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 Lowndes County (GA) Lidar DEM

1.2. Summary description of the data:

TASK NAME: NOAA OCM Lidar for Lowndes County, GA with the option to Collect Lidar in Cook and Tift Counties, GA

Lidar Data Acquisition and Processing Production Task

NOAA Contract No. EA133C11CQ0010

Woolpert Order No. 05271

CONTRACTOR: Woolpert, Inc.

This data set is comprised of lidar point cloud data, raster DEM, hydrologic 3-d breaklines, flightline vectors, survey control, project tile index, and project data extent. This task order requires lidar data to be acquired over the Lowndes County, GA area of interest (AOI), and will be acquired as part of this task order. The total area of the Lowndes County, GA AOI is approximately 500 square miles. The lidar data acquisition parameters for this mission are detailed in the lidar processing report for this task order. The lidar data will be acquired and processed under the requirements identified in this task order. Lidar data is a remotely sensed high resolution elevation data collected by an airborne platform. The lidar sensor uses a combination of laser range finding, GPS positioning, and inertial measurement technologies. The lidar systems collect data point clouds that are used to produce highly detailed Digital Elevation Models (DEMs) of the earth's terrain, man-made structures, and vegetation. The task required the LiDAR data to be collected at a nominal pulse spacing (NPS) of 0.7 meters. The final products include classified LAS, four (4) foot pixel raster DEMs of the bare-earth surface ESRI Grid Format. Each LAS file contains lidar point information, which has been calibrated, controlled, and classified. Additional deliverables include hydrologic breakline data, flightline vectors, control data, tile index, lidar processing and survey reports in PDF format, FGDC metadata files for each data deliverable in .xml format. Ground conditions: Water at normal levels; no unusual inundation; no snow.

Original contact information:

Contact Org: Woolpert

Phone: (937) 461-5660

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:
2015-03-16 to 2015-03-27

1.5. Actual or planned geographic coverage of the data:
W: -83.614795, E: -82.982704, N: 31.095266, S: 30.58606

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

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:
- 2015-03-17 00:00:00 - Using one Leica Optech Gemini (lidar) system on board a Cessna 310 Titan fixed-wing aircraft, lidar data, at a nominal pulse spacing (NPS) of 0.7 meters, was collected for this task order (approximately 500 square miles). AGL = 6500 feet - Aircraft Speed = 150 Knots, Field of View (Full) = 40 degrees, Pulse Rate = 272.0 kHz, Scan Rate = 41.0 Hz, with an average side lap of 20%. Multiple returns were recorded for each laser pulse along with an intensity value for each return. Five (5) missions were flown between March 16, 2015 and March 27, 2015. One (1) Global Navigation Satellite System (GNSS) Base Station was used in support of the lidar data acquisition. Specific information regarding latitude, longitude, and ellipsoid height to the L1 phase center is included in the lidar processing report. Multiple returns were recorded for each laser pulse along with an intensity value for each return. The lidar data acquisition parameters for this mission are detailed in the lidar processing report for this task order. For all acquired lidar data as part of entire NOAA Lidar for Lowndes County, GA task order, the geoid used to reduce satellite derived elevations to orthometric heights was GEOID12A. Data for the task order is referenced to the StatePlane Zone of Georgia West, North American Datum of 1983 (2011) US Feet, and NAVD88, in US Feet. Once the data acquisition and GPS processing phases are complete, the lidar data was processed immediately to verify the coverage had no voids. The GPS and IMU data was post processed using differential and Kalman filter algorithms to derive a best estimate of trajectory. The quality of the solution was verified to be consistent with the accuracy requirements

of the project. The SBET was used to reduce the lidar slant range measurements to a raw reflective surface for each flight line. The coverage was classified to extract a bare earth digital elevation model (DEM) and separate last returns. The Optech Gemini calibration and system performance is verified on a periodic basis using Woolpert's calibration range. The calibration range consists of a large building and runway. The edges of the building and control points along the runway have been located using conventional survey methods. Inertial measurement unit (IMU) misalignment angles and horizontal accuracy are calculated by comparing the position of the building edges between opposing flight lines. The scanner scale factor and vertical accuracy is calculated through comparison of lidar data against control points along the runway. Field calibration is performed on all flight lines to refine the IMU misalignment angles. IMU misalignment angles are calculated from the relative displacement of features within the overlap region of adjacent (and opposing) flight lines. The raw lidar data is reduced using the refined misalignment angles.

- 2015-03-17 00:00:00 - Ground control and QAQC control point survey was performed by Woolpert surveyors, to support the NOAA Lidar for Lowndes County, GA project. All surveys were performed in such a way as to achieve ground control that supports lidar data at 9.25 cm RMSE accuracy and satisfy a local network accuracy of 5 cm at a 95% confidence level. All ground control survey field activities took place from 03/16/2015 thru 03/23/2015. Woolpert collected control data for data processing as supplemental QAQC points. The supplemental QAQC points were collected to be used in independent accuracy testing. The field crew utilized Real-Time Kinematic (RTK) GPS surveying throughout most of the ground control data collection process. Using RTK GPS techniques, observations were performed on a total of 30 LiDAR control points and 152 ground control quality check points. The survey was conducted using a 1-second epoch rate, in a fixed solution RTK mode, with each observation lasting between 60 to 180 seconds. Each station was occupied twice to insure the necessary horizontal and vertical accuracies were being met for this photogrammetric project. The "Virtual Reference Station" (VRS) concept is based on having a network (spaced at 50-60kms) of GNSS (GPS or GPS/GLONASS) reference stations permanently connected to the control center via the Internet. The networked stations collectively and precisely, model Ionospheric errors for the individual GNSS rover in the network coverage area. The rover interprets and uses the VRS network-correction data as if it is operating with a single physical base station on a very short baseline which increases the RTK performance. Corrections (vectors) are from the closest base, but because the ionospheric error (which is traditionally baseline dependent) is practically negated, the rover's degradation in accuracy due to baseline length starts when the rover is first initialized, that is, at the work site. Thus accuracies are increased and more consistent throughout the working region.

- 2015-03-17 00:00:00 - The individual flight lines were inspected to ensure the systematic and residual errors have been identified and removed. Then, the flight lines were compared to adjacent flight lines for any mismatches to obtain a

homogenous coverage throughout the project area. The point cloud underwent a classification process to determine bare-earth points and non-ground points utilizing "first and only" as well as "last of many" lidar returns. This process determined Default (Class 1), Ground (Class 2), Noise (Class 7), Water (Class 9), Ignored Ground (Class 10), Overlap Default (Class 17) and Overlap Ground (Class 18). The bare-earth (Class 2 - Ground) lidar points underwent a manual QA/QC step to verify the quality of the DEM as well as a peer-based QC review. This included a review of the DEM surface to remove artifacts and ensure topographic quality. Classification of water (class 9) and ignored ground (class 10) was completed via the use of the hydrologic breaklines collected for the hydro-flattening phase. The overlap classes were determined by first identifying the overlapping areas and reclassifying the LAS data by offset from a corridor. This allows the returns located on the edge of the swath to be removed from the bare earth coverage in an effort to produce a more uniform data density. The returns determined to be overlap are then further classified to produce overlap default (class 17) and overlap ground (class 18). The surveyed ground control points are used to make vertical adjustments to the data set and to perform the accuracy checks and statistical analysis of the lidar dataset. Supervisory QC monitoring of work in progress and completed editing ensured consistency of classification character and adherence to project requirements across the entire project area. The method used to create the DEM consisted of isolating the ground (class 2) points and introducing 3-d breakline data derived from delineating hydrologic features and applying USGS v1.0 hydro flattening specification z-values. This combined dataset was then processed into a gridded format for additional QAQC to ensure DEM quality. Following QAQC process completion, a gridded raster file was created on a per tile basis. The task order projection information was applied to the final raster dataset. Prior to delivery, all raster files were visually reviewed to ensure coverage and reviewed using automated processes to ensure proper formatting. The resulting deliverables for this task order consist of classified LAS file in LAS 1.2 format, 4 feet pixel size DEM files in ESRI Grid format, and Hydrologic Breakline, Flightline Vector, and Control Point data in ESRI Geodatabase format.
- 2016-09-07 00:00:00 - The first delivery of this dataset (August, 2015) to the NOAA Office for Coastal Management arrived via hard-drive device from Woolpert, the contracting the company for this project. An internal review from the CGSC data team at NOAA OCM generated a report with data concerns and alterations required before accepting the data as final. A second delivery arrived in October, 2015 and the dataset was marked as final and accepted for distribution on the Digital Coast. The project files included lidar, breaklines and DEMs. OCM performed the following processing for data storage and Digital Coast provisioning purposes: 1. The delivered DEM rasters were converted from Georgia West State Plane Coordinate System (1002 in feet) to geographic (decimal degrees). 2. The vertical coordiante system was kept the same, NAVD88 in meters.

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:
- 1.6. Type(s) of data
- 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/49425

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=5155
https://noaa-nos-coastal-lidar-pds.s3.us-east-1.amazonaws.com/dem/Lowndes_DEM_2015_5155/index

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=5155;

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.