

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT VA1102

Ports of Richmond and Hopewell, Virginia

Introduction

Coastal Mapping Program (CMP) Project VA1102 provides highly accurate digital shoreline data for key areas of change in the ports of Richmond and Hopewell, 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 VA1102 was accomplished by the Requirements Branch (RB) of the Remote Sensing Division (RSD) in response to the need for timely updates to the NOAA Electronic Navigational Chart (ENC) series. 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 RB CSCAP Memorandum of August 22, 2011 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 digital aerial imagery. Aerial survey operations were conducted on May 7, 2011 with the NOAA King Air aircraft (N68RF). Four strips (50-001 through 50-004) of natural color photographs were acquired between 16:03 and 16:24 (UTC) with an Applanix DSS439 digital camera with a ground sample distance (GSD) of 0.35 m. Although imagery was not acquired in strict coordination with local tides, the goal was to collect all imagery below Mean High Water (MHW).

GPS Data Reduction

GPS and IMU data was collected and processed to yield precise positions and orientations of camera centers for use in the aerotriangulation phase. The airborne kinematic data were collected using an Applanix POS/AV510 GPS/IMU System. This data was processed on May 20, 2011 using POSpac (version 5.4.0) software. For further information refer to the Airborne Positioning and Orientation Report (APOR) on file with other project data within the AB Project Archive.

Aerotriangulation

Routine softcopy aerotriangulation methods 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. This work was initiated by RSD personnel in April 2013 utilizing a Digital Photogrammetric Workstation (DPW), which is a configuration of computer hardware, modular software components and other associated peripheral devices. The aerial images were measured as two separate sub-blocks using the automatic and interactive point measurement tools within BAE Systems SOCET SET (version 5.6.0) photogrammetric software. After point editing was completed both image blocks were included in a single bundle adjustment using the Multi-Sensor Triangulation (MST) module in SOCET SET. Upon successful completion of the aerotriangulation process, the MST software provided the RMS of the standard deviations of the residuals for each aerotriangulated ground point which were used to compute a predicted horizontal circular error of 0.6 meters for the block based on a 95% confidence level. An Aerotriangulation Report was written and is on file with other project data within the RSD Applications Branch (AB) Project Archive.

The project database consists of project parameters and options, camera calibration data, interior orientation parameters, adjusted exterior orientation parameters, and positional listing of all measured points. Positional data is referenced to the North American Datum of 1983 (NAD83).

Compilation

The data compilation phase of this project was accomplished by RSD in August 2013. Digital mapping was performed using a DPW in conjunction with the SOCET GXP (version 4.0.0) Feature Database software. Feature identification and attribution within the Geographic Cell (GC) were based on image analysis of the digital photographs 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 VA1102 were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 1.2 meters at the 95% confidence level. This value was derived by doubling the circular error computed from the AT statistics in order to conservatively predict the accuracy of compiled well defined points.

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

Date	Time (UTC)	Roll Number	Photo Numbers	GSD (nominal)	Tide Level*
5-7-11	16:03 – 16:04	11NC24	3443 - 3453	0.35 m	0.2 – 0.1

5-7-11	16:09 – 16:11	11NC24	3454 - 3464	0.35 m	0.1 – 0.2
5-7-11	16:14 – 16:16	11NC24	3465 - 3483	0.35 m	0.3
5-7-11	16:22 – 16:24	11NC24	3484 - 3502	0.35 m	0.3

* Tide levels are given in meters above MLLW and are based on daily predictions at various NOS tidal substations in the project area for the time of photography. The elevation of the MHW tidal datum in the project area varies between 0.76 – 1.06 meters above MLLW.

Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a member of AB. The final QC review was completed in August 2013. The review process included analysis of the AT 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 9.3.1. The entire suite of project products was evaluated for compliance to CMP requirements.

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

RSD Applications Branch Archive

- Hardcopy of the APOR
- Hardcopy of the Aerotriangulation Report
- Hardcopy of the Project Completion Report (PCR)
- Page size graphic plot of GC10993 file contents, attached to PCR
- Hardcopy of the CSCAP evaluation memorandum

Remote Sensing Division Electronic Data Library

- GC10993 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

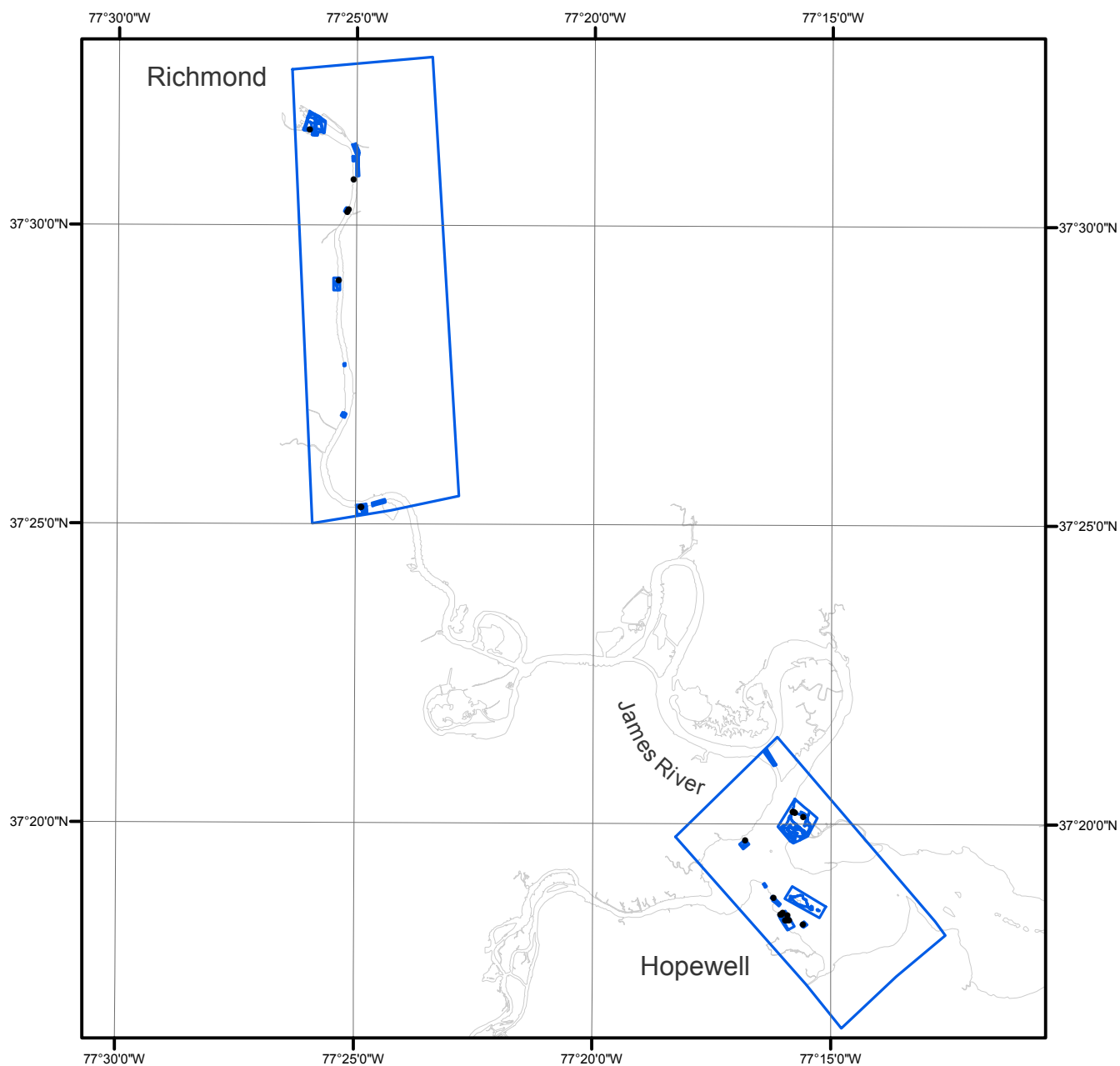
NOAA Shoreline Data Explorer

- GC10993 in shapefile format
- Metadata file for GC10993
- Digital copy of the PCR in Adobe PDF format

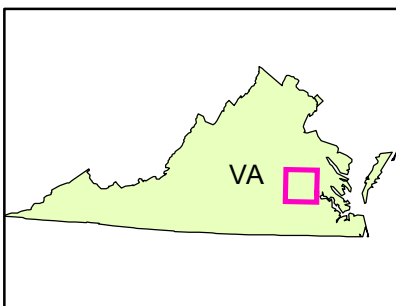
End of Report

PORTS OF RICHMOND AND HOPEWELL

VIRGINIA



Overview



VA1102

GC10993