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:

2022 City of Philadelphia Lidar: Philadelphia, PA

1.2. Summary description of the data:

This dataset is lidar point cloud data covering the City of Philadelphia, PA. The data were collected for the City of Philadelphia in April 2022. DEMs were generated from the raw data. This lidar point cloud data covers approximately 239 sq miles total. Each LAS file contains LiDAR point information, which has been calibrated, controlled, and classified. At the time of capture ground conditions were leaf-off, snow free, and water was at normal levels.

The lidar mapping requirements and deliverables meet Quality Level One (QL1) standards for final deliverables as outlined in the USGS-NGP Lidar Base Specification 2021, Revision A (https://www.usgs.gov/3DEP/lidarspec). QL1 lidar specifications suggest a pulse density of greater than or equal to 8 pulses per square meter Aggregate Nominal Pulse Density (ANPD), and pulse spacing of less than or equal to 35 centimeters Aggregate Nominal Pulse Spacing (ANPS). Additionally, lidar capture over the city center has increased point density of 16 ppsm.

This metadata record supports the data entry in the NOAA Digital Coast Data Access Viewer (DAV).

The NOAA Office for Coastal Management (OCM) downloaded las point data files from the PASDA (Pennsylvania Spatial Data Access) site.

The data were processed to the NOAA Digital Coast Data Access Viewer (DAV) to make the data available for bulk and custom downloads. In addition to these lidar point data, the bare earth Digital Elevation Models (DEM) created from the lidar point data are also available. These data are available for custom download at the link provided in the URL section of this metadata record.

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:

2022-03-29

1.5. Actual or planned geographic coverage of the data:
W: -75.337789, E: -74.939567, N: 40.158785, S: 39.81252

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?

Yes

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

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:

Data were collected and processed by Merrick for the City of Philadelphia Office of Innovation and Technology and were made available on the PASDA site. The data were downloaded from the PASDA site by the NOAA Office for Coastal Management (OCM) where the data were processed to make it available for custom download from the NOAA Digital Coast Data Access Viewer (DAV) and for bulk download from AWS S3.

Process Steps:

- 2022-03-29 00:00:00 - Lidar acquisition was collected using fixed wing aircraft and two Optech Galaxy T2000 lidar sensors staging from a variety of airports around the project area. Up to eight return values are recorded for each pulse which ensures the greatest chance of ground returns in a heavily forested area. Lidar data collection was accomplished on March 29, 2022 (dates listed are in local time NOT UTC). Each mission represents a lift of the aircraft and system from the ground, collects data, and lands again. Multiple lifts within a day are represented by Mission A, B, C, and D.

- 2022-01-01 00:00:00 - GNSS/IMU Data A five-minute IMU initialization is conducted on the ground, with the aircraft engines running, prior to flight, to establish fine alignment of the IMU. In air IMU calibration maneuvers were performed at the beginning and ending of all mission collections to ensure the best forward and reverse trajectory processing using the highest quality IMU calibration. During the data collection, the operator recorded information on log sheets which includes weather conditions, lidar operation parameters, and flight line statistics. Data is sent back to the main office for preliminary processing to check overall quality of GNSS / IMU data and to ensure sufficient overlap between flight lines. Any problematic data may be reflown immediately as required. The airborne GNSS data was post-processed using Applanix POSPac Mobile Mapping Suite version 8.x. A fixed bias carrier phase solution was computed in both the forward and reverse chronological directions. Whenever practical, lidar acquisition was limited to periods when the PDOP was less than 4.0. PDOP indicates satellite geometry relating to position. Generally, PDOPs of 3.0 or less result in a good quality solution, however PDOPs between 3.0 and 5.0 can still yield good results most of the time.

PDOPs over 6.0 are of questionable results and PDOPs of over 7.0 usually result in a poor solution. Usually as the number of satellites increase the PDOP decreases. Other quality control checks used for the GNSS include analyzing the combined separation of the forward and reverse GNSS processing from one CORS station and the results of the combined separation when processed from two different CORS stations. An analysis of the number of satellites, present during the flight and data collection times, is also performed. The GNSS trajectory was combined with the raw IMU data and post-processed using POSPac Mobile Mapping Suite version 8.x. The SBET and refined attitude data are then utilized in the Optech LMS lidar processing software to compute the laser point-positions. The trajectory is combined with the laser range measurements to produce lidar point cloud data. GNSS Controls Virtual Ground GNSS Base Station(s) were used to control the lidar airborne flight lines. Post processed Trimble CenterPoint RTX correction service is a high-accuracy, satellite-delivered global positioning service. This technology provides high accuracy GNSS positioning without the use of traditional reference station based differential RTK infrastructure and delivers very high cm level accuracy. In addition, CORS are at times used to further QC or enhance the airborne GNSS solution. Lidar Calibration Merrick takes great care to ensure all lidar acquisition missions are carried out in a manner conducive to postprocessing an accurate dataset. Proper Airborne GNSS surveying techniques are always followed including pre- and post-mission static initializations. In-air IMU alignments (figure-eights) are performed both before and after on-site collection to ensure proper calibration of the IMU accelerometers and gyros. A minimum of one cross-flight is planned throughout the project area across all flightlines and over roadways where possible. The cross-flight provides a common control surface used to remove any vertical discrepancies in the lidar data between flightlines. The cross-flight is critical to ensure flightline ties across the project area. The areas of overlap between flightlines are used to boresight (calibrate) the lidar point cloud to achieve proper flightline to flightline alignment in all three axes. Each lidar mission flown is accompanied by a hands-on boresight in the office. After boresighting is complete a detailed statistical report is generated to check relative and absolute accuracies before filtering of lidar begins.

- 2022-01-01 00:00:00 - The lidar filtering process encompasses a series of automated and manual steps to classify the boresighted point cloud data set. Each project represents unique characteristics in terms of cultural features (urbanized vs. rural areas), terrain type and vegetation coverage. These characteristics are thoroughly evaluated at the onset of the project to ensure that the appropriate automated filters are applied and that subsequent manual filtering yields correctly classified data. Data is most often classified by ground and unclassified, but specific project applications can include a wide variety of classifications including but not limited to buildings, vegetation, power lines, etc. A variety of software packages are used for the auto-filtering, manual filtering and QC of the classified data. Merrick used the ASPRS LAS Specification Version 1.4 R15 (ASPRS, 2011, published 09 July 2019), Point Data Record Format 6 for this project and classified the lidar point cloud in

accordance with the following classification classes and bitflags. Merrick has developed several customized automated filters that are applied to the lidar data set based on project specifications, terrain, and vegetation characteristics. A filtering macro, which may contain one or more filtering algorithms, is executed to derive LAS files separated into the different classification groups as defined in the ASPRS classification table. The macros are tested in several portions of the project area to verify the appropriateness of the filters. Often, there is a combination of several filter macros that optimize the filtering based on the unique characteristics of the project. Automatic filtering generally yields a ground surface that is 85 - 90% valid, so additional editing (hand-filtering) is required to produce an accurate ground surface. Lidar data is next taken into a graphic environment using MARS to manually re-classify (or hand-filter) noise and other features that may remain in the ground classification after auto filter. A cross-section of the post auto-filtered surface is viewed to assist in the reclassification of non-ground data artifacts. The following is an example of re-classification of the non-ground points (elevated features) that need to be excluded from the true ground surface. Certain features such as berms, hilltops, cliffs and other features may have been aggressively auto-filtered and points will need to be re-classified into the ground classification. Data in the profile view displays non-ground (Unclassified, class 1) in grey and ground in brown/tan (Class 2). At this point, individual lidar points from the original point cloud have now been parsed into separate classifications.
- 2022-01-01 00:00:00 - After hand-filtering has been completed and quality checked, a Checkpoint Report is generated to validate that the accuracy of the ground surface is within the defined accuracy specifications. Each surveyed ground check point is compared to the lidar surface by interpolating an elevation from a Triangulated Irregular Network (TIN) of the surface. The MARS derived report provides an in-depth statistical report, including an RMSE of the vertical errors; a primary component in most accuracy standards and a statistically valid assessment of the overall accuracy of the ground surface.
- Hydro - flattening breaklines are captured per the USGS-NGP Lidar Base Specification 2021, Revision A. Final hydro-flattened breaklines features are appropriately turned into polygons (flat elevations) and polylines (decreasing by elevation) and are used to reclassify ground points in water to water (Class 9). The lidar points around the breaklines are reclassified to ignored ground (Class 20) based on the planned collected point density. The next step in the process is the hydro-flattening breakline collection required for the development of the hydro-flattened DEMs. Merrick will capture hydro-flattening breaklines for waterbodies greater than or equal to approximately eight-tenths (~0.8) hectare (e.g., ~100-meter diameter); double-sided streams and rivers that are greater than or equal to 30 meters in (nominal) width, and; any visible islands greater than or equal to approximately four-tenths (~0.4) hectare. Criteria for Non-Tidal Boundary Waters and Tidal Waters are assumed not applicable. No single-line streams or drainages will be collected, nor will any planimetric features that could be utilized as traditional breaklines. All downstream hydro-flattening breaklines require

monotonicity (e.g., streams and rivers). Closed polygonal boundaries of water will maintain a fixed (i.e., flat) elevation.
- 2023-06-15 00:00:00 - The NOAA Office for Coastal Management (OCM) downloaded 752 las point data files from this PASDA site: https://www.pasda.psu.edu/download/phillyLiDAR/2022/LAS/Classified_LAS/ The data were in Pennsylvania State Plane South (NAD83 2011), US survey feet coordinates and NAVD88 (Geoid18) elevations in feet. The data were classified as: 1 - Unclassified, 2 - Ground, 7 - Low Noise, 8 - Model Key Point, 9 - Water, 17 - Bridge Decks, 18 - High Noise, 20 - Ignored Ground. OCM processed all classifications of points to the Digital Coast Data Access Viewer (DAV). Classes available on the DAV are: 1, 2, 7, 8, 9, 17, 18, 20. OCM performed the following processing on the data for Digital Coast storage and provisioning purposes: 1. The las files were converted to laz format using laszip 2. Internal OCM scripts were run to check the number of points by classification and by flight ID and the gps, elevation, and intensity ranges. 3. Internal OCM scripts were run on the las files to: a. Convert from orthometric (NAVD88) elevations to NAD83 (2011) ellipsoid elevations using the Geoid18 model b. Convert the laz files from Pennsylvania State Plane South (NAD83 2011), US survey feet coordinates to geographic coordinates c. Convert the laz files from elevations in feet to meters d. Assign the geokeys, sort the data by gps time and zip the data to database.

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
- 5.2. Quality control procedures employed
- 7.1.1. If data are not available or has limitations, has a Waiver been filed?
- 7.4. Approximate delay between data collection and dissemination
- 8.3. Approximate delay between data collection and submission to an archive facility

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/70168

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?
Yes

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=9848/details/9848
https://noaa-nos-coastal-lidar-pds.s3.amazonaws.com/laz/geoid18/9848/index.html

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

NCEI_CO

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

Data is backed up to tape and to cloud storage.

9. Additional Line Office or Staff Office Questions

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