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:

2021 NOAA NGS Topobathy Lidar DEM: Revillagigedo Channel, Southeast Alaska

1.2. Summary description of the data:

NOAA Southeast AK Topobathymetric Lidar data were collected by NV5 Geospatial (NV5) using Leica Hawkeye 4X and Riegl 1560i systems and delivered to NOAA in four blocks. The NOAA Southeast AK Topobathymetric Lidar Block01 was acquired between 20210608 and 20210730 in 13 missions, Block02 was acquired between 20210611 and 20210730 in 14 missions, Block03 was acquired between 20210730 and 20210823 in 6 mission and Block 04 was acquired between 20210625 and 20210823 in 7 missions. The four block dataset includes topobathymetric data in a LAS format 1.4, point data record format 6, with the following classifications in accordance with project specifications and the American Society for Photogrammetry and Remote Sensing (ASPRS) classification standards:

1 - unclassified

2 - ground

7 Withheld -low noise

18 Withheld - high noise

40 - bathymetric bottom or submerged topography

41 - water surface

42 Synthetic- Chiroptera synthetic water surface

43 - submerged feature

45 - water column

64 - Submerged Aquatic Vegetation (SAV)

65 - overlap bathy bottom - temporally different from a separate lift

71 - unclassified associated with areas of overlap bathy bottom/temporal bathymetric

differences

72 - ground associated with areas of overlap bathy bottom/temporal bathymetric differences

81 - water surface associated with areas of overlap bathy bottom/temporal bathymetric differences

82 Synthetic - Chiroptera synthetic water surface associated with areas of overlap bathy bottom/temporal bathymetric differences

85 - water column associated with areas of overlap bathy bottom/temporal bathymetric differences

1 Withheld - edge clip

1 Overlap Withheld - unrefracted green data from Chiroptera sensor

The channel bits are as follows:

0 - Riegl VQ1560 NIR channel A and Chiroptera green shallow laser

1 - Riegl VQ1560 NIR channel B and Chiroptera/Hawkeye synthetic water surface

2 - Hawkeye green deep laser

3 - Chiroptera NIR

The user byte is mapped as the following:

0 - Riegl NIR channel A

1 - Riegl NIR channel B

10 - Chiroptera green shallow

11 - Chiroptera green shallow 4X

12 - Chiroptera green shallow synthetic

20 - Hawkeye green deep

21 - Hawkeye green deep 4X

22 - Hawkeye green deep synthetic

30 - Chiroptera NIR

Data in all blocks includes lidar intensity values, number of returns, return number, time, and scan angle. The block01 boundary extent covers 103,002 acres , the Block02 boundary extent covers 76,119 acres, the block03 boundary extent covers 55,929 acres and Block04 boundary extent covers 18,351 acres of the combined topographic and

bathymetric project boundaries.

After the initial Southeast AK Topobathymetric Lidar submission, NOAA reviewed the data and provided NV5 Geospatial with a feedback edit review. NV5 Geospatial has corrected these feedback edits and incorporated them into the final block datasets. Additionally, green laser intensity values were normalized for depth for the dataset resulting in a full redelivery of all LAS files. LAS files were compiled in 500 m x 500 m tiles. The final classified lidar data were then transformed from ellipsoid (GRS80) to geoidal height (Geoid12b) and used to create topobathymetric DEMs in GeoTIFF format with 1m pixel resolution.

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:
2021-06-08 to 2021-07-30, 2021-06-11 to 2021-07-30, 2021-07-30 to 2021-08-23, 2021-06-25 to 2021-08-23

1.5. Actual or planned geographic coverage of the data:
W: -131.683084, E: -131.14722, N: 55.153375, S: 54.797478
W: -131.817401, E: -131.114438, N: 55.392168, S: 55.059655
W: -131.122052, E: -130.70137, N: 55.223374, S: 54.745594
W: -131.132875, E: -130.713203, N: 55.425577, S: 55.208082

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):
Process Steps:
- 2022-06-23 00:00:00 - Data for the block areas were acquired by NV5 Geospatial (NV5) using Leica Hawkeye 4X and Riegl VQ-1560i topobathymetric lidar systems. All derived LAS data is referenced to: Horizontal Datum-NAD83(2011) epoch: 2010. 00 Projection-UTM Zone 9N Horizontal Units-meters Vertical Datum-GRS80 Ellipsoid Vertical Units-meters NOAA provided NV5 Geospatial with a bathymetric boundary and a topographic boundary for the NOAA Southeast AK Topobathymetric Lidar project. Two separate acquisition plans were made; one for the bathymetric boundary and one for the topographic lidar boundary. The bathymetric areas for Block01 and Block02 were acquired using a Leica Hawkeye 4X topobathymetric sensor while Block03 and Block04 were acquired using a Leica Chiroptera Hawkeye 4X topobathymetric sensor. The topographic area in Block01 and Block02 was acquired using a Riegl 1560i NIR sensor while Block03 and Block04

was acquired using a Riegl VQ-1560ii NIR sensor. The data were integrated and calibrated together into a singular dataset after the initial extractions. A cutline was drawn through the project area to prioritize the bathymetric data and to produce the smoothest and most cohesive integrated dataset. A more detailed description of data processing is outlined below. The collected lidar data were immediately processed in the field by NV5 to a level that will allow QA\QC measures to determine if the sensor is functioning properly and assess the coverage of submerged topography. An initial SBET was created using Waypoint Inertial Explorer 8.90, and the raw data were extracted into geo-referenced LAS files using Lidar Survey Studio 3.0 with pre-calculated scanner misalignment angles determined through a boresight protocol. These files were inspected for errors and then passed through an automated workflow, producing rasters to develop an initial assessment of bathymetric coverage. NV5 reviewed all acquired flight lines to ensure complete coverage and positional accuracy of the laser points. These rasters were also used to create an initial product in Quick Look Coverage Maps. These Quick Look files are not fully processed data or final products but provide rapid assessment of approximate coverage and depth penetration.
- 2022-06-23 00:00:00 - NV5 resolved kinematic corrections for aircraft position data using aircraft GNSS and Applanix's proprietary PP-RTX solution. When PP-RTX was not used NV5 conducted static Global Navigation Satellite System (GNSS) ground surveys (1 Hz recording frequency) using base stations over known monument locations during flights. After the airborne survey, static GPS data were triangulated with nearby Continuously Operating Reference Stations (CORS) using the Online Positioning User Service (OPUS) for precise positioning. Multiple independent sessions over the same base station were performed to confirm antenna height measurements and to refine position accuracy. This data was used to correct the continuous on board measurements of the aircraft position recorded throughout the flight. A final smoothed best estimate trajectory (SBET) was developed that blends post-processed aircraft position with attitude data. Using the SBETs, sensor head position and attitude were then calculated throughout the survey. Trimble Business Center v.3.90, Blue Marble Geographic Calculator 2019, and PosPac MMS 8. 3 SP3 were used for these processes. Following final SBET creation for the Leica Chiroptera 4X and Hawkeye systems, NV5 used Leica Lidar Survey Studio (LSS) to calculate laser point positioning by associating SBET positions to each laser point return time, scan angle, and intensity. Leica LSS was used to derive a synthetic water surface to create a water surface model. Light travels at different speeds in air versus water and its direction of travel or angle is changed or refracted when entering the water column. The refraction tool corrects for this difference by adjusting the depth (distance traveled) and horizontal positioning (change of angle/ direction) of the lidar data. All lidar data below water surface models were classified as water column to correct for refraction. Using raster-based QC methods, the output data is verified to ensure the refraction tool functioned properly. In addition, following final SBET creation for the Reigl VQ1560i sensor data, NV5 used RiProcess 1.8.5 to calculate laser point positioning by associating SBET positions to

each laser point return time, scan angle, and intensity. Terra 19 and LasTools were used to classify water surface and create a water surface model. They are created for single swaths to ensure temporal differences and wave or water surface height variations between flight lines do not impact the refraction of the bathymetric data. These models are used in NV5's LasMonkey refraction tool to determine the accurate positioning of bathymetric points. Using raster-based QC methods, the output data is verified to ensure the refraction tool functioned properly. Once all data was refracted by flight line data was exported to LAS 1.4 format and combined into 500 m x 500 m tiles. Data were then further calibrated using TerraMatch. NV5 used custom algorithms in TerraScan to classify the initial ground/submerged topography surface points. Relative accuracy of overlapping swaths was compared and verified through the use Delta-Z (DZ) orthos created using NV5's Las Product Creator. Absolute vertical accuracy of the calibrated data was assessed using ground survey data and complete coverage was again verified.
- 2022-06-23 00:00:00 - Post automated classification NV5 then performed manual editing to review all classification and improve the final topobathymetric surface. NV5's LasMonkey was used to update LAS header information, including all projection and coordinate reference system information. The final lidar data are in LAS format 1.4 and point data record format 6. The final classification scheme is as follows: 1 - unclassified 2 - ground 7 Withheld -low noise 18 Withheld - high noise 40 - bathymetric bottom or submerged topography 41 - water surface 42 Synthetic- Chiroptera synthetic water surface 43 - submerged feature 45 - water column 64 - Submerged Aquatic Vegetation (SAV) 65 - overlap bathy bottom - temporally different from a separate lift 71 - unclassified associated with areas of overlap bathy bottom/temporal bathymetric differences 72 - ground associated with areas of overlap bathy bottom/temporal bathymetric differences 81 - water surface associated with areas of overlap bathy bottom/ temporal bathymetric differences 82 Synthetic - Chiroptera synthetic water surface associated with areas of overlap bathy bottom/temporal bathymetric differences 85 - water column associated with areas of overlap bathy bottom/ temporal bathymetric differences 1 Withheld - edge clip 1 Overlap Withheld - unrefracted green data from Chiroptera sensor
- 2022-06-23 00:00:00 - NV5 transformed the final lidar data from ellipsoid heights to orthometric heights referenced to NAVD88, Geoid 12b to create the final topobathymetric void clipped DEMs. The topobathymetric bare earth DEMs were output at 1 meter resolution in GeoTIFF format into 5000 m x 5000 m tiles. The NOAA Southeast AK Option 1 Award Topobathymetric Lidar rasters are clipped to the combinded topographic and bathymetric extents of the project boundary and named according to project specifications. A bathymetric void shapefile was created to indicate areas where there was a lack of bathymetric returns. This shape was created by triangulating bathymetric bottom points with an edge length maximum of 4.56m to identify all areas greater then 9 square meters without bathymetric returns. This shapefile was used to clip and exclude interpolated elevation data from these areas in the bathymetric void clipped topobathymetric

bare earth model.

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/69901

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://noaa-nos-coastal-lidar-pds.s3.us-east-1.amazonaws.com/dem/NGS_Revillagigedo_AK_Topobat
https://coast.noaa.gov/dataviewer/#/lidar/search/where:ID=9834

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.