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:

2018 TWDB Lidar DEM: Coastal Texas

1.2. Summary description of the data:

The Texas Water Development Board (TWDB) in cooperation with their project partners tasked Fugro Geospatial, Inc. (Fugro) under the Department of Information Resources (DIR) Geographic Information Systems (GIS) Hardware, Software and Services contract also known as the Texas Strategic Mapping (StratMap) Contract to acquire high resolution elevation data and associated products from airborne lidar systems during the 2017-2018 leaf-off season. The StratMap Program promotes inter-governmental collaboration and partnerships to purchase geospatial data products that provide cost savings and project efficiencies. Both the StratMap Program and the StratMap Contract are administered by the Texas Natural Resources Information System (TNRIS), a division of TWDB. Project partners include: Houston-Galveston Area Council (H-GAC), Harris County Flood Control District (HCFCD), and the United States Geological Survey (USGS). This Coastal Texas project consists of approximately 9,758 DO4Q tiles and is located on the Texas Coast covering much of Orange to Matagorda County along with Harris County and the surrounding area. The project includes large metropolitan areas as well as coastal areas. The Urban and Coastal AOIs consist of approximately 4.045 square miles and were acquired between January 12 and March 22, 2018 utilizing both Riegl LMS-Q680i and Riegl LMS-Q780 sensors; collecting multiple return x, y, and z as well as intensity data. Specialized in-house and commercial software processes the native lidar data into 3-dimensional positions that can be imported into GIS software for visualization and further analysis.

The NOAA Office for Coastal Management (OCM) downloaded this data set from this TNRIS site:

https://data.tnris.org/collection/b5bd2b96-8ba5-4dc6-ba88-d88133eb6643

These files were processed to the Data Access Viewer (DAV) and https. The total number of files downloaded and processed was 9071.

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. Hydro breaklines are also available. These data are available for download at the link provided in the URL section of this metadata record. Please note that 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:
2018-01-13, 2018-01-14, 2018-01-15, 2018-01-17, 2018-01-18, 2018-01-22, 2018-01-23, 2018-01-24, 2018-01-25, 2018-01-28, 2018-01-29, 2018-01-30, 2018-01-31, 2018-02-02, 2018-02-08, 2018-02-19, 2018-02-23, 2018-02-26, 2018-03-01, 2018-03-02, 2018-03-03, 2018-03-06, 2018-03-07, 2018-03-08, 2018-03-11, 2018-03-12, 2018-03-13, 2018-03-14, 2018-03-19, 2018-03-20, 2018-03-21, 2018-03-22

1.5. Actual or planned geographic coverage of the data:
W: -96.609375, E: -93.687493, N: 31.03125, S: 28.59375

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):
Lineage Statement:
Fugro collected Light Detection and Ranging (LIDAR) data in the coastal upper Texas project area for the Texas Water Development Board (TWDB) and TNRIS. NOAA OCM downloaded the data from TNRIS and ingested it into the Digital Coast Data Access Viewer for distribution.

Process Steps:
- 2018-04-01 00:00:00 - All acquired lidar data went through a preliminary review to assure that complete coverage had been obtained and that there were no gaps between flight lines before the flight crew left the project site. Once back in the office, the data was run through a complete iteration of processing to ensure that it is complete, uncorrupted, and that the entire project area has been covered without gaps between flight lines. There are essentially three steps to this processing: 1) GPS/ IMU Processing - Airborne GPS and IMU data was processed using the airport GPS base station data. 2) Raw Lidar Data Processing - Technicians processed the raw data to LAS format flight lines with full resolution output before performing QC. A starting configuration file is used in this process, which contains the latest

calibration parameters for the sensor. The technicians also generated flight line trajectories for each of the flight lines during this process. 3) Verification of Coverage and Data Quality - Technicians checked the trajectory files to ensure completeness of acquisition for the flight lines, calibration lines, and cross flight lines. The intensity images were generated for the entire lift at the required 0.5 meter NPS. Visual checks of the intensity images against the project boundary were performed to ensure full coverage to the 300 meter buffer beyond the project boundary. The intensity histogram was analyzed to ensure the quality of the intensity values. The technician also thoroughly reviewed the data for any gaps in project area. The technician generated a sample TIN surface to ensure no anomalies were present in the data. Turbulence was inspected for each flight line; if any adverse quality issues were discovered, the flight line was rejected and re-flown. The technician also evaluated the achieved post spacing against project specified 0.5 meter NPS as well as making sure no clustering in point distribution.
- 2018-05-11 00:00:00 - The boresight for each lift was done individually as the solution may change slightly from lift to lift. The following steps describe the Raw Data Processing and Boresight process: 1) Technicians processed the raw data to LAS format flight lines using the final GPS/IMU solution. This LAS data set was used as source data for boresight. 2) Technicians first used Fugro proprietary and commercial software to calculate initial boresight adjustment angles based on sample areas within the lift. These areas cover calibration flight lines collected in the lift, cross tie and production flight lines. These areas are well distributed in the lift coverage and cover multiple terrain types that are necessary for boresight angle calculation. The technician then analyzed the results and made any necessary additional adjustment until it is acceptable for the selected areas. 3) Once the boresight angle calculation was completed for the selected areas, the adjusted settings were applied to all of the flight lines of the lift and checked for consistency. The technicians utilized commercial and proprietary software packages to analyze the matching between flight line overlaps for the entire lift and adjusted as necessary until the results met the project specifications. 4) Once all lifts were completed with individual boresight adjustment, the technicians checked and corrected the vertical misalignment of all flight lines and also the matching between data and ground truth. The relative accuracy was ? 3 cm RMSDz within swath overlap (between adjacent swaths) with a maximum difference of ± 17 cm. 5) The technicians ran a final vertical accuracy check of the boresighted flight lines against the surveyed ground control points after the z correction to ensure the requirement of RMSEz (non-vegetated) ? 10 cm, NVA ? 19.6 cm 95% Confidence Level was met.
- 2018-05-29 00:00:00 - Once boresighting was completed, the project was set up for automatic classification. First, the lidar data was cut into production tiles and the flight line overlap points, noise points, ground points, and building points were classified automatically. Fugro utilized commercial software, as well as proprietary, in-house developed software for automatic filtering. The parameters used in the process were customized for each terrain type to obtain optimum results. These

parameters were also customized to capture multiple categories of vegetation based on height (low, medium, and high vegetation). After all “low” points are classified, points remaining are reclassified automatically based on height from the ground. Once the automated filtering was completed, the files were run through a visual inspection to ensure that the filtering was not too aggressive or not aggressive enough. In cases where the filtering was too aggressive and important terrain were filtered out, the data was either run through a different filter within local area or was corrected during the manual filtering process. Bridge deck points and culvert points were classified as well during the interactive editing process. Interactive editing was completed in visualization software that provides manual and automatic point classification tools. Fugro utilized commercial and proprietary software for this process. All manually inspected tiles went through a peer review to ensure proper editing and consistency. After the manual editing and peer review, all tiles went through another final automated classification routine. This process ensures only the required classifications are used in the final product (all points classified into any temporary classes during manual editing will be re-classified into the project specified classifications). Once manual inspection, QC and final autofilter is complete for the lidar tiles, the LAS data was packaged to the project specified tiling scheme, cut to the approved tile layout, and formatted to LAS v1.4. It was also re-projected to UTM Zone 15 north; NAD83(2011), meters; NAVD88(GEOID12B), meters. The file header was formatted to meet the project specification. This Classified Point Cloud product was used for the generation of derived products. This product was delivered in fully compliant LAS v1.4, Point Record Format 6 with Adjusted Standard GPS Time. Georeferencing information is included in all LAS file headers. Each tile has File Source ID assigned to zero. The Point Source ID matches to the flight line ID in the flight trajectory files. Intensity values are included for each point, normalized to 16-bit. The following classifications are included: Class 1 – Processed, but unclassified; Class 2 – Bare earth ground; Class 3 – Low Vegetation (0. 01m to 1.00m above ground); Class 4 – Medium Vegetation (1.01m to 3.00m above ground); Class 5 – High Vegetation (greater than 3.01m above ground); Class 6 – Building; Class 7 – Low Point (Noise); Class 9 – Water; Class 10 – Ignored Ground; Class 14 – Culverts; and Class 17 – Bridge Decks. The classified point cloud data was delivered in tiles without overlap using the project tiling scheme.
- 2018-05-30 00:00:00 - Hydro linework is produced by heads-up digitizing using classified lidar datasets. Additionally, products created from lidar including intensity images, shaded-relief TIN surfaces, and contours are used. Hydrographic features were collected as separate feature classes: 1) Inland Ponds and Lakes nominally larger than 2 acres in area (Ponds_and_Lakes) and 2) Inland Streams and Rivers nominally larger than 15.25 meters (Stream_and_River)(1_Acre_Islands). After initial collection, features were combined into working regions based on watershed sub-basins. Linework was then checked for the following topological and attribution rules: 1) Lines must be attributed with the correct feature code and 2) Lake and stream banklines must form closed polygons. Hydro features were collected as vector linework using lidar and its derived products listed above. This

linework is initially 2D, meaning that it does not have elevation values assigned to individual line vertices. Vertex elevation values were assigned using a distance weighted distribution of lidar points closest to each vertex. This is similar to draping the 2D linework to a surface modeled from the lidar points. After the initial 'drape', the linework elevation values were further adjusted based on the following rules: 1) Lake feature vertices were re-assigned (flattened) to lowest draped vertex value, and 2) Double stream bankline vertices were re-assigned based on the vertices of the closest adjusted double stream connector line. Fugro proprietary software was used to create profiles to ensure bank to bank flatness, monotonicity check, and lake flatness. The hydro breaklines were delivered as polygons in Esri ArcGIS version 10.3 geodatabase format.
- 2018-06-01 00:00:00 - The hydro-flattened bare earth DEM was generated using the lidar bare earth points and 3D hydro breaklines to a resolution of 1 meter. The bare earth points that fell within 1*NPS along the hydro breaklines (points in class 10) were excluded from the DEM generation process. This is analogous to the removal of mass points for the same reason in a traditional photogrammetrically compiled DTM. This process was done in batch using proprietary software. The technicians then used Fugro proprietary software for the production of the lidar-derived hydro-flattened bare earth DEM surface in initial grid format at 1 meter GSD. Water bodies (inland ponds and lakes), inland streams and rivers, and island holes were hydro-flattened within the DEM. Hydro-flattening was applied to all water impoundments, natural or man-made, nominally larger than 2 acres in area and to all streams nominally wider than 15.25 meters. This process was done in batch. Once the initial, hydro-flattened bare earth DEM was generated, the technicians checked the tiles to ensure that the grid spacing met specifications. The technicians also checked the surface to ensure proper hydro-flattening. The entire data set was checked for complete project coverage. Once the data was checked, the tiles were then converted to .IMG format. Georeference information is included in the raster files.
- 2019-10-15 00:00:00 - The NOAA Office for Coastal Management (OCM) downloaded 9071 raster DEM files in img format from TNRIS at this site: https://data.tnris.org/collection/b5bd2b96-8ba5-4dc6-ba88-d88133eb6643. The data were in UTM14 (913 files) and UTM15 (8158 files) NAD83(2011), meters coordinates and NAVD88 (Geoid12b) elevations in meters. The bare earth raster files were at a 1 meter grid spacing. OCM performed the following processing on the data for Digital Coast storage and provisioning purposes: 1. Used internal script to assign the EPSG codes and convert to GeoTiff format. 2. Copied to the files to https.

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/57961

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=8899
https://noaa-nos-coastal-lidar-pds.s3.us-east-1.amazonaws.com/dem/TX_Coastal_DEM_2018_8899/ind

7.3. Data access methods or services offered:
Data is available online for bulk and custom 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.