

# **NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT**

## ***PROJECT NJ1804-CM-N***

### ***Raritan River, Raritan Bay to New Brunswick, New Jersey***

#### **Introduction**

NOAA Coastal Mapping Program (CMP) Project NJ1804-CM-N provides a highly accurate dataset of shoreline feature data for Raritan River, from Raritan Bay to New Brunswick, including a portion of Arthur Kill River, in New Jersey. 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**

Photographic mission instructions for NJ1804-CM-N were formulated by the Requirements Branch (RB) of the Remote Sensing Division (RSD) following the guidelines of RSD's Photo Mission Standard Operating Procedures. The instructions discussed the project's purpose, geographic area of coverage, scope and priority, image requirements, Global Positioning System (GPS) data collection procedures and guidelines, instructions for data recording and handling, and mission communication protocols. RB created a Project Layout Diagram, flight maps and input files for the aircraft flight management system.

#### **Field Operations**

Field operations for NJ1804-CM-N consisted of the collection of static and kinematic GPS data and Inertial Measurement Unit (IMU) data, and the acquisition of digital aerial imagery. Aerial survey operations were conducted on August 26, 2018 and October 15, 2020 with the NOAA King Air aircraft (N68RF). All project imagery was acquired with an Applanix DSS 580/560 dual camera system in coordination with Mean High Water (MHW) and Mean Lower Low Water (MLLW). Five lines of color (RGB) and near-infrared (NIR) imagery were acquired for this project. All imagery was acquired at a nominal altitude of 10,500 feet, resulting in an approximate ground sample distance (GSD) of 0.32 meters for RGB and 0.38 meters for NIR imagery, respectively.

#### **Direct Georeferencing Data Processing**

The GPS/IMU data for Project NJ1804-CM-N were processed by RSD personnel to yield precise camera positions and orientations for direct georeferencing (DG) of the imagery. GPS base stations were established for use as reference stations for kinematic GPS processing. The positions of the base stations were determined using the NGS Online Processing User Service (OPUS), which computed fixed baseline solutions from nearby CORS stations. Kinematic data for imagery used for NJ1804-CM-N was processed using POSPac MMS (ver. 8.2, 8.4) GPS/IMU software in October 2018 and December 2020. For further information refer to the Airborne Positioning and Orientation Reports (APOR) on file with other project data within the RSD Electronic Data Library.

For Project NJ1804-CM-N, no aerial triangulation processing was conducted. Upon completion of the processing of GPS/IMU data, the processed data were used to derive precise exterior orientation (EO) values of the camera centers required for digital feature extraction. A predicted horizontal accuracy of the imagery was determined by propagating sensor EO and image measurement uncertainties through the photogrammetric collinearity equations using the Exterior Orientation Total Propagated Uncertainty (EO-TPU) tool developed by NGS. Using this tool, the predicted horizontal uncertainty at the 95% confidence level was calculated to be 0.92 meters. Stereo models were examined for parallax and found to be acceptable for use in compilation.

## Compilation

The data compilation phase of this project was accomplished by RSD Applications Branch (AB) personnel in April 2021. Digital mapping was performed using the Feature Extraction module within BAE's SOCET SET (ver. 5.6) photogrammetric software suite. Feature identification and attribution within the GC were based on image analysis of the aerial imagery and information extracted from the largest scale NOAA nautical charts 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 NJ1804-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 1.8 meters at the 95% confidence level. This predicted accuracy of well-defined points measured during the compilation phase was derived by doubling the imagery accuracy computed from the EO-TPU tool.

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

Date	Time (UTC)	Color Imagery		Infrared Imagery		Tide Level*
		Roll	Images	Roll	Images	
08-26-2018	13:16 – 13:20	18VC47	62-003/10199 – 10219	18VR47	62-003/10200 – 10220	1.7-1.9 m
08-26-2018	13:25 – 13:27	18VC47	62-005/10220 – 10231	18VR47	62-005/10221 – 10232	1.7-1.9 m
08-26-2018	13:33 – 13:35	18VC47	62-001/10232 – 10241	18VR47	62-001/10233 – 10242	1.6-1.7 m
08-26-2018	13:36 – 13:37	18VC47	62-001/10245 – 10252	18VR47	62-001/10246 – 10253	1.6-1.7 m
08-26-2018	13:41 – 13:44	18VC47	62-002/10253 – 10268	18VR47	62-002/10254 – 10269	1.6 m
08-26-2018	13:51 – 13:52	18VC47	62-001/10269 – 10275	18VR47	62-001/10270 – 10276	1.6 m
08-26-2018	13:57 – 13:58	18VC47	62-004/10277 – 10286	18VR47	62-004/10278 – 10287	1.7-1.8 m
10-15-2020	17:50 – 17:55	20VC45	62-001/19388 – 19408	20VR40	62-001/17271 – 17291	0.1 m
10-15-2020	18:00 – 18:03	20VC45	62-002/19409 – 19424	20VR40	62-002/17292 – 17307	0-0.1 m
10-15-2020	18:10 – 18:15	20VC45	62-003/19425 – 19445	20VR40	62-003/17308 – 17328	0-0.1 m
10-15-2020	18:19 – 18:22	20VC45	62-005/19446 – 19457	20VR40	62-005/17329 – 17340	0-0.1 m
10-15-2020	18:28 – 18:30	20VC45	62-004/19458 – 19467	20VR40	62-004/17341 – 17350	0-0.1 m

\* 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 ranges 1.60 – 1.81 m above MLLW.

## **Quality Control / Final Review**

Quality control tasks were conducted during all phases of project completion by a senior member of RSD. The final QC review was completed in July 2021. The review process included analysis of the DG 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 Esri's ArcGIS (ver. 10.8.1) desktop GIS software. All project data was evaluated for compliance to CMP requirements.

A Chart Evaluation File (CEF) resulted from the comparison of source imagery and compiled project data with the largest scale NOAA electronic nautical charts covering the project area:

ENC US3NY01M, 49<sup>th</sup> Ed., Aug. 2020  
ENC US5NYCAB, 1<sup>st</sup> Ed., Apr. 2020  
ENC US5NYCAC, 1<sup>st</sup> Ed., Apr. 2020  
ENC US5NYCAD, 1<sup>st</sup> Ed., Apr. 2020  
ENC US5NYCBB, 1<sup>st</sup> Ed., Apr. 2020  
ENC US5NYCBC, 1<sup>st</sup> Ed., Apr. 2020  
ENC US5NYCBD, 1<sup>st</sup> Ed., Apr. 2020

## **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**

- Data Acquisition Summary Report for NJ1804
- Airborne Positioning and Orientation Reports (APOR)
- Project Completion Report (PCR)
- Project database
- GC11704 in shapefile format
- CEF in shapefile format

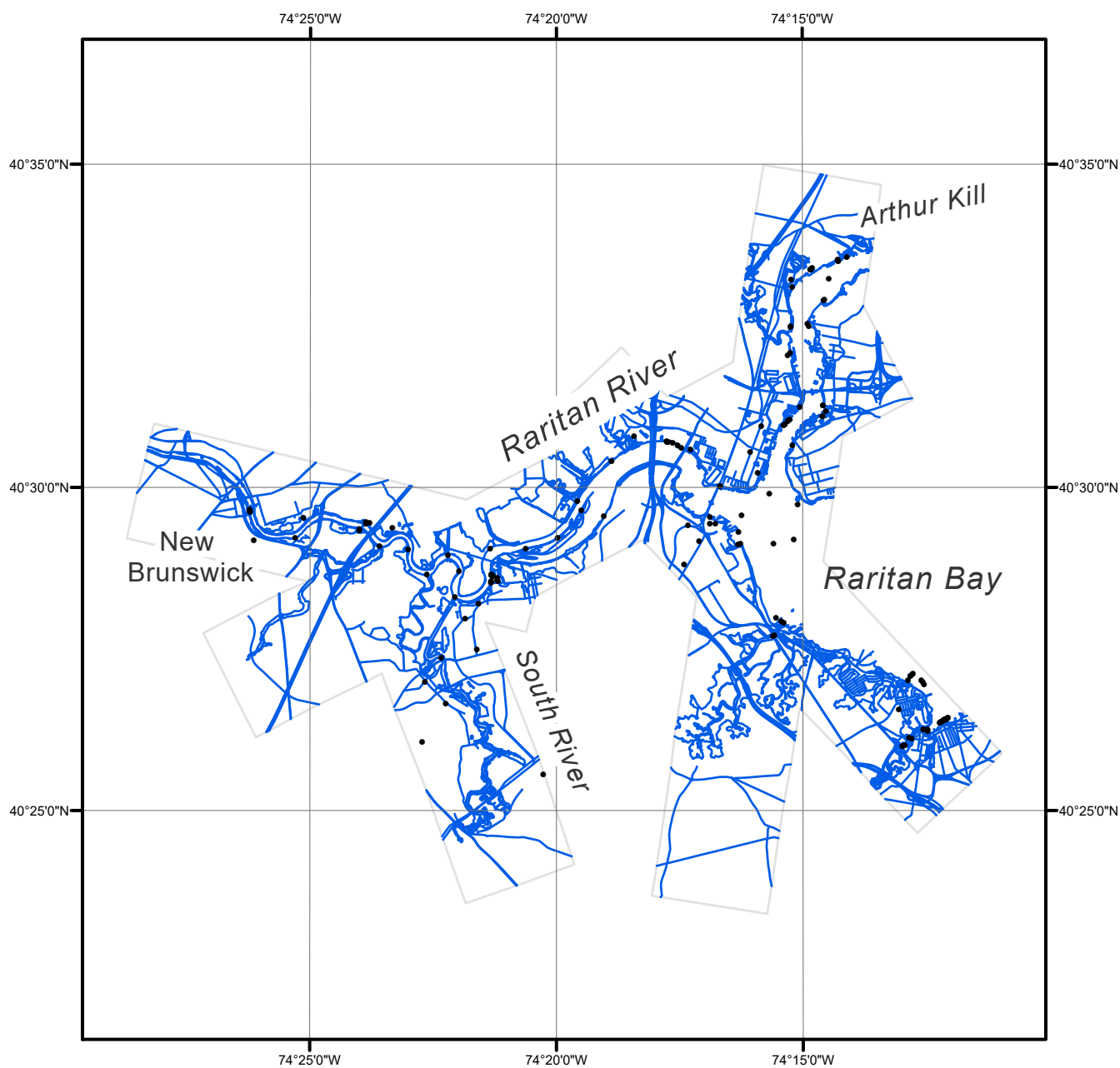
### **NOAA Shoreline Data Explorer**

- GC11704 in shapefile format
- Metadata file for GC11704
- PCR in Adobe PDF format

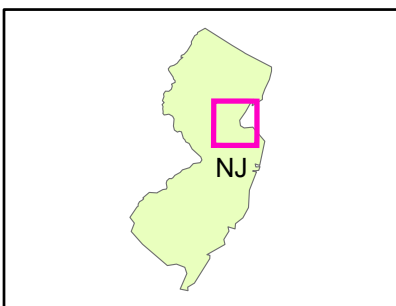
## **End of Report**

# RARITAN RIVER, RARITAN BAY TO NEW BRUNSWICK

## NEW JERSEY



Overview



NJ1804-CM-N

GC11704