NOAA COASTAL MAPPING PROGRAM
PROJECT COMPLETION REPORT

PROJECT VA2101A-CS-N

Port of Richmond, Virginia

Introduction

NOAA Coastal Mapping Program (CMP) Project VA2101A-CS-N provides highly accurate digital shoreline data for key areas of change within the port of Richmond, Virginia. 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

The design of Project VA2101A-CS-N was accomplished by the Requirements Branch (RB) of the Remote Sensing Division (RSD) in response to the need for updates to the NOAA chart suite within key U.S. ports. Project requirements were formulated as a result of analysis conducted within the Coast and Shoreline Change Analysis Program (CSCAP), in which NOAA nautical chart products are compared to contemporary high resolution digital imagery in order to ascertain the need for more current shoreline data. A Chart Evaluation File (CEF) was forwarded to the Applications Branch (AB) of RSD once the change analysis was complete. Refer to the CSCAP Memorandum for Project VA2101A-CS-N for details of the chart comparison process.

Field Operations

The field operations consisted of the collection of static and kinematic Global Positioning System (GPS) data and Inertial Measurement Unit (IMU) data and the acquisition of aerial imagery. Three strips of 4-band digital images (RGB+NIR) utilized for this project were acquired with a NOAA Twin Otter aircraft (N48RF) on April 27, 2021 using a Leica RCD30 camera at a nominal altitude of 8,200 feet, resulting in an approximate ground sample distance (GSD) of 0.25 meters. Although imagery was not acquired in strict coordination with local tides, the goal was to collect all imagery below Mean High Water (MHW).

Direct Georeferencing Data Processing

GPS/IMU data were processed by RSD personnel to yield precise camera positions and orientations for direct georeferencing (DG) of the imagery. The kinematic GPS data was processed in May 2021 using Novatel's Inertial Explorer (ver. 8.90) software, utilizing the PPP-NRT processing mode, which is an implementation of the TerraStar Correction Service. This processing mode uses the HxGN SmartNet reference station network, so it was not necessary to set a local base station. For further information refer to the Airborne Positioning and Orientation Report (APOR) on file with other project data within the RSD Electronic Data Library.

Compilation

The data compilation phase of this project was accomplished by a member of RSD in June 2021. Digital feature data was compiled from orthoimagery generated from the project imagery, using Esri's ArcGIS (ver. 10.8.1) desktop GIS software. Feature identification and attribution within the GC was based on image analysis of project imagery and information extracted from the appropriate NOAA nautical charts. 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.

Spatial data accuracies for Project VA2101A-CS-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Check points extracted from previously completed CMP projects were used to assess the accuracy of the orthoimagery, and the RMS of the residuals for each measured check point was used to compute a predicted horizontal circular error (CE) of 1.0 meters based on a 95% confidence level. This CE value was doubled and added to the accuracy of the source from which check points were extracted to conservatively predict the accuracy of well-defined points measured during compilation. The accuracy assessment is on file with other project data within the RSD Electronic Data Library. Cartographic features were tested to have a horizontal accuracy of 3.3 meters at the 95% confidence level by comparing at least 20 check points to an independent source of higher accuracy.

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

Date	Time (UTC)	Flight Line / Image #s	Water Level
4-27-2021	15:15 – 15:20	005 / 157 – 184	n/a
4-27-2021	15:27 – 15:33	004 / 198 – 226	n/a
4-27-2021	15:47 – 15:53	006 / 242 – 269	n/a

Quality Control / Final Review

The final review of the project was completed by a senior member of RSD in December 2021, and included analysis of 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 ArcGIS software. All project data was evaluated for compliance to CMP requirements.

End Products and Deliverables

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

Remote Sensing Division Electronic Data Library

- CSCAP evaluation memorandum
- Airborne Positioning and Orientation Report (APOR)
- Project database
- Project Completion Report (PCR)
- GC11728 in shapefile format
- CEF in shapefile format

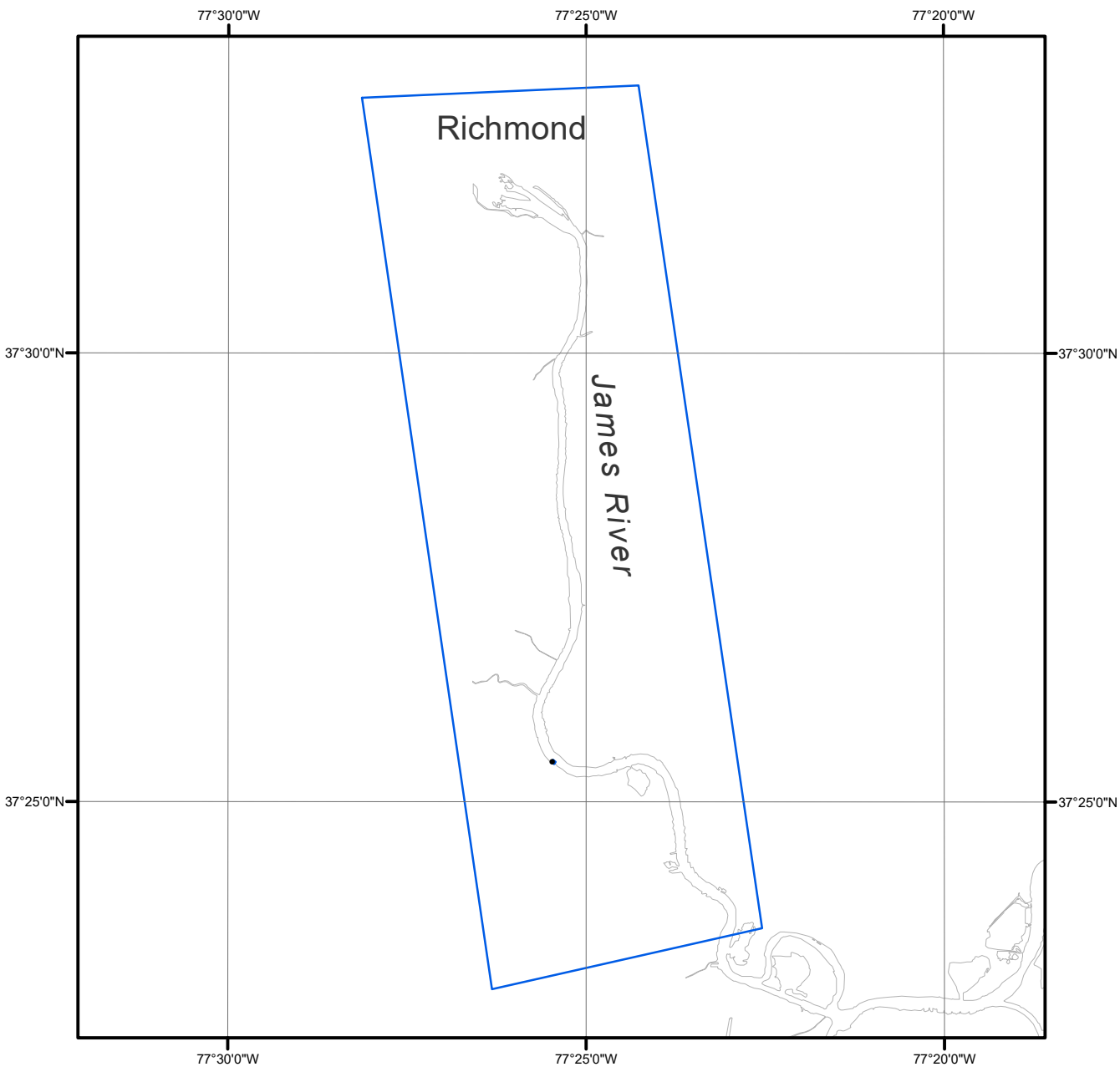
NOAA Shoreline Data Explorer

- GC11728 in shapefile format
- Metadata file for GC11728
- PCR in Adobe PDF format

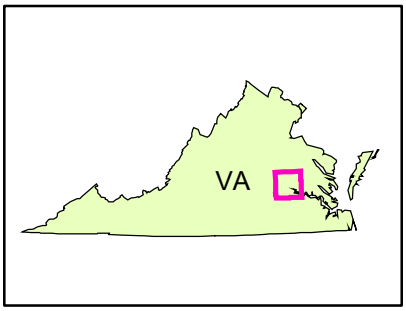
End of Report

PORT OF RICHMOND

VIRGINIA



Overview



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GC11728