Minor			Minor								
Public safety, including life and property description	Flood inundation maps could be developed in more communities, potentially enabling life-saving evacuation plans for forecasted floods			More accurate and widespread flood hazard maps would better advise persons already in high-risk locations and help communities better restrict high-risk future investments								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

MCA Title: Wildfire Management, Planning, and Response



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required			
Geographic Area Requirements	Federal Review AOIs			
Sub Area Requirements	All study land areas			

MCA Description	Response
Mission Critical Activity	Determination of forest fuel and fire susceptibility. Fire behavior modeling to support wildfire suppression activities. Wildland/urban interface building identification. Post fire analysis to determine landslide prone areas.
MCA Title	Wildfire Management, Planning, and Response
MCA ID	60684
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	
Organization Mission	
Program Name	
Total Annual Program Budget	
Primary Business Use	BU 17 - Wildfire Management, Planning, and Response
Secondary Business Use	
Tertiary Business Use	

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Required
Tops of vegetation	Required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Required
River/lake bottom	Not required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	
Smallest 3D features needed	
Description of smallest 3D features	

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL1			
Update Frequency	4-5 years			
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter			
Acceptable Vertical Error	Up to 20 cm			
How far onshore needed				
How far down the beach profile needed				

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Nice to have
Hydro-enforcement	Nice to have
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness						
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable					
Entire AOI under same environmental conditions	Required					
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required					
DEM for entire AOI needs to be seamless	Required					
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level					

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Required			
DTM	Required			
DEM	Required			
Raw point cloud data	Nice to have			
Classified point cloud	Highly desirable			
Edited/cube XYZ				
Full waveform	Not required			
Bathymetric Attributed Grid (BAG)				
Breaklines required for standard hydro-flattening	Nice to have			
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Highly desirable			
Ground control/ground truthing	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Required			
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Nice to have			
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				
Shorelines – current, historic, change rates	Not required			
Land use/land cover	Highly desirable			
Wetlands	Highly desirable			

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries				
Inland surface water features	Highly desirable			
Bridges/culverts	Nice to have			
Landmark features	Nice to have			
Cultural resources	Nice to have			
Coastal and riverine structures	Nice to have			
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used				
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast				
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories				
State repositories used				
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Moderate			
Cost savings/cost reduction	Moderate			
Cost avoidance	Major			
Increased revenues	Minor			
Mission-driven performance improvements	Major			
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major			

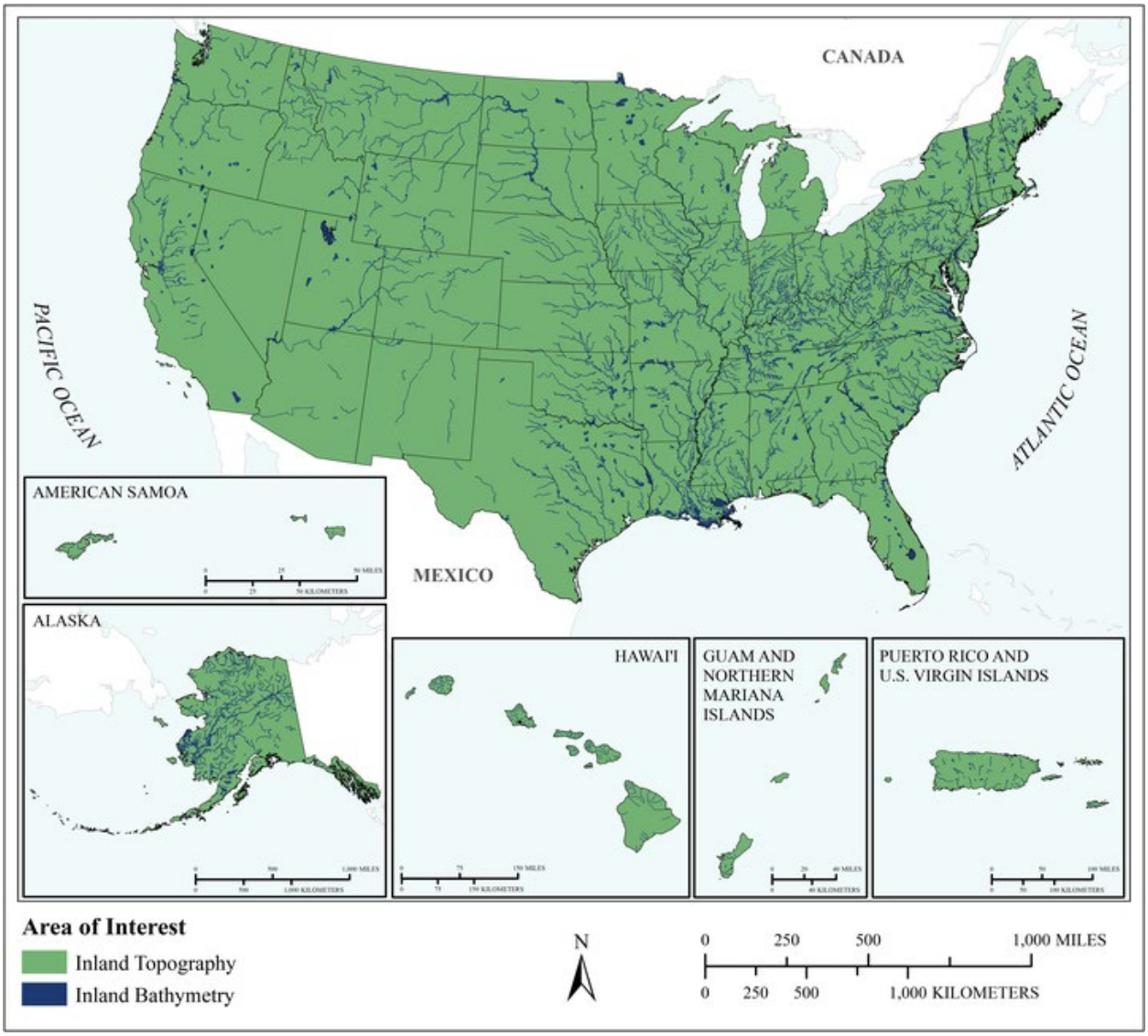
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Improved response or timeliness	Moderate			
Improved customer experience	Major			
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major			
Environmental	Major			
Public safety, including life and property	Major			

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide										
Cost savings/cost reduction	Major	Unable to provide										
Cost avoidance	Major	Unable to provide										
Increased revenues	Minor	Unable to provide										
Mission-driven performance improvements	Major	Unable to provide										
Future annual operational benefits added during validation		Annual dollars saved/ realized	$14,787,434									
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Major	Unable to provide										
Improved response or timeliness	Major	Unable to provide										
Improved customer experience	Major	Unable to provide										
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major											
Environmental	Major											
Public safety, including life and property	Major											

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours				
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints	Yes			
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	1
Vertical accuracy	2
Update frequency	3

MCA Title: StreamStats



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required		
Geographic Area Requirements	States and/or Territories	States and/or Territories		
Sub Area Requirements	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau	Areas not shown on map: U.S. Minor Outlying Islands, Federated States of Micronesia, Marshall Islands, Palau		

MCA Description	Response
Mission Critical Activity	Enhancing Streamstats Program and providing data for flow regression equations nationwide
MCA Title	StreamStats
MCA ID	22155
Organization Type	Federal Agencies and Commissions
Organization Name	DoI: U.S. Geological Survey (USGS)
Sub-Agency or Division	Water Science Centers
Organization Mission	The USGS serves the Nation by providing reliable scientific information to describe and understand the Earth; minimize loss of life and property from natural disasters; manage water, biological, energy, and mineral resources; and enhance and protect our quality of life.
Program Name	StreamStats and regional hydrology studies
Total Annual Program Budget	$3,000,000
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 02 - Riverine Ecosystem Management
Tertiary Business Use	BU 06 - Natural Resources Conservation

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Not required
Tops of submerged structures, objects	Not required
Tops of submerged vegetation	Not required
Subcanopy of vegetation/understory	Not required
River/lake bottom	Required
Nearshore elevation (<10 m deep)	Not required
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Not required

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Aggregated features (e.g. generalized landscapes, large areal patches of seagrass, coral reef, etc.)
Description of smallest 3D features	Rivers, streams, wetlands, lakes

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Required
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Highly desirable
501 - 2,500 ft	Required
Greater than 2,500 ft	Required
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Highly desirable
2.1 – 5 acres	Highly desirable

Inland Bathy Feature Size Requirements	Response
5.1 – 10 acres	Required
Greater than 10 acres	Required

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL1B		
Update Frequency	6-10 years	6-10 years		
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	The best horizontal accuracy achievable for the vertical accuracy I need	The best horizontal accuracy achievable for the vertical accuracy I need		
Acceptable Vertical Error	Up to 20 cm	Up to 20 cm		
How far onshore needed				
How far down the beach profile needed	To MLLW			
Tide correction requirement				
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Nice to have
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Not required	Not required			Nice to have	
Entire AOI under same environmental conditions	Nice to have	Nice to have			Nice to have	
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Required	Required			Required	
DEM for entire AOI needs to be seamless	Required	Required			Required	
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer			Whatever it takes to achieve seamlessness, including changes to the older, previously accepted dataset if it is proven to be less accurate than the newer	

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Not required	Not required		
DTM	Nice to have	Nice to have		
DEM	Required	Required		
Raw point cloud data	Nice to have	Nice to have		
Classified point cloud	Nice to have	Nice to have		
Edited/cube XYZ		Nice to have		
Full waveform	Not required	Not required		
Bathymetric Attributed Grid (BAG)		Not required		

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Required			
National Vertical Datum Transformation Tool (V-Datum)				
Tide Predictions				
Tidal Constituent And Residual Interpolation (TCARI)				
Intensity imagery/sidescan imagery	Not required	Not required		
Ground control/ground truthing	Not required	Not required		

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data				
Nautical and/or navigation charts				
Acoustic imagery of the seafloor				
Aerial and/or satellite imagery	Highly desirable	Highly desirable		
Underwater videography				
Bottom texture				
Bottom type				
Submerged features				
Subbottom characteristics				
Geologic and seismic data	Not required	Not required		
Water column properties - Physical				
Water column properties - Chemical				
Water column properties - Biological				
Currents				
Tide/wave heights				
Sea ice conditions				
Habitat distribution and classification				
Boundaries				
Routes				
Offshore cadastral				
Lease areas				
Fixed obstructions				
Floating observation/navigation systems				

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Shorelines – current, historic, change rates	Nice to have	Nice to have		
Land use/land cover	Highly desirable	Highly desirable		
Wetlands	Highly desirable	Highly desirable		
Estuaries				
Inland surface water features	Highly desirable	Highly desirable		
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Not required	Not required		
Cultural resources	Not required	Not required		
Coastal and riverine structures	Nice to have	Nice to have		
Overhead structures				
Lowest Floor Elevation of Buildings	Not required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	For each individual project at the time it is funded, best available data (i.e., highest QL or lowest TVU) as found in USIEI or, where multiple datasets of the same or similar quality overlap, most recent data. In Hydrologic Region 01, most such data are at QL2 or better and currently less than 5 years old.	For each individual project at the time it is funded, best available data (i.e., highest QL or lowest TVU) as found in USIEI or, where multiple datasets of the same or similar quality overlap, most recent data. In Hydrologic Region 01, most such data are at QL2 or better and currently less than 5 years old.		
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes		
NCEI				
Open Topography				
NOAA nautical charts				
USACE navigation charts				

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
USGS Inland Waters server				
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes		
State repositories used	Any available	Any available		
Other		Yes		
Other description		The National Map		
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major		
Cost savings/cost reduction	None	None		
Cost avoidance	None	None		
Increased revenues	None	None		
Mission-driven performance improvements	Minor	Minor		
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Minor	Minor		
Improved response or timeliness	None	None		
Improved customer experience	Minor	Minor		
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	None	None		
Environmental	None	None		
Public safety, including life and property	None	None		

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Minor	Unable to provide		I don't know	Unable to provide							
Time savings description	Avoiding data manipulation in combining datasets would be a minor benefit but not able to be quantified.											
Cost savings/cost reduction	None			I don't know	Unable to provide							
Cost avoidance	Minor	Unable to provide		I don't know	Unable to provide							
Cost avoidance description	Avoiding data processing would be a minor benefit but not able to be quantified.											
Increased revenues	None			I don't know	Unable to provide							
Mission-driven performance improvements	None			I don't know	Unable to provide							
Future annual operational benefits added during validation		Annual dollars saved/ realized	$142,660,531		Annual dollars saved/ realized	$38,932,187						
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Minor	Unable to provide		I don't know	Unable to provide							
Value added to products or services description	StreamStats output would be more accurate and precise with more accurate and precise elevation data; benefit can't be quantified; More accurate, precise, and up-to-date data would improve hydrologic modeling, but benefits are not quantifiable.											
Improved response or timeliness	Minor	Unable to provide		I don't know	Unable to provide							
Improved response or timeliness description	Elevation data refreshed at least once a decade would contribute to more up-to-date statistics and modeling, but benefits are not quantifiable.											
Improved customer experience	Minor	Unable to provide		I don't know	Unable to provide							
Improved customer experience description	Streamstats output would be more accurate and precise with more accurate and precise elevation data; benefit can't be quantified.											
Future annual customer service benefits added during validation		Annual dollars saved/ realized	$91,455,985		Annual dollars saved/ realized	$2,432,927						
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	None			None								
Environmental	None			None								
Public safety, including life and property	None			None								

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)				
Contours	Yes	Yes		
Hillshades				
Slope maps				
Aspect maps				
Curvature maps				
Cross sections				
Height-Above-Ground maps				
Viewshed maps				
Hydrologic Flow Direction Grids				
Hydrologic Flow Accumulation Grids				
Hydrologic networks (e.g. streams, lakes)				
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)				
Building footprints				
Breaklines for road edge-of-pavement				
Rugosity/Surface Roughness				

Importance of 3D Data Requirements	Response
Geographic coverage	3
Vertical accuracy	2
Update frequency	1

U.S. Marine Corps (USMC)

As America's expeditionary force in readiness since 1775, the U.S. Marines are forward deployed to win our Nation's battles swiftly and aggressively in times of crisis. We fight on land, sea and air, as well as provide forces and detachments to naval ships and ground operations.

Marines have a long history of developing expeditionary doctrine and innovations that set the example while leading other countries in multinational military operations. These unique capabilities and leadership qualities make the Marines our Nation's first line of defense.

Importance of elevation data to USMC

The USMC currently uses lidar and bathymetry data from NOAA, USACE, and the Army Geospatial Center (AGC). Elevation data are used for infrastructure and construction management including water, sewer, and power line planning; stormwater modeling; and sea level rise mitigation. The data are used to inform pump, drain, and well placement; road infrastructure; and to conduct building site analysis. Elevation data are also used for training support. Elevation data provide the USMC with the ability to generate virtual terrain for simulations to conduct current and future exercise scenarios for training exercises.

High-level summary of elevation data requirements

The USMC expressed a need for Quality Level 0 (QL0) inland topography updated every 2-3 years and QL2B inland and nearshore bathymetry updated every 6-10 years and 4-5 years respectively for infrastructure management purposes. For training modeling and simulations, the USMC needs QL2 data for inland topography, QL0B for inland and nearshore bathymetry, and Special Order for offshore bathymetry updated every 2-3 years.

High-level summary of benefits that would come from higher resolution elevation data

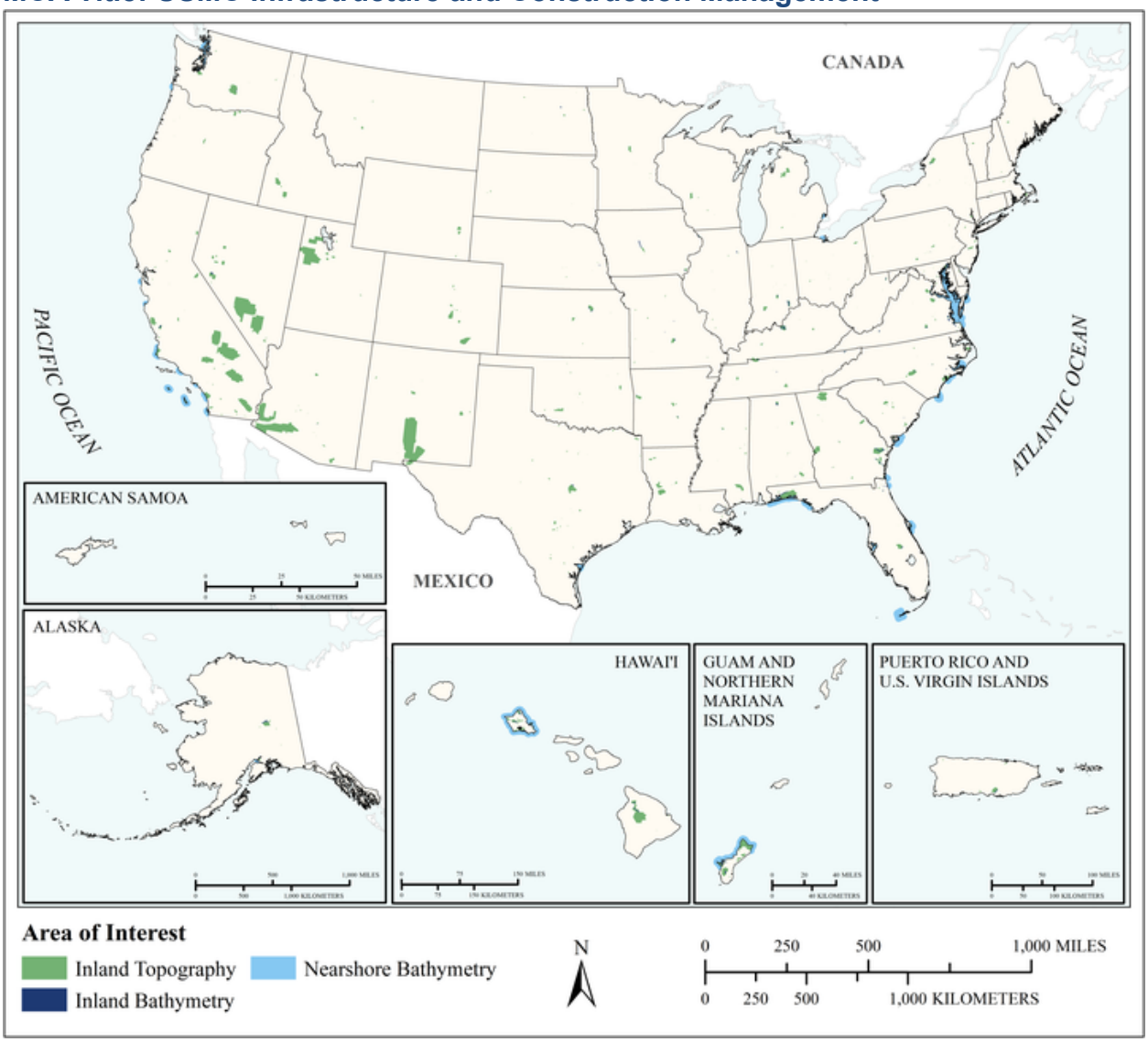
Future annual benefits from enhanced elevation data for infrastructure and construction management would be 25-85% improvements in program effectiveness, ability to carry out mission, and improved decision making. Future annual benefits from enhanced elevation data for modeling and simulation would be 3,552 annual hours saved because of faster field visits, more efficient modeling, and reduced data manipulation. Other major benefits would be realized but are not quantifiable.

The USMC has identified Business Uses and Mission Critical Activities that rely on elevation data and would benefit from enhanced elevation data. Summarized details of elevation data requirements and benefits received from the enhanced elevation data are provided in the following pages.

Summary Table

MCA Description				**Requirements**			**Future Operational Benefits**	**Future Customer Service Benefits**	**Future Societal Benefits**		
Primary Business Use	Agency/ Organization Name	MCA No.	Mission Critical Activity	Data Type	QL/Order	Update Frequency	Total Reported Future Annual Operational Benefits	Total Reported Future Annual Customer Service Benefits	Education or Outreach	Environ-mental	Public Safety
BU 22 – Infrastructure Management	DoD: U.S. Marine Corps (USMC)	1454	USMC Infrastructure and Construction Management	Inland Topo	QL0	2-3 years	Unable to quantify	Unable to quantify	Major	Major	Major
				Inland Bathy	QL2B	6-10 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
				Nearshore Bathy	QL2B	4-5 years	Unable to quantify	Unable to quantify	Minor	Minor	Minor
BU 29 – Military	DoD: U.S. Marine Corps (USMC)	21726	USMC Modeling and Simulation	Inland Topo	QL2	2-3 years	$107,092	Unable to quantify	Minor	Moderate	Moderate
				Inland Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Minor	Moderate	Moderate
				Nearshore Bathy	QL0B	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate
				Offshore Bathy	Special Order	2-3 years	Unable to quantify	Unable to quantify	Moderate	Moderate	Moderate

MCA Title: USMC Infrastructure and Construction Management



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	
Geographic Area Requirements	Custom description	Custom description	Custom description	
Sub Area Requirements	USMC installations	USMC installations	USMC installations	

MCA Description	Response
Mission Critical Activity	Infrastructure and Construction Management. Water, sewer, or power line planning and vegetation analysis. Pump, drain, and well placement. Stormwater modeling. Cut and fill analysis for earth-moving. Building site analysis. Road infrastructure. Infrastructure hardening or mitigation for climate change effects, e.g. sea level change. Entry and exit slopes of rivers are needed for site selection for amphibious vehicle crossings.
MCA Title	USMC Infrastructure and Construction Management
MCA ID	1454
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: U.S. Marine Corps (USMC)
Sub-Agency or Division	Regional Geospatial Information & Services (RGIS) Division, Facilities Directorate (G-F)
Organization Mission	The program is focused on providing precise and reliable geospatial information, products and service that support interoperability across the Marine Corps.
Program Name	Infrastructure Readiness.
Total Annual Program Budget	Unable to provide
Primary Business Use	BU 22 - Infrastructure and Construction Management
Secondary Business Use	BU 17 - Wildfire Management, Planning, and Response
Tertiary Business Use	BU 04 - Forest Resources Management

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Nice to have
Tops of vegetation	Nice to have
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Nice to have
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Highly desirable
Nearshore elevation (<10 m deep)	Highly desirable
Sea surface	Not required
Ocean/sea bottom (>10 m deep)	Highly desirable

General Geographic Area and Size	
Average geographic extent of day-to-day area	50 sq mi - 999 sq mi (e.g. small county or County Equivalent, District of Columbia, etc.)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Telephone poles, fire hydrants, etc.

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Highly desirable
Rivers and Streams	
Less than 10 ft	Highly desirable
10 - 50 ft	Highly desirable
51 - 100 ft	Nice to have
101 - 500 ft	Not required
501 - 2,500 ft	Not required
Greater than 2,500 ft	Not required

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL0	QL2B	QL2B	
Update Frequency	2-3 years	6-10 years	4-5 years	
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Less than 20 cm	Up to 10 meters	Less than 50 cm	
Acceptable Vertical Error	Up to 10 cm	Up to 40 cm	Up to 40 cm	
How far onshore needed			To cover the beach slope	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			No requirement for tide correction	
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Required
Hydro-enforcement	Required
Hydro-conditioning	Required
No Treatment	Not required

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Not required	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Not required	Required		Not required	Nice to have
Entire AOI under same environmental conditions	Highly desirable	Highly desirable	Required		Not required	Nice to have
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Required	Required		Not required	Required
DEM for entire AOI needs to be seamless	Highly desirable	Required	Required		Not required	Required
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level		I don't know	Up to the required Total Vertical Uncertainty (TVU) at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Nice to have	Nice to have	Nice to have	
DTM	Nice to have	Nice to have	Nice to have	
DEM	Required	Highly desirable	Highly desirable	
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Nice to have	Nice to have	
Full waveform	Nice to have	Not required	Nice to have	
Bathymetric Attributed Grid (BAG)		Nice to have	Nice to have	
Breaklines required for standard hydro-flattening	Highly desirable	Highly desirable		
Additional breaklines for hydro-enforcement of culverts	Nice to have			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Highly desirable	
Tide Predictions			Highly desirable	
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	
Intensity imagery/sidescan imagery	Nice to have	Highly desirable	Highly desirable	
Ground control/ground truthing	Nice to have	Highly desirable	Nice to have	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	
Nautical and/or navigation charts			Required	
Acoustic imagery of the seafloor			Not required	
Aerial and/or satellite imagery	Highly desirable	Highly desirable	Highly desirable	
Underwater videography			Not required	
Bottom texture			Nice to have	
Bottom type			Nice to have	
Submerged features			Highly desirable	
Subbottom characteristics			Nice to have	
Geologic and seismic data	Highly desirable	Highly desirable	Nice to have	
Water column properties - Physical			Nice to have	
Water column properties - Chemical			Nice to have	
Water column properties - Biological			Nice to have	
Currents			Nice to have	
Tide/wave heights			Nice to have	
Sea ice conditions			Not required	
Habitat distribution and classification			Not required	
Boundaries			Nice to have	
Routes			Nice to have	
Offshore cadastral			Not required	
Lease areas			Not required	
Fixed obstructions			Highly desirable	
Floating observation/navigation systems			Highly desirable	
Shorelines – current, historic, change rates	Highly desirable	Highly desirable	Highly desirable	
Land use/land cover	Highly desirable	Highly desirable	Highly desirable	
Wetlands	Highly desirable	Highly desirable	Highly desirable	

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Highly desirable	
Inland surface water features	Highly desirable	Highly desirable	Highly desirable	
Bridges/culverts	Highly desirable	Highly desirable		
Landmark features	Highly desirable	Highly desirable	Highly desirable	
Cultural resources	Highly desirable	Highly desirable	Highly desirable	
Coastal and riverine structures	Highly desirable	Highly desirable	Highly desirable	
Overhead structures			Highly desirable	
Lowest Floor Elevation of Buildings	Highly desirable			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	Classified point cloud, DEMS, and bathymetry data. AGC data.	NOAA. Little currently used	USACE, NOAA, little currently used.	
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes		Yes	
NCEI	Yes	Yes	Yes	
Open Topography	Yes			
NOAA nautical charts		Yes	Yes	
USACE navigation charts		Yes		
USGS Inland Waters server		Yes		
USGS data series				
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	North / South Carolina Georgia Florida Virginia	North / South Carolina Virginia Florida	North / South Carolina Virginia Florida	
Other	Yes			
Other description	Contracted collection			
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Moderate	Major	
Cost savings/cost reduction	Major	Moderate	Major	
Cost avoidance	Major	Moderate	Major	

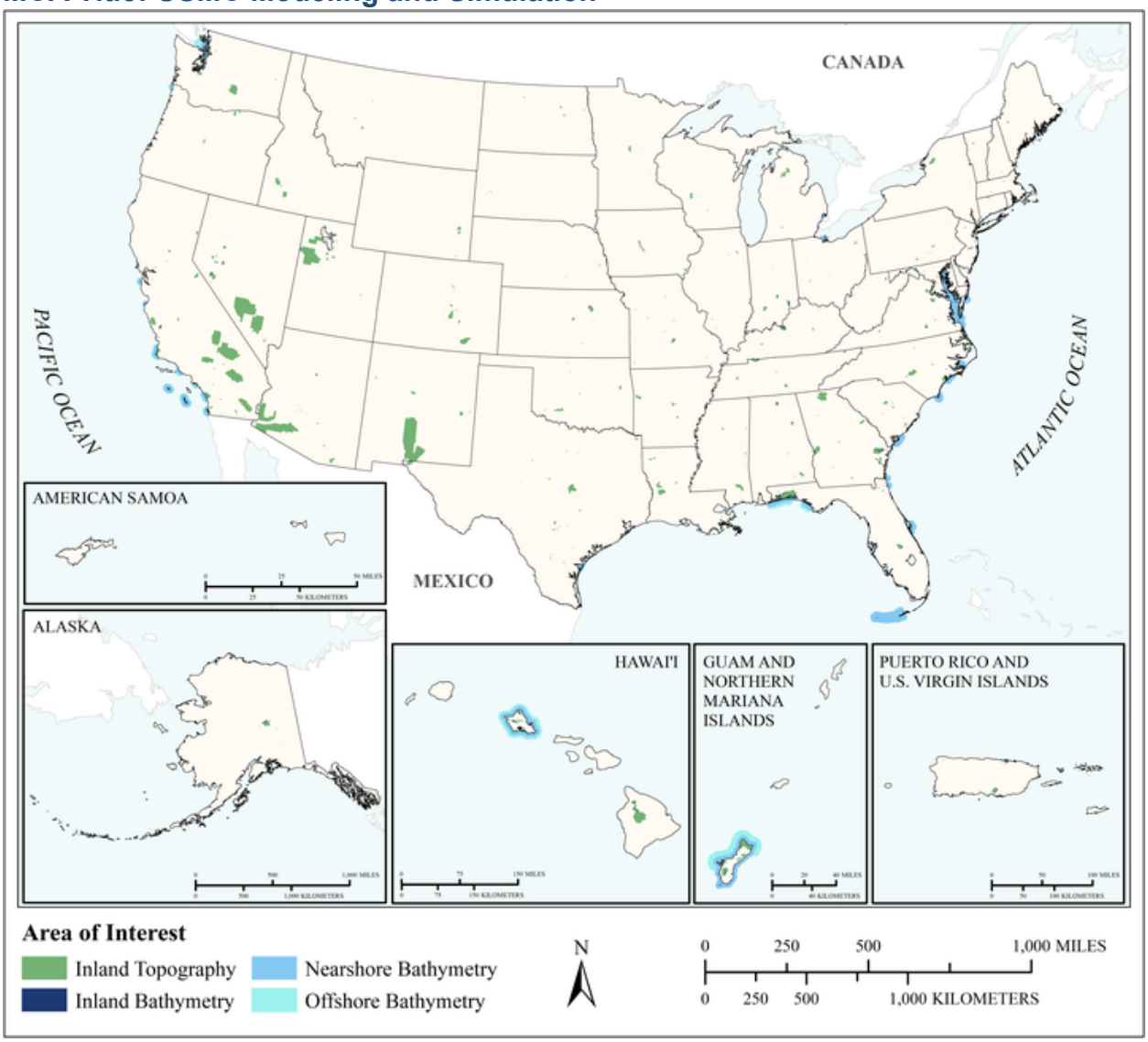
Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Increased revenues	None	Moderate	Major	
Mission-driven performance improvements	Major	Moderate	Major	
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Major	
Improved response or timeliness	Minor	Moderate	Moderate	
Improved customer experience	Major	Major	Major	
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Major	Minor	Moderate	
Environmental	Major	Moderate	Moderate	
Public safety, including life and property	Major	Minor	Moderate	

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Cost avoidance	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Increased revenues	Moderate	Unable to provide		Minor	Unable to provide		Moderate	Unable to provide				
Mission-driven performance improvements	Major	Annual percent improvement	62%	Moderate	Unable to provide		Major	Unable to provide				
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Improved response or timeliness	Major	Unable to provide		Moderate	Unable to provide		Major	Unable to provide				
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide				
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Major			Minor			Minor					
Environmental	Major			Minor			Minor					
Public safety, including life and property	Major			Minor			Minor					

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	
Contours	Yes	Yes	Yes	
Hillshades	Yes		Yes	
Slope maps	Yes		Yes	
Aspect maps				
Curvature maps		Yes	Yes	
Cross sections				
Height-Above-Ground maps	Yes			
Viewshed maps	Yes			
Hydrologic Flow Direction Grids		Yes		
Hydrologic Flow Accumulation Grids		Yes		
Hydrologic networks (e.g. streams, lakes)		Yes		
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)		Yes		
Building footprints	Yes			
Breaklines for road edge-of-pavement	Yes	Yes		
Rugosity/Surface Roughness	Yes			

Importance of 3D Data Requirements	Response
Geographic coverage	2
Vertical accuracy	3
Update frequency	1

MCA Title: USMC Modeling and Simulation



MCA Area of Interest	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Data Type	Required	Required	Required	Required
Geographic Area Requirements	Custom description	Custom description	Custom description	Custom description
Sub Area Requirements	USMC installations	USMC installations	USMC installations	USMC installations

MCA Description	Response
Mission Critical Activity	Training support. Current and future exercise scenarios utilizing the full extent of the battlespace and movement across non-DOD space during training exercises. Generate virtual terrain for modeling and simulations. Also tactical movements between DoD installations.
MCA Title	USMC Modeling and Simulation
MCA ID	21726
Organization Type	Federal Agencies and Commissions
Organization Name	DoD: U.S. Marine Corps (USMC)
Sub-Agency or Division	GEOFidelis
Organization Mission	To provide GIS support for the USMC.
Program Name	GEOFidelis has been developed to facilitate accomplishing the policy and goals set forth in Marine Corps Order (MCO) 11000.25, Installation Geospatial Information and Services. MCO 11000.25 provides policy, guidance and standards for acquiring, protecting, utilizing and implementing Marine Corps Installation Geospatial Information and Services (IGI&S), also referred to as GEOFidelis, in support of Marine Corps installation management.
Total Annual Program Budget	$10,000,000
Primary Business Use	BU 29 - Military
Secondary Business Use	BU 22 - Infrastructure and Construction Management
Tertiary Business Use	BU 25 - Real Estate, Banking, Mortgage, and Insurance

What Needs to be Measured in 3D	Response
Bare earth ground	Required
Tops of buildings, structures, objects	Highly desirable
Tops of vegetation	Highly desirable
Tops of submerged structures, objects	Highly desirable
Tops of submerged vegetation	Highly desirable
Subcanopy of vegetation/understory	Highly desirable
River/lake bottom	Nice to have
Nearshore elevation (<10 m deep)	Nice to have
Sea surface	Nice to have
Ocean/sea bottom (>10 m deep)	Nice to have

General Geographic Area and Size	
Average geographic extent of day-to-day area	1 sq mi - 49 sq mi (e.g. small city/town, Census Tract, Voting District, Zip Code, etc)
Smallest 3D features needed	Survey-level features (e.g. sign, curb, road line, mailbox, rock, etc.
Description of smallest 3D features	Large buildings

Inland Bathy Feature Size Requirements	Response
Navigable channels (as defined by USACE)	Nice to have
Rivers and Streams	
Less than 10 ft	Nice to have
10 - 50 ft	Nice to have
51 - 100 ft	Nice to have
101 - 500 ft	Nice to have
501 - 2,500 ft	Nice to have
Greater than 2,500 ft	Nice to have

Inland Bathy Feature Size Requirements	Response
Waterbodies (Reservoirs, lakes, ponds)	
Less than ½ acre	Nice to have
½ - 1 acre	Nice to have
1.1 – 2 acres	Nice to have
2.1 – 5 acres	Nice to have
5.1 – 10 acres	Nice to have
Greater than 10 acres	Nice to have

Requirements	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Quality Level/IHO Order	QL2	QL0B	QL0B	Special Order
Update Frequency	2-3 years	2-3 years	2-3 years	2-3 years
Event type(s)				
Quality Level and/or update frequency variability across AOI				
Acceptable Horizontal Error	Up to 1 meter	Less than 50 cm	Less than 50 cm	Less than 50 cm
Acceptable Vertical Error	Up to 20 cm	Less than 10 cm	Less than 10 cm	Less than 1 meter
How far onshore needed			To cover the installation	
How far down the beach profile needed	Below MLLW		Below MLLW	
Tide correction requirement			MSL	MSL
Cross sections and/or transects meet needs				
Cross section/transect requirement				

Hydrologic Processing Required	Response
Hydro-flattening	Highly desirable
Hydro-enforcement	Highly desirable
Hydro-conditioning	Highly desirable
No Treatment	Highly desirable

Seamlessness Requirements	Within Inland Topo Data	Within Inland Bathy Data	Within Nearshore Data	Within Offshore Data	Between Inland Topo and Inland Bathy	Between Topo, Topobathy, and/or Bathy
Importance of Seamlessness					Highly desirable	
Temporal Seamlessness						
Entire AOI in same acquisition season	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Entire AOI under same environmental conditions	Required	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Spatial Seamlessness						
Point cloud for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
DEM for entire AOI needs to be seamless	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable	Highly desirable
Amount of acceptable vertical manipulation to achieve spatial seamlessness	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level	Up to double the required TVU at the 95% confidence level

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
DSM	Highly desirable	Highly desirable	Highly desirable	Nice to have
DTM	Highly desirable	Highly desirable	Highly desirable	Nice to have
DEM	Required	Required	Required	Required
Raw point cloud data	Highly desirable	Highly desirable	Highly desirable	Required
Classified point cloud	Highly desirable	Highly desirable	Highly desirable	
Edited/cube XYZ		Highly desirable	Highly desirable	Nice to have
Full waveform	Highly desirable	Highly desirable	Highly desirable	Nice to have
Bathymetric Attributed Grid (BAG)		Nice to have	Highly desirable	Nice to have
Breaklines required for standard hydro-flattening	Highly desirable	Nice to have		
Additional breaklines for hydro-enforcement of culverts	Highly desirable			

Importance of 3D Products	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
National Vertical Datum Transformation Tool (V-Datum)			Required	Highly desirable
Tide Predictions			Required	Highly desirable
Tidal Constituent And Residual Interpolation (TCARI)			Highly desirable	Highly desirable
Intensity imagery/sidescan imagery	Highly desirable	Required	Required	Highly desirable
Ground control/ground truthing	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Hydrographic survey data			Required	Required
Nautical and/or navigation charts			Required	Required
Acoustic imagery of the seafloor			Highly desirable	Highly desirable
Aerial and/or satellite imagery	Required	Required	Required	Required
Underwater videography			Nice to have	Nice to have
Bottom texture			Highly desirable	Required
Bottom type			Required	Required
Submerged features			Required	Required
Subbottom characteristics			Required	Required
Geologic and seismic data	Nice to have	Nice to have	Highly desirable	Highly desirable
Water column properties - Physical			Highly desirable	Highly desirable
Water column properties - Chemical			Highly desirable	Highly desirable
Water column properties - Biological			Highly desirable	Highly desirable
Currents			Required	Required
Tide/wave heights			Required	Required
Sea ice conditions			Required	Required
Habitat distribution and classification			Highly desirable	Highly desirable
Boundaries			Required	Required
Routes			Required	Required
Offshore cadastral			Required	Required
Lease areas			Required	Required
Fixed obstructions			Required	Required
Floating observation/navigation systems			Required	Required
Shorelines – current, historic, change rates	Required	Required	Required	
Land use/land cover	Required	Required	Required	Required
Wetlands	Required	Required	Required	Required

Importance of Integration with Other Datasets	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Estuaries			Required	Required
Inland surface water features	Required	Required	Required	
Bridges/culverts	Required	Required		
Landmark features	Required	Required	Required	
Cultural resources	Required	Required	Required	
Coastal and riverine structures	Required	Required	Required	
Overhead structures			Required	
Lowest Floor Elevation of Buildings	Required			

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Current dataset used	We use a wide variety of 3d topographic data that varies from installation to installation.	We use a wide variety of bathymetric data depending on the installation.	We use a wide variety of bathymetry data from different installations.	We use a wide variety of bathymetry data for different installations.
Where current elevation data are accessed	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
National Map	Yes			
Digital Coast	Yes	Yes	Yes	Yes
NCEI	Yes		Yes	Yes
Open Topography				
NOAA nautical charts		Yes	Yes	Yes
USACE navigation charts		Yes	Yes	Yes
USGS Inland Waters server				
USGS data series		Yes		
Marine Minerals Program GIS				
State Repositories	Yes	Yes	Yes	
State repositories used	Virginia, California, North Carolina	California, North Carolina, Virginia	California, North Carolina, Virginia	
Other	Yes		Yes	
Other description	Many individual contracts		Individual contracts	
Data that meet my needs are not available				
Current Operational Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Time savings	Major	Major	Major	Major
Cost savings/cost reduction	Major	Major	Major	Major

Benefits of Currently Used Elevation Data	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Cost avoidance	Major	Major	Major	Major
Increased revenues	None	None	None	None
Mission-driven performance improvements	Major	Major	Major	Major
Current Customer Service Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Value added to products or services	Major	Major	Moderate	Major
Improved response or timeliness	Major	Major	Moderate	Major
Improved customer experience	Major	Major	Moderate	Major
Current Societal Benefits	**Inland Topo**	**Inland Bathy**	**Nearshore Bathy**	**Offshore Bathy**
Education or outreach	Moderate	Minor	Moderate	Moderate
Environmental	Moderate	Moderate	Moderate	Moderate
Public safety, including life and property	Moderate	Moderate	Moderate	Moderate

Future Benefits if Elevation Data Requirements Are Met	Inland Topo			Inland Bathy			Nearshore Bathy			Offshore Bathy		
Future Operational Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Time savings	Major	Annual dollars saved/realized	$107,093	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Time savings description	24 Installations x 2 services x 4 hours per service. 24 Installations x 2 services x 20 hours per service acquisition and distribution. 24 Installations x 50 field visits x 2 hours field visit.											
Cost savings/cost reduction	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Cost avoidance	Moderate	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Increased revenues	Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide		Minor	Unable to provide	
Mission-driven performance improvements	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Future Customer Service Benefits	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**	**Benefits**	**Units**	**Amount**
Value added to products or services	Moderate	Unable to provide		Moderate	Unable to provide		Major	Unable to provide		Moderate	Unable to provide	
Improved response or timeliness	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Improved customer experience	Major	Unable to provide		Major	Unable to provide		Major	Unable to provide		Major	Unable to provide	
Societal Benefits	**Benefits**			**Benefits**			**Benefits**			**Benefits**		
Education or outreach	Minor			Minor			Moderate			Moderate		
Environmental	Moderate			Moderate			Moderate			Moderate		
Public safety, including life and property	Moderate			Moderate			Moderate			Moderate		

3D Derivatives Needed	Inland Topo	Inland Bathy	Nearshore Bathy	Offshore Bathy
Triangulated Irregular Network (TIN)	Yes	Yes	Yes	Yes
Contours	Yes	Yes	Yes	Yes
Hillshades	Yes	Yes	Yes	Yes
Slope maps	Yes	Yes	Yes	Yes
Aspect maps	Yes	Yes	Yes	Yes
Curvature maps	Yes	Yes	Yes	Yes
Cross sections	Yes	Yes	Yes	Yes
Height-Above-Ground maps	Yes	Yes	Yes	Yes
Viewshed maps	Yes	Yes	Yes	Yes
Hydrologic Flow Direction Grids	Yes	Yes	Yes	Yes
Hydrologic Flow Accumulation Grids	Yes	Yes	Yes	Yes
Hydrologic networks (e.g. streams, lakes)	Yes	Yes	Yes	Yes
Hydrologic Units (Watershed Boundaries) (e.g. surface water drainage to a point)	Yes	Yes	Yes	Yes
Building footprints	Yes	Yes	Yes	Yes
Breaklines for road edge-of-pavement	Yes	Yes	Yes	Yes
Rugosity/Surface Roughness	Yes	Yes	Yes	Yes

Importance of 3D Data Requirements	Response
Geographic coverage	
Vertical accuracy	
Update frequency	