

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT NY1802B-CM-N

Hudson River, Catskill to Newburgh, New York

Introduction

NOAA Coastal Mapping Program (CMP) Project NY1802B-CM-N provides a highly accurate database of new digital shoreline data for the Hudson River from Catskill to Newburgh, New York, and is a subproject of a larger acquisition project, NY1802-CM-N, which extends southward along the Hudson River from Troy to Manhattan in New York City. The Geographic Cell (GC) may be used in support of the NOAA Nautical Charting Program (NCP) as well as geographic information systems (GIS) for a variety of coastal zone management applications.

Project Design

Project NY1802-CM-N was designed in response to a request for shoreline data from NOAA's Office of Coast Survey. The Requirements Branch (RB) of the Remote Sensing Division (RSD) formulated the photographic mission instructions for this project following the guidelines of the Photo Mission Standard Operating Procedures. The instructions discussed the project's purpose, geographic area of coverage, scope and priority, image requirements, flight line priority, Global Positioning System (GPS) data collection procedures and guidelines, instructions for data recording and handling, and contact and communication information. RB created a Project Layout Diagram, flight maps and input files for the aircraft flight management system.

Field Operations

The field operations for the NY1802-CM-N project consisted of the collection of static and kinematic GPS data and Inertial Measurement Unit (IMU) data, the acquisition of digital aerial imagery, followed by ground surveys performed under contract with Fugro Geospatial, Inc.

Aerial survey operations included the acquisition of seventeen flight lines for RGB and NIR imagery at MHW tidal stage. The images were acquired using an Applanix DSS 580/560 dual camera system in 2018. All aerial imagery acquisition was accomplished with NOAA's King Air aircraft (N68RF) flying at an altitude of 10,500 feet. Refer to the NY1802-CM-N Hudson River Data Acquisition Summary report for additional information and specific dates concerning the aerial survey operations.

Fugro was contracted by NGS to perform field operations limited to the surveying of ground control points (GCPs) and check points (CPs). The National Spatial Reference System (NSRS) was used to provide control for the network. As a subcontractor to Fugro, TerraSurv Inc. established 34 photo identifiable control points. Of the 34 collected control points, 27 were successfully located for the RGB, 28 were successfully located for the NIR, and used as ground control in the final block adjustments TerraSurv Inc. surveyed 4 additional points that were used

as check points for both the RGB and NIR blocks. Refer to Fugro's Aerotriangulation Report, NY1802 (A-C) for more information on ground survey operations.

GPS Data Processing

All GPS/IMU data processing tasks were completed by NGS and the final processed data was supplied to Fugro Geospatial, Inc. GPS and IMU data were collected and processed by RSD personnel to yield precise positions and orientations of camera centers as a means of rendering accurately georeferenced digital images. For further information refer to the multiple Airborne Positioning and Orientation Reports (APOR) on file within the RSD Electronic Data Library.

Aerotriangulation

Fugro Geospatial, Inc. performed routine softcopy aerotriangulation methods that were applied to establish the network of precise camera positions and other control for mapping, and to provide model parameters and orientation elements required for digital compilation. The RGB and NIR images were measured and adjusted as two separate blocks. This work was completed in June 2019 using a softcopy photogrammetric workstation. The softcopy system hardware consisted of a high-end Dell Precision Workstation with stereo viewing capability. SOCET SET (ver. 5.6) was used for project setup and the mensuration phase. The adjustment solution phase was accomplished with the ORIMA (ver. 11.01) module.

Upon successful completion of the aerotriangulation process, the overall RMS data for all of the adjusted ground point's standard deviations (both x & y) were used to compute a predicted horizontal circular error, computed at a 95% confidence level, of 0.7 meters for the RGB adjusted block solution and 0.6 meters for the NIR solution.

The project database consists of project parameters and options, camera calibration data, interior orientation parameters, ground control parameters, adjusted exterior orientation parameters, and positional listing of all measured points. Positional data is referenced to the North American Datum of 1983, (NAD83/2011). An Aerotriangulation Report was completed and is on file with other project data within the RSD Electronic Data Library.

Compilation

The compilation for NY1802B-CM-N was done by Fugro Geospatial, Inc., between September and October 2019. Digital mapping was performed using SOCET SET (ver. 5.6) stereo softcopy workstations with the SOCET for ArcGIS module and ArcGIS (ver. 10.3) desktop GIS software. Feature identification and attribution within the GC were based on image analysis of the project imagery and information extracted from the appropriate NOAA nautical charts, U.S. Coast Guard Light List and other ancillary sources.

Feature attribution was assigned in compliance with the Coastal Cartographic Object Attribute Source Table (C-COAST), which provides the definition and attribution scheme for the full range of cartographic features pertinent to the CMP. Selected features were further modified with additional descriptive information to refine general classification.

Spatial data accuracies for Project NY1802B-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. The cartographic features were

compiled to meet a horizontal accuracy of 1.4 meters at the 95% confidence level for features extracted from the RGB imagery and 1.2 meters for features from NIR images. The predicted accuracy of compiled, well defined points is derived by doubling the circular error derived from aerotriangulation statistics.

The following table provides information on the imagery used to complete this project:

Date	Time (UTC)	Flight Line	Color Imagery		Infrared Imagery		Tide Level*
			Roll	Images	Roll	Images	
5/9/2018	12:11 – 12:17	64-006	18VC30	7885 – 7913	18VR30	7885 – 7913	1.2 – 1.3
5/9/2018	12:21 – 12:27	64-007	18VC30	7914 – 7943	18VR30	7914 – 7943	1.2 – 1.3
5/9/2018	12:40 – 12:46	64-009	18VC30	7970 – 7999	18VR30	7970 – 7999	1.3 – 1.4
5/9/2018	12:51 – 12:57	64-010	18VC30	8000 – 8029	18VR30	8000 – 8029	1.2 – 1.4
5/9/2018	13:04 – 13:10	64-011	18VC30	8030 – 8060	18VR30	8030 – 8060	1.4
5/9/2018	13:14 – 13:19	64-012	18VC30	8061 – 8087	18VR30	8061 – 8087	1.4 – 1.5
5/9/2018	13:58 – 14:01	64-013	18VC30	8088 – 8104	18VR30	8088 – 8104	1.5 – 1.6
5/9/2018	14:15 – 14:18	64-014	18VC30	8118 – 8134	18VR30	8118 – 8134	1.5 – 1.6

* Tide levels are given in meters above MLLW and were calculated using the Pydro software tool with a TCARI grid referenced to verified water level observations at the time of photography from various NOS gauges in the vicinity of the project. The elevation of the MHW tidal datum in the project area varies between 1.29 – 1.64 meters above MLLW.

Quality Control / Final Review

Quality Control tasks were conducted during all phases of project completion by a senior member of the Fugro Geospatial, Inc. compilation team. The final QC review was completed in October 2019. The review process included analysis of aerotriangulation results and assessment of the identification and attribution of digital feature data within the GC according to image analysis and criteria defined in C-COAST. The quality control process concluded with an inspection of topological connectivity within the GC using ArcGIS (ver. 10.3) software. All project data was evaluated for compliance to CMP requirements.

Comparisons of the largest scale NOAA nautical charts with project imagery and compiled project data resulted in creation of a Chart Evaluation File (CEF). The following nautical charts were used in the comparison process:

- 12343, New York to Wappinger Creek, NY, 20th Ed., Mar. 2013
- 12347, Wappinger Creek to Hudson, NY, 32nd Ed., Feb. 2017

End Products and Deliverables

The following specifies the location and identification of the products generated during the completion of this project:

Remote Sensing Division Electronic Data Library

- Airborne Positioning and Orientation Report (APOR)
- Ground Survey Report

- Aerotriangulation Report
- Project Completion Report (PCR)
- Project database
- GC11495 in shapefile format
- CEF in shapefile format

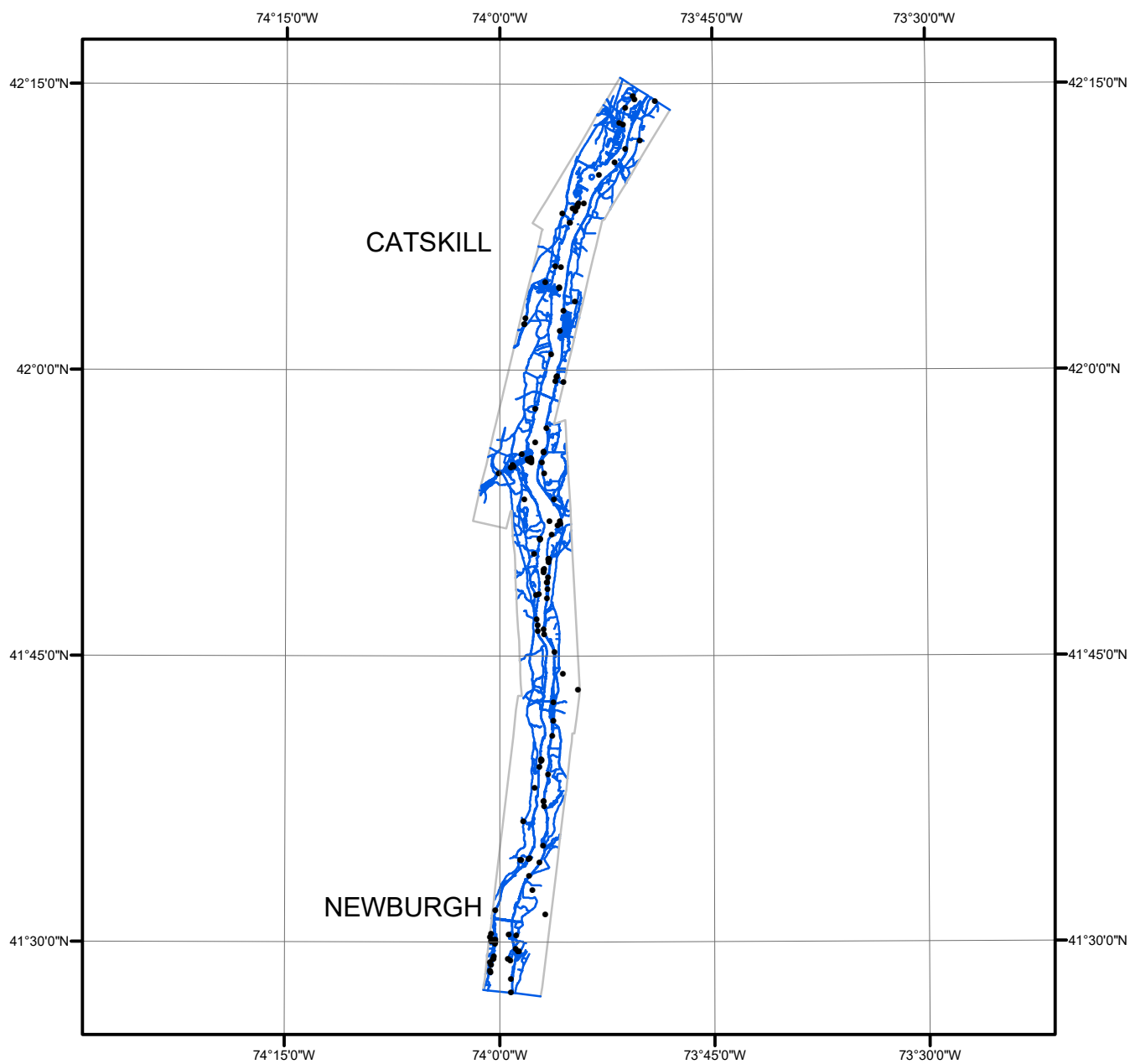
NOAA Shoreline Data Explorer

- GC11495 in shapefile format
- Metadata file for GC11495
- PCR in Adobe PDF format

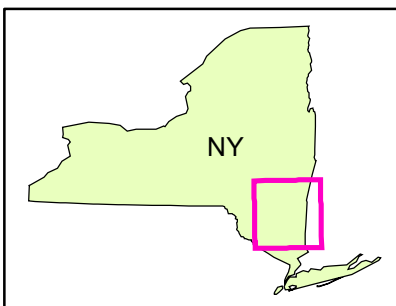
End of Report

HUDSON RIVER, CATSKILL TO NEWBURGH

NEW YORK



Overview



NY1802B-CM-N

GC11495