

*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:**

2015 USGS Lidar: Eastern Shore VA

### **1.2. Summary description of the data:**

Leading Edge Geomatics (LEG) collected 994 square miles in the Virginia counties of Accomack and Northampton. The nominal pulse spacing for this project was 1 point every 0.7 meters. Dewberry used proprietary procedures to classify the LAS according to project specifications: 0-Never Classified, 1-Unclassified, 2-Ground (bare earth points identified as Model Key Points are flagged with the Model Key Point bit), 7-Low Noise, 9-Water, 10-Ignored Ground due to breakline proximity, 17- Bridge Decks, 18-High Noise. Because the Eastern Shore Virginia LiDAR project includes data from the Sandy Topobathy project, there are also topobathy point classifications. They are: 23 - Sensor noise, 24 - Refracted sensor noise, 25 - Water column, 26 - Bathymetric bottom, 27 - Water Surface. Classes 28, 29, and 151 were also included, but after discussion with Dewberry, were determined to be noise classes that should be disregarded. NOAA Office for Coastal Management processed all classifications of points to the Digital Coast Data Access Viewer (DAV), but have made the topobathy noise points unavailable. Classes available from the DAV are: 1, 2, 7, 9, 10, 17, 18, 25, 26, 27.

Dewberry produced 3D breaklines and combined these with the final LiDAR data to produce seamless hydro flattened DEMs for the project area. The data was formatted according to the VBMP tile naming convention with each tile covering an area of 5,000 feet by 5,000 ft. A total of 1375 LAS tiles and 1310 DEM tiles were produced for the entire project.

The NOAA Office for Coastal Management (OCM) downloaded this lidar data from the USGS site: [ftp://rockyftp.cr.usgs.gov/vdelivery/Datasets/Staged/NED/LPC/projects/USGS\\_LPC\\_VA\\_Eastern\\_ShoreBAA\\_2015\\_LAS\\_2017/](ftp://rockyftp.cr.usgs.gov/vdelivery/Datasets/Staged/NED/LPC/projects/USGS_LPC_VA_Eastern_ShoreBAA_2015_LAS_2017/) and processed the data to be available on the Digital Coast Data Access Viewer (DAV).

In addition to these lidar point data, the breakline data are also available. These data are available for download at the link provided in the URL section of this metadata record. These products have not been reviewed by the NOAA Office for Coastal Management (OCM) and any conclusions drawn from the analysis of this information

are not the responsibility of NOAA or OCM.

**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:**

2015-04-11 to 2015-04-24

**1.5. Actual or planned geographic coverage of the data:**

W: -76.093949, E: -75.2271, N: 38.064707, S: 37.062181

**1.6. Type(s) of data:**

*(e.g., digital numeric data, imagery, photographs, video, audio, database, tabular data, etc.)*

Point Cloud (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:

- 2015-04-01 00:00:00 - Data for the Eastern Shores Virginia QL2 LiDAR project was acquired by Leading Edge Geomatics (LEG). The project area included approximately 994 contiguous square miles or 2574.45 square kilometers for the counties of Accomack and Northampton in Virginia. LiDAR sensor data were collected with the Riegl 680i LiDAR system. The data was delivered in the State Plane coordinate system, feet, Virginia South, horizontal datum NAD83, vertical datum NAVD88, Geoid 12a. Deliverables for the project included a raw (unclassified) calibrated LiDAR point cloud, survey control, and a final acquisition/calibration report. The calibration process considered all errors inherent with the equipment including errors in GPS, IMU, and sensor specific parameters. Adjustments were made to achieve a flight line to flight line data match (relative calibration) and subsequently adjusted to control for absolute accuracy. Process steps to achieve this are as follows: Rigorous LiDAR calibration: all sources of error such as the sensor's ranging and torsion parameters, atmospheric variables, GPS conditions, and IMU offsets were analyzed and removed to the highest level possible. This method addresses all errors, both vertical and horizontal in nature. Ranging, atmospheric variables, and GPS conditions affect the vertical position of the surface, whereas IMU offsets and torsion parameters affect the data horizontally. The horizontal accuracy is proven through repeatability: when the position of features remains constant no matter what direction the plane was flying and no matter where the feature is positioned within the swath, relative horizontal accuracy is achieved. Absolute horizontal accuracy is achieved through the use of differential GPS with base lines shorter than 25 miles. The base station is set at a temporary monument that is 'tied-in' to the CORS network. The same position is used for every lift, ensuring that any errors in its position will affect all data equally and can therefore

be removed equally. Vertical accuracy is achieved through the adjustment to ground control survey points within the finished product. Although the base station has absolute vertical accuracy, adjustments to sensor parameters introduces vertical error that must be normalized in the final (mean) adjustment. A copy of the final calibrated swaths are maintained in LAS format 1.2 for production utilizing Terrascan software. A second, identical version of final calibrated swaths are converted from v1.2 to v1.4 using GeoCue software. The withheld and overlap bits are set and all headers, appropriate point data records, and variable length records, including spatial reference information, are updated in GeoCue software and then verified using proprietary Dewberry tools.

- 2015-09-01 00:00:00 - Dewberry utilizes a variety of software suites for inventory management, classification, and data processing. All LiDAR related processes begin by importing the data into the GeoCue task management software. The swath data is tiled according to project specifications (5,000 ft x 5,000 ft). Dewberry extended the client provided boundary where tiles had ground to include thirty four extra tiles. The tiled data is then opened in Terrascan where Dewberry classifies edge of flight line points that may be geometrically unusable to a separate class. These points are separated from the main point cloud so that they are not used in the ground algorithms. Dewberry then uses proprietary ground classification routines to remove any non-ground points and generate an accurate ground surface. The ground routine consists of three main parameters (building size, iteration angle, and iteration distance); by adjusting these parameters and running several iterations of this routine an initial ground surface is developed. The building size parameter sets a roaming window size. Each tile is loaded with neighboring points from adjacent tiles and the routine classifies the data section by section based on this roaming window size. The second most important parameter is the maximum terrain angle, which sets the highest allowed terrain angle within the model. As part of the ground routine, low noise points are classified to class 7 and high noise points are classified to class 18. Once the ground routine has been completed, bridge decks are classified to class 17 using bridge breaklines compiled by Dewberry. A manual quality control routine is then performed using hillshades, cross-sections, and profiles within the Terrasolid software suite. After this QC step, a peer review is performed on all tiles and a supervisor manual inspection is completed on a percentage of the classified tiles based on the project size and variability of the terrain. After the ground classification and bridge deck corrections are completed, the dataset is processed through a water classification routine that utilizes breaklines compiled by Dewberry to automatically classify hydrographic features. The water classification routine selects ground points within the breakline polygons and automatically classifies them as class 9, water. During this water classification routine, points that are within 1x NPS or less of the hydrographic features are moved to class 10, an ignored ground due to breakline proximity. Next, an intelligently thinned ground classification identified model key points and are flagged with the Model Key Point bit. Overage points are then identified in Terrascan and GeoCue is used to set the overlap bit for the overage

points and the withheld bit is set on the withheld points previously identified in Terrascan before the ground classification routine was performed. A final QC is performed on the data. The LAS files are then converted from v1.2 to v1.4 using GeoCue software. At this time, all headers, appropriate point data records, and variable length records, including spatial reference information, are updated in GeoCue software and then verified using proprietary Dewberry tools. The data was classified as follows: Class 1 = Unclassified. This class includes vegetation, buildings, noise etc. Class 2 = Ground (bare earth points identified as Model Key Points are flagged with the Model Key Point bit) Class 7 = Low Noise Class 9 = Water Class 10 = Ignored Ground due to breakline proximity Class 17 = Bridge Decks Class 18 = High Noise The LAS header information was verified to contain the following: Class (Integer) Adjusted GPS Time (0.0001 seconds) Easting (0.003 m) Northing (0.003 m) Elevation (0.003 m) Echo Number (Integer) Echo (Integer) Intensity (16 bit integer) Flight Line (Integer) Scan Angle (degree)

- 2015-09-01 00:00:00 - Existing lidar data acquired and processed as part of the NOAA Sandy Supplemental project were re-processed and combined with the LEG data to supplement/complete data coverage along the eastern portion of this project

- 2018-01-29 00:00:00 - The NOAA Office for Coastal Management (OCM) downloaded 1375 las files from the USGS rockyftp site. The files contained elevation and intensity measurements for the eastern shore of Virginia. The data were in VA State Plane South coordinates and NAVD88 (Geoid12A) elevations in survey feet. The data were classified as: 1-Unclassified, 2-Ground (bare earth points identified as Model Key Points are flagged with the Model Key Point bit), 7-Low Noise, 9-Water, 10-Ignored Ground due to breakline proximity, 17- Bridge Decks, 18-High Noise. Because the Eastern Shore Virginia LiDAR project included data from the Sandy Topobathy project, there were also topobathy point classifications. They were: 23 - Sensor noise, 24 - Refracted sensor noise, 25 - Water column, 26 - Bathymetric bottom, 27 - Water Surface. Classes 28, 29, and 151 were also included, but after discussion with Dewberry, were determined to be noise classes that should be disregarded. NOAA Office for Coastal Management processed all classifications of points to the Digital Coast Data Access Viewer (DAV), but made the topobathy noise points unavailable. Classes available on the DAV are: 1, 2, 7, 9, 10, 17, 18, 25, 26, 27. OCM performed the following processing on the data for Digital Coast storage and provisioning purposes: 1. Data file names were standardized to OCM file naming convention (retaining USGS names). 2. The LAsTools software scripts lasinfo and lasvalidate were run on the las files to check for errors. 3. An internal OCM script was run to check the number of points by classification and by flight ID and the gps and intensity ranges. 4. Internal OCM scripts were run on the las files to convert from orthometric (NAVD88) elevations to ellipsoid elevations using the Geoid 12A model, to convert from VA State Plane South coordinates to geographic coordinates, to convert from elevations in survey feet to meters, to assign the geokeys, to sort the data by gps time and zip the data to database and to http.

#### **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
- 7.4. 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/50784>

**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](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=8445>

<https://noaa-nos-coastal-lidar-pds.s3.amazonaws.com/laz/geoid18/8445/index.html>

### 7.3. Data access methods or services offered:

This data can be obtained on-line at the following URL: <https://coast.noaa.gov/dataviewer/#/lidar/search/where:ID=8445>

### 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.*