*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 WA Dept. of Ecology Lidar DEM: Edgewater Beach, WA

### 1.2. Summary description of the data:

No metadata record was provided with the data. This record is populated with information from the WA Department of Ecology report provided along with the data. The technical report is available for download from the link provided in the URL section of this metadata record.

To document changes resulting from the removal of shoreline armor, there are several research groups monitoring various biological and geomorphic aspects of the beach and nearshore environment. The Washington State Department of Ecology Coastal Monitoring & Analysis Program (CMAP) was contracted to collect high-resolution boat-based lidar data before and after the bulkhead was removed to measure coastal morphological changes. Data were collected on September 24, 2015, a year before the bulkhead was removed, and again on June 22, 2017, almost eight months after removal. Lidar data was collected for the entire drift cell plus the two adjacent short drift cells on either side, totaling 5 km of shoreline. Bare-earth digital elevation models (DEMs) with 0.5-m resolution of the beach and bluff (where visible through the vegetation) were created in ArcGIS v10.2 by interpolating the gridded lidar data using a Triangulated Irregular Network (TIN). This metadata record describes the data that was collected June 22, 2017, after the armor shoreline removal.

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.

### 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:

2017-06-22

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

W: -122.94, E: -122.918, N: 47.18, S: 47.14

**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:
The NOAA Office for Coastal Management (OCM) received one Geotiff file from the Washington Department of Ecology for addition to the NOAA Digital Coast Data Access Viewer.

Process Steps:

- 2017-06-22 00:00:00 - Data Collection  Geodetic Control  A local GNSS base station was set up during each survey over the same known position to transmit RTK corrections to the POS MV and GNSS rovers. The base station also logged static GNSS raw data every second at its location for post-processing. During the boat-based lidar survey the base station receiver logged ~7 hours of raw GNSS data at the same location.  Boat Based Lidar  Boat-based lidar data were collected along 5 km of shoreline from Sanderson Harbor south of Edgewater Beach, heading north around Hunter Point, and ending at the small embayment between Hunter Point and Carlyon Beach on the south shore of Squaxin Passage. Data were collected on June 22, 2017, almost eight months after removal of shoreline armoring. Data were collected at low tide during maximum exposure of the beach; however, multiple passes of select areas, such as the Edgewater Beach restoration site, were made at a higher tide to achieve greater data density and higher resolution on the upper beach.  During lidar data acquisition, the vessel slowly moved alongshore at a speed of ~1 kt while the laser continuously scanned in a vertical line pattern. The angular interval between laser pulses was set at 0.09 degrees, which equates to a vertical point spacing of 1.6 cm at distance of 100 m. An object's range was determined using the last returned laser pulse. Data from the laser scanner and IMU were integrated in Quality Positioning Services (QPS) QINSy hydrographic software (v8. 16.1), which was also used for navigation. Position and orientation data from the IMU were logged at 10 Hz for post-processing. High-resolution digital photographs of the shoreline were taken from the vessel simultaneously to document the landscape.  Ground Based GNSS  During the laser scanning, ground elevation data were collected by land-based surveyors walking on the beach with RTK-GNSS receivers mounted to backpacks. Data were collected along the shore, one point per meter, distributed throughout the survey area in locations that were clearly surveyed by the lidar system. These data are primarily used as a means of quality assurance to ensure accuracy in the vertical component of the laser data. In some

cases, the ground-based GNSS data may help to supplement the lidar data by filling in gaps or shadows that can be present due to large objects on the beach or where the beach is wet. Several ground-control targets were set up on the beach throughout the survey area for checking the positional alignment of the lidar point cloud with independently surveyed GNSS points. Targets made of 1 m by 1 m sheet metal, spray-painted flat white, were mounted to wooden stakes and placed on the upper beach. A smaller, rectangular sheet metal target (0.61 m high by 0.76 m wide), also spray-painted flat white, was set up near the water's edge and moved several times during the course of the survey. During the 2017 survey, a spherical target (0.73 m diameter) made from an inflatable ball covered in aluminum foil was also used as ground control. The advantage of the spherical target is that regardless of the direction the target is scanned, the spherical shape can be modeled from the lidar returns, and a more accurate target center can be obtained from the point cloud. After each target was set up level and plumb, surveyors on land measured the position of the target center by obtaining a 10-second average using RTK-GNSS. - Data Processing Geodetic Control An accurate position for the location of the base station was determined in the office by processing the static GNSS data logged during the first boat-based lidar survey and the following day through the National Geodetic Survey's Online Positioning User Service (OPUS; accessible at: https://www.ngs.noaa.gov/OPUS/) and computing the average of the two solutions. These coordinates were used during post-processing of the boat-based lidar and ground-based GNSS data for both the first and second surveys to ensure all data are identically georeferenced. The GNSS data logged by the base station receiver during the second survey were processed through OPUS to compare the solution with the established coordinates. The values varied by 1.9 cm in Easting, 2.4 cm in Northing, and only 0.7 cm in elevation. Small variations in the coordinates are expected as more data is collected over the same point and will ultimately converge onto a well-established set of coordinates. This does, however, show that the reference point has not significantly moved between the two surveys. Boat Based Lidar Data logged by the base station during the survey, along with the final coordinates from OPUS, were used to post-process the vessel's position in Applanix POSPac Mobile Mapping Suite software (POSPac MMS v8.0) using Applanix IN-Fusion Single Base Station Processing to correct for RTK dropouts experienced in the field and establish accurate vessel positioning. The resultant Smoothed Best Estimate of Trajectory (SBET) file was applied to the lidar data in Qimera v1.5 to adjust the point-cloud position. An initial cleaning of the post-processed point cloud was performed in Qloud v2.3 to remove high-fliers, reflections, and other noise due to sun glare or debris on the water surface. Final cleaning and point-cloud classification was completed in the QPS 3D Editor (available in both Qimera v1.5 and Fledermaus v7.7) by examining cross-sections of the point cloud in three dimensions to remove all vegetation, buildings, large woody debris, and to define a clear waterline, resulting in a bare-earth surface. Backshore protection structures (i.e., armoring) were left in the point cloud as a contiguous part of the ground surface. Data upland of the bluff crest were rejected. Digital photos taken during the survey,

along with aerial imagery from Google Earth and oblique shoreline photos from the Washington Coastal Atlas, were used when needed to interpret and classify the lidar point cloud. Photomosaics for select areas were made by stitching overlapping photos taken from the boat together using Autopano Giga Pro v3.0. Point-cloud data from individual passes along the shoreline were compared to one another in MATLAB and adjusted for agreement. Areas of the point cloud on the beach with low standard deviation, a relatively uniform slope, and gravel-sized or finer texture were extracted for comparison with the ground-based GNSS data. Ground Based GNSS GNSS data collected on the beach and at each laser target were processed in Trimble Business Center v3.70 using the final coordinates computed for the base station location. Data points between surveyors within a 30-cm radius were compared in MATLAB, and each surveyor's data were adjusted for vertical agreement based on the average of individual comparisons to produce the final XYZ coordinates for the GNSS data. The final GNSS data were compared to surrounding lidar points within a 30-cm radius to determine an average vertical offset between the two datasets. For the 2017 survey, an offset was calculated for each pass made by the vessel since certain sections of the beach were scanned multiple times at different tide levels. The lidar point cloud was adjusted vertically (+Z) to match the GNSS data.
- Point Cloud Classification Detailed classification of the 2017 lidar point cloud was performed for the Edgewater Beach restoration site. Features in the point cloud were identified and classified into four main groups: ground, vegetation, large woody debris, and armoring. With the point cloud classified, different groups of points can be turned on or off to examine and quantify various morphological and ecological aspects of the shoreline.
- The clean, adjusted lidar point cloud for the ground surface and GNSS beach topography data from each survey were combined in Qimera and gridded using the average elevation within a 0.5-m grid cell. Bare-earth digital elevation models ( DEMs) with 0.5-m resolution of the beach and bluff (where visible through the vegetation) were created in ArcGIS v10.2 by interpolating the gridded data using a Triangulated Irregular Network (TIN).
- 2024-07-29 00:00:00 - The NOAA Office for Coastal Management (OCM) received one GeoTiff file along the coast of Edgewater Beach, in the south Puget Sound, from the Washington State Dept. of Ecology. The bare earth raster files were at a 0.5 m grid spacing. The data were in Washington State Plane NAD83 (2011), meters coordinates and NAVD88 (Geoid12B) elevations in meters. OCM assigned the appropriate EPSG codes (Horiz - 32149, Vert - 5703) and copied the raster files to https for Digital Coast storage and provisioning purposes.

#### 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/73184

### 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=10160/details/10160
https://noaa-nos-coastal-lidar-pds.s3.us-east-1.amazonaws.com/dem/WA_EdgeBeach_DEM_2017_1016

**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)*
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.*