Please provide the following information, and submit to the NOAA DM Plan Repository.

Reference to Master DM Plan (if applicable)

As stated in Section IV, Requirement 1.3, DM Plans may be hierarchical. If this DM Plan inherits provisions from a higher-level DM Plan already submitted to the Repository, then this more-specific Plan only needs to provide information that differs from what was provided in the Master DM Plan.

URL of higher-level DM Plan (if any) as submitted to DM Plan Repository:

1. General Description of Data to be Managed

1.1. Name of the Data, data collection Project, or data-producing Program:

2016-2017 NOAA NGS Topobathy Lidar DEM: Coastal South Carolina

1.2. Summary description of the data:

These data were collected by Quantum Spatial, Inc. (QSI) for the National Oceanic and Atmospheric Administration (NOAA), National Geodetic Survey (NGS), Remote Sensing Devision (RSD), Coastal Mapping Program (CMP) using a Riegl VQ880G system. The Delivery 1 and Delivery 2 (D1/D2) data were acquired from 20161203 - 20170301 in nine missions. The missions were flown on 20161203, 20161209, 20161210, 20161228, 20161229, 20161230, 20170105, 20170228, and 20170301. The Delivery 3 (D3) data were acquired from 20161002 - 20170219 in fifteen missions. Data acquired on 10/02, pre-Hurricane Matthew, was only used to fill a small gap in data entirely over water where no bathymetric coverage was achieved. The Delivery 4 (D4) data were acquired from 20161211 - 20170204 in thirteen missions. The Delivery 5 (D5) data were acquired from 20170112 - 20170204 in eleven missions. The Delivery 6 (D6) data were acquired from 20161203 - 20170301 in eleven missions. The Delivery 7 (D7) data were acquired from 20170212 - 20170221 in eight missions. The Delivery 8 (D8) data were acquired from 20170218 - 20170227 in six missions.

1.3. Is this a one-time data collection, or an ongoing series of measurements?

One-time data collection

1.4. Actual or planned temporal coverage of the data:

2016-12-12 to 2017-03-03

1.5. Actual or planned geographic coverage of the data:

W: -80.041115, E: -79.986325, N: 32.714096, S: 32.578384
D1/D2

W: -80.575337, E: -80.307752, N: 32.542629, S: 32.254916
D3

W: -80.893994, E: -80.574798, N: 32.372078, S: 32.117508
D4

W: -81.092181, E: -80.787823, N: 32.189411, S: 31.878403
D5

W: -79.933722, E: -79.609965, N: 32.905082, S: 32.647866
D6

W: -79.717039, E: -79.327277, N: 33.117057, S: 32.886564
D7

W: -79.428248, E: -79.130611, N: 33.228379, S: 33.064631
D8

1.6. Type(s) of data:
(e.g., digital numeric data, imagery, photographs, video, audio, database, tabular data, etc.)
Model (digital)

1.7. Data collection method(s):
(e.g., satellite, airplane, unmanned aerial system, radar, weather station, moored buoy, research vessel, autonomous underwater vehicle, animal tagging, manual surveys, enforcement activities, numerical model, etc.)

1.8. If data are from a NOAA Observing System of Record, indicate name of system:

1.8.1. If data are from another observing system, please specify:

2. Point of Contact for this Data Management Plan (author or maintainer)

2.1. Name:
NOAA Office for Coastal Management (NOAA/OCM)

2.2. Title:
Metadata Contact

2.3. Affiliation or facility:
NOAA Office for Coastal Management (NOAA/OCM)

2.4. E-mail address:
coastal.info@noaa.gov

2.5. Phone number:
(843) 740-1202

3. Responsible Party for Data Management
Program Managers, or their designee, shall be responsible for assuring the proper management of the data produced by their Program. Please indicate the responsible party below.

3.1. Name:

3.2. Title:

Data Steward

4. Resources

Programs must identify resources within their own budget for managing the data they produce.

4.1. Have resources for management of these data been identified?

4.2. Approximate percentage of the budget for these data devoted to data management (specify percentage or "unknown"):

5. Data Lineage and Quality

NOAA has issued Information Quality Guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information which it disseminates.

5.1. Processing workflow of the data from collection or acquisition to making it publicly accessible

(describe or provide URL of description):

Process Steps:

- 2017-11-01 00:00:00 - Data for the NOAA South Carolina Topobathymetric-Shoreline Mapping project was acquired by Quantum Spatial (QSI) using a Riegl VQ-880G Topobathy LiDAR system. All derived DEM data is referenced to: Horizontal Datum-NAD83 (2011) epoch: 2010 Projection-UTM Zone 17N Horizontal Units-meters Vertical Datum- NAVD88 (Geoid12b) Vertical Units-meters This D1/D2 dataset encompasses 987 500m x 500m tiles in eastern South Carolina. Green and NIR (for water surface model creation that is used during refraction of the green bathymetric data) LiDAR data were acquired with the Riegl sensor VQ-880G. QSI reviewed all acquired flight lines to ensure complete coverage and positional accuracy of the laser points. QSI creates an initial product call Quick Look Coverage Maps. These Quick Looks files are not fully processed data or final products. The collected LiDAR data is immediately processed in the field by QSI to a level that will allow QA\QC measures to determine if the sensor is functioning properly and assess the coverage of submerged topography. An initial SBET is created in POSPAC MMS 7. 1 and used in RiProcess which applies pre-calibrated angular misalignment corrections of scanner position to extract the raw point cloud into geo-referenced LAS files. These files are inspected for sensor malfunctions and then passed through automated classification routines (TerraScan) to develop an initial topo-bathymetric ground model. To correct the continuous onboard measurements of the aircraft position recorded throughout the missions, QSI concurrently conducted multiple static Global Navigation Satellite System (GNSS) ground surveys (1 Hz recording frequency) over each monument. After the airborne survey, the static GPS data were triangulated with nearby Continuously Operating Reference Stations (CORS)

using the Online Positioning User Service (OPUS) for precise positioning. Multiple independent sessions over the same monument were processed to confirm antenna height measurements and to refine position accuracy. QSI then resolved kinematic corrections for aircraft position data using kinematic aircraft GPS and static ground GPS data. A smoothed best estimate trajectory (SBET) was developed that blends post-processed aircraft position with attitude data. Sensor head position and attitude are calculated throughout the survey. The SBET data are used extensively for laser point processing. The software Trimble Business Center v.3.90, Blue Marble Geographic Calculator 2016, and PosPac MMS 8.0 are used for these processes.

- 2017-11-01 00:00:00 - Next, QSI used RiProcess 1.8.1 to calculate laser point positioning of the Riegl VQ-880G data by associating SBET positions to each laser point return time, scan angle, intensity, etc. A raw laser point cloud is created in Riegl data format. Erroneous points are filtered and then automated line-to-line calibrations are performed for system attitude parameters (pitch, roll, heading), mirror flex (scale) and GPS/IMU drift. Calibrations are calculated on matching surfaces within and between each line and results are applied to all points in a flight line. Every flight line is used for relative accuracy calibration. Green data are calibrated using TerraScan, TerraModeler, and TerraMatch. Accuracy of the calibrated data is assessed using ground RTK survey data. All data are then exported to LAS 1.2 format and are ready for processing and editing. QSI verified complete coverage. Relative accuracy of the green swaths compared to overlapping and adjacent swaths and verified through the use Delta-Z (DZ) orthos created using QSI's DZ Ortho creator. QSI used the green water surface points and as needed NIR water surface points to create water surface models. These models are used in the refraction tool to determine the depth of bathymetric points and are created for single swaths to ensure temporal differences and wave or water surface height variations between flight lines do not impact the refraction of the bathymetric data.

All LiDAR data below water surface models were classified as water column. Light travels at different speeds in air versus water and its direction of travel or angle is changed or refracted when entering the water column. The refraction tool corrects for this difference by adjusting the depth (distance travelled) and horizontal position (change of angle/direction) of the LiDAR data. Using statistics and limited manual review, the output data is verified to ensure the refraction tool functioned properly. Once all green data has been refracted by flight lines, all flight lines covering each tile are combined into a single 500 m x 500 m tile. QSI used algorithms in TerraScan to create the initial ground/submerged topography surface. QSI then performed manual editing to review and improve the final topobathy surface. All LiDAR data was peer-reviewed. All necessary edits were applied to the dataset. QSI's LasMonkey was used to update LAS header information, including all projection and coordinate reference system information. The final LiDAR data are in LAS format 1.2 and point data record format 3. The final classification scheme is as follows: 1-Unclassified 2-Ground 7-Noise 19-Overlap Default 20-Overlap Ground 21-Overlap Water Column 22-Overlap Water Surface 25-Water Column 26-

Bathymetric Bottom or Submerged Topography 27-Water Surface 29-Submerged feature 31-Temporal Bathymetric Bottom 129-Edge Clip
- QSI then transformed the ellipsoid heights of the final LiDAR data to into orthometric heights referenced to NAVD88 using Geoid 12B to create the DEMs. The topobathymetric DEM was output at 1 meter resolution in IMG format into 5000 m x 5000 m tiles. The D1/D2 raster is clipped to the extent of the tile grid and named according to project specifications. Interpolated DEM dataset-These DEMs represent a continuous surface with all void areas interpolated. No void layer was incorporated into this DEM and there are no areas of No Data, regardles of whether the LiDAR data fully penetrated to the submerged topography. Void DEM dataset-A void shapefile was created to indicate areas where there was a lack of bathymetric returns. This shape was created by triangulating bathymetric bottom points with an edge length maximum of 4.56m to identify all areas greater then 9 square meters without bathymetric returns. This shapefile was used to exclude interpolated elevation data from these areas.

5.1.1. If data at different stages of the workflow, or products derived from these data, are subject to a separate data management plan, provide reference to other plan:

5.2. Quality control procedures employed (describe or provide URL of description):

6. Data Documentation

The EDMC Data Documentation Procedural Directive requires that NOAA data be well documented, specifies the use of ISO 19115 and related standards for documentation of new data, and provides links to resources and tools for metadata creation and validation.

6.1. Does metadata comply with EDMC Data Documentation directive?

No

6.1.1. If metadata are non-existent or non-compliant, please explain:

Missing/invalid information:
- 1.7. Data collection method(s)
- 3.1. Responsible Party for Data Management
- 4.1. Have resources for management of these data been identified?
- 4.2. Approximate percentage of the budget for these data devoted to data management
- 5.2. Quality control procedures employed
- 7.1. Do these data comply with the Data Access directive?
- 7.1.1. If data are not available or has limitations, has a Waiver been filed?
- 7.1.2. If there are limitations to data access, describe how data are protected
- 7.3. Data access methods or services offered
- 7.4. Approximate delay between data collection and dissemination
- 8.1. Actual or planned long-term data archive location

- 8.3. Approximate delay between data collection and submission to an archive facility
- 8.4. How will the data be protected from accidental or malicious modification or deletion prior to receipt by the archive?

6.2. Name of organization or facility providing metadata hosting:
NMFS Office of Science and Technology

6.2.1. If service is needed for metadata hosting, please indicate:

6.3. URL of metadata folder or data catalog, if known:
https://www.fisheries.noaa.gov/inport/item/53372

6.4. Process for producing and maintaining metadata
(describe or provide URL of description):
Metadata produced and maintained in accordance with the NOAA Data Documentation Procedural Directive: https://nosc.noaa.gov/EDMC/DAARWG/docs/EDMC_PD-Data_Documentation_v1.pdf

7. Data Access
NAO 212-15 states that access to environmental data may only be restricted when distribution is explicitly limited by law, regulation, policy (such as those applicable to personally identifiable information or protected critical infrastructure information or proprietary trade information) or by security requirements. The EDMC Data Access Procedural Directive contains specific guidance, recommends the use of open-standard, interoperable, non-proprietary web services, provides information about resources and tools to enable data access, and includes a Waiver to be submitted to justify any approach other than full, unrestricted public access.

7.1. Do these data comply with the Data Access directive?

7.1.1. If the data are not to be made available to the public at all, or with limitations, has a Waiver (Appendix A of Data Access directive) been filed?

7.1.2. If there are limitations to public data access, describe how data are protected from unauthorized access or disclosure:

7.2. Name of organization of facility providing data access:
NOAA Office for Coastal Management (NOAA/OCM)

7.2.1. If data hosting service is needed, please indicate:

7.2.2. URL of data access service, if known:
https://coast.noaa.gov/dataviewer/#/lidar/search/where:ID=8585
https://noaa-nos-coastal-lidar-pds.s3.us-east-1.amazonaws.com/dem/NGS_SC_Topobathy_DEM_2016_

7.3. Data access methods or services offered:

7.4. Approximate delay between data collection and dissemination:

7.4.1. If delay is longer than latency of automated processing, indicate under what authority data access is delayed:

8. Data Preservation and Protection

The NOAA Procedure for Scientific Records Appraisal and Archive Approval describes how to identify, appraise and decide what scientific records are to be preserved in a NOAA archive.

8.1. Actual or planned long-term data archive location:
(Specify NCEI-MD, NCEI-CO, NCEI-NC, NCEI-MS, World Data Center (WDC) facility, Other, To Be Determined, Unable to Archive, or No Archiving Intended)

8.1.1. If World Data Center or Other, specify:

8.1.2. If To Be Determined, Unable to Archive or No Archiving Intended, explain:

8.2. Data storage facility prior to being sent to an archive facility (if any):
Office for Coastal Management - Charleston, SC

8.3. Approximate delay between data collection and submission to an archive facility:

8.4. How will the data be protected from accidental or malicious modification or deletion prior to receipt by the archive?
Discuss data back-up, disaster recovery/contingency planning, and off-site data storage relevant to the data collection

9. Additional Line Office or Staff Office Questions

Line and Staff Offices may extend this template by inserting additional questions in this section.