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:

2017 Lidar DEM: City of Palm Coast, FL

1.2. Summary description of the data:

Digital Aerial Solutions LLC collected 185.5 square miles in the City of Palm Coast in Florida. The nominal pulse spacing for this project was 1 point every 0.35 meters. Dewberry used proprietary procedures to classify the LAS according to project specifications: 1-Unclassified, 2-Ground, 7-Low Noise, 9-Water, 10-Ignored Ground due to breakline proximity, 17- Overpasses and Bridges, 18-High Noise. 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 FDEM statewide tiling scheme with each tile covering an area of 5,000 ft by 5,000 ft. A total of 161 LAS tiles and 161 DEM tiles were produced for the entire project.

The NOAA Office for Coastal Management (OCM) received 161 DEM files from the City of Palm Coast, FL. OCM processed the data to be available on the Digital Coast Data Access Viewer (DAV).

In addition to these bare earth Digital Elevation Model (DEM) data, the lidar point data that these DEM data were created from, are also available. These data are available for custom download at the link provided in the URL section of this metadata record.

Breakline data are also available. These data are 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:

2017-03-28 to 2017-03-29

1.5. Actual or planned geographic coverage of the data:

W: -81.381478, E: -81.14499762, N: 29.65638572, S: 29.40842538

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:

- 2017-03-01 00:00:00 - Data for St. Johns River Water Management District QL2 Lidar Project was acquired by Digital Aerial Solutions LLC. The project area included approximately 185.5 contiguous square miles or 480.44 square kilometers for the City of Palm Coast in Florida. Lidar sensor data were collected with the Leica ALS80 HP lidar system. The data was delivered in NAD83(2011) State Plane Florida East, U.S. Survey Feet and NAVD88 (Geoid12B), U.S. Survey Feet. 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. 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.
- 2017-06-01 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). The tiled data is then opened in Terrascan where Dewberry identifies edge of flight line points that may be geometrically unusable with the withheld bit. These points are separated from the main point cloud so that they are not used in the ground algorithms. Overage points are then identified with the overlap bit. 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. A final QC is performed on the data. 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 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)
- 2017-06-01 00:00:00 - Dewberry used GeoCue software to produce intensity imagery and raster stereo models from the source lidar for use in lidargrammetry techniques. Dewberry then produced full point cloud intensity imagery, bare earth ground models, density models, and slope models. These files were ingested into eCognition software, segmented into polygons, and training samples were created

to identify water. eCognition used the training samples and defined parameters to identify water segments throughout the project area. Water segments were then reviewed for completeness, separated into project defined feature classes, merged, and smoothed. Elevations derived from a bare earth lidar terrain were applied to each feature for 3D attribution. The delineation of lakes and ponds and tidal waters, or other water bodies at a constant elevation, was achieved using eCognition software. Lidargrammetry was used to monotonically collect streams and rivers, or features that have gradient 3D elevations. All breaklines were collected according to specifications for the project.
- 2017-09-01 00:00:00 - Dewberry digitized 2D bridge deck polygons from the intensity imagery and used these polygons to classify bridge deck points in the LAS to class 17. As some bridges are hard to identify in intensity imagery, Dewberry then used ESRI software to generate bare earth elevation rasters. Bare earth elevation rasters do not contain bridges. As bridges are removed from bare earth DEMs but DEMs are continuous surfaces, the area between bridge abutments must be interpolated. The rasters are reviewed to ensure all locations where the interpolation in a DEM indicates a bridge have been collected in the 2D bridge deck polygons.
- 2017-10-01 00:00:00 - The bridge deck polygons are loaded into Terrascan software. Lidar points and surface models created from ground lidar points are reviewed and 3D bridge breaklines are compiled in Terrascan. Typically, two breaklines are compiled for each bridge deck-one breakline along the ground of each abutment. The bridge breaklines are placed perpendicular to the bridge deck and extend just beyond the extents of the bridge deck. Extending the bridge breaklines beyond the extent of the bridge deck allows the compiler to use ground elevations from the ground lidar data for each endpoint of the breakline.
- 2017-09-01 00:00:00 - Breaklines are reviewed against lidar intensity imagery to verify completeness of capture. All breaklines are then compared to ESRI terrains created from ground only points prior to water classification. The horizontal placement of breaklines is compared to terrain features and the breakline elevations are compared to lidar elevations to ensure all breaklines match the lidar within acceptable tolerances. Some deviation is expected between hydrographic breakline and lidar elevations due to monotonicity, connectivity, and flattening rules that are enforced on the hydrographic breaklines. Once completeness, horizontal placement, and vertical variance is reviewed, all breaklines are reviewed for topological consistency and data integrity using a combination of ESRI Data Reviewer tools and proprietary tools. Corrections are performed within the QC workflow and re-validated.
- 2017-09-01 00:00:00 - Class 2, ground, and Class 8, model key points, lidar points are exported from the LAS files into an Arc Geodatabase (GDB) in multipoint format. The 3D breaklines, Inland Lakes and Ponds and Streams and Tidal are imported into the same GDB. An ESRI Terrain is generated from these inputs. The surface type of each input is as follows: Ground Multipoint: Masspoints Inland Lakes and Ponds: Hard Replace Streams and Rivers : Hard Line Tidal : Hard Replace

- 2017-10-01 00:00:00 - The ESRI Terrain is converted to a raster. The raster is created using linear interpolation with a 2.5 foot cell size. The DEM is reviewed with hillshades in both ArcGIS and Global Mapper. Hillshades allow the analyst to view the DEMs in 3D and to more efficiently locate and identify potential issues. Analysts review the DEM for missed lidar classification issues, incorrect breakline elevations, incorrect hydro-flattening, and artifacts that are introduced during the raster creation process.
- 2017-10-01 00:00:00 - The corrected and final DEM is clipped to individual tiles. Dewberry uses a proprietary tool that clips the DEM to each tile located within the final Tile Grid, names the clipped DEM to the Tile Grid Cell name, and verifies that final extents are correct. All individual tiles are loaded into Global Mapper for the last review. During this last review, an analsyt checks to ensure full, complete coverage, no issues along tile boundaries, tiles seamlessly edge-match, and that there are no remaining processing artifacts in the dataset.
- 2023-07-03 00:00:00 - The NOAA Office for Coastal Management (OCM) received 161 DEM files from the City of Palm Coast, Florida. The data were in FL State Plane East (NAD83 2011) coordinates and NAVD88 (Geoid12B) elevations in feet. The bare earth hydro-flattened raster files were at a 2.5 ft grid spacing. OCM performed the following processing on the data for Digital Coast storage and provisioning purposes: Converted the raster files from img format to cloud optimized geotiffs

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/52734

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=8535
https://noaa-nos-coastal-lidar-pds.s3.us-east-1.amazonaws.com/dem/FL_Palm_Coast_DEM_2017_8535

7.3. Data access methods or services offered:

Data is available online for custom and bulk downloads.

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.