

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT MD1102

Port of Baltimore, Maryland

Introduction

Coastal Mapping Program (CMP) Project MD1102 provides highly accurate digital shoreline data for key areas of change in the port of Baltimore, Maryland. 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 MD1102 was accomplished by the Requirements Branch (RB) of the Remote Sensing Division (RSD) in response to the need for 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 imagery sources 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 3, 2011 for details of the chart comparison process.

Field Operations

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. Aerial survey operations were conducted on May 9, 2011 with the NOAA King Air (N68RF) aircraft. A total of five strips of digital RGB (color) images were acquired with an Applanix DSS-439 medium format digital camera at a nominal altitude of 10,000 feet, resulting in an approximate ground sample distance (GSD) of 0.35 m. The imagery was not tide coordinated but was required to be obtained at or below Mean High Water.

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 31, 2011 using POSpac (ver. 5.3) 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

The aerotriangulation (AT) phase of project completion was performed in June 2013 by a member of the Applications Branch. Routine softcopy AT methods were applied to establish a 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 accomplished by a member of AB utilizing a Digital Photogrammetric Workstation (DPW), which is a configuration of computer hardware, modular software components, and other associated peripheral devices. The digital images were measured and adjusted as a single block using BAE Systems SOCET GXP (ver. 4.0) photogrammetric suite in conjunction with the Triangulation module. Upon completion of the AT process, the simultaneous solve tool within the Triangulation module provided the standard deviations for each aerotriangulated ground point, which were used to compute a predicted horizontal circular error of 0.3 meters based on a 95% confidence level. An AT Report was written and is on file with other project data within the RSD project archive. Positional data is based on the UTM Coordinate System (zone 18), and referenced to the North American Datum of 1983.

Compilation

The data compilation phase of this project was accomplished by RSD in June 2013. Digital mapping was performed using a DPW in conjunction with the SOCET SET (ver. 5.6) Feature Extraction software module. Feature identification and attribution within the Geographic Cell (GC) were based on analysis of the digital imagery and information extracted from the appropriate NOAA nautical chart products 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 MD1102 were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 0.7 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 aerial images used in the project completion:

Date	Time (UTC)	Roll #	Photo #s	GSD	Tide Level*
05-09-11	12:16 – 12:19	11NC25	3533 – 3549	0.35 m	0.4 m
05-09-11	12:24 – 12:27	11NC25	3550 – 3571	0.35 m	0.4 m
05-09-11	12:32 – 12:35	11NC25	3572 – 3588	0.35 m	0.4 m
05-09-11	12:41 – 12:44	11NC25	3589 – 3612	0.35 m	0.4-0.5 m
05-09-11	12:50 – 12:51	11NC25	3613 – 3621	0.35 m	0.5 m

* Tide levels are given in meters above MLLW and are based on actual observations recorded by the NOS gauge in Baltimore at the time of photography. The elevation of the MHW tidal datum in the project area is equal to 0.4 m above MLLW.

Quality Control / Final Review

The final QC review was completed in July 2013 by a senior member of RSD. The review process included analysis of the 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 9.3. The entire suite of project products 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:

RSD Applications Branch Archive

- Hardcopy of the Airborne Positioning and Orientation Report (APOR)
- Hardcopy of the Aerotriangulation Report
- Hardcopy of the Project Completion Report (PCR)
- Page size graphic plot of GC11009 file contents, attached to PCR
- Hardcopy of the CSCAP evaluation memorandum

Remote Sensing Division Electronic Data Library

- GC11009 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

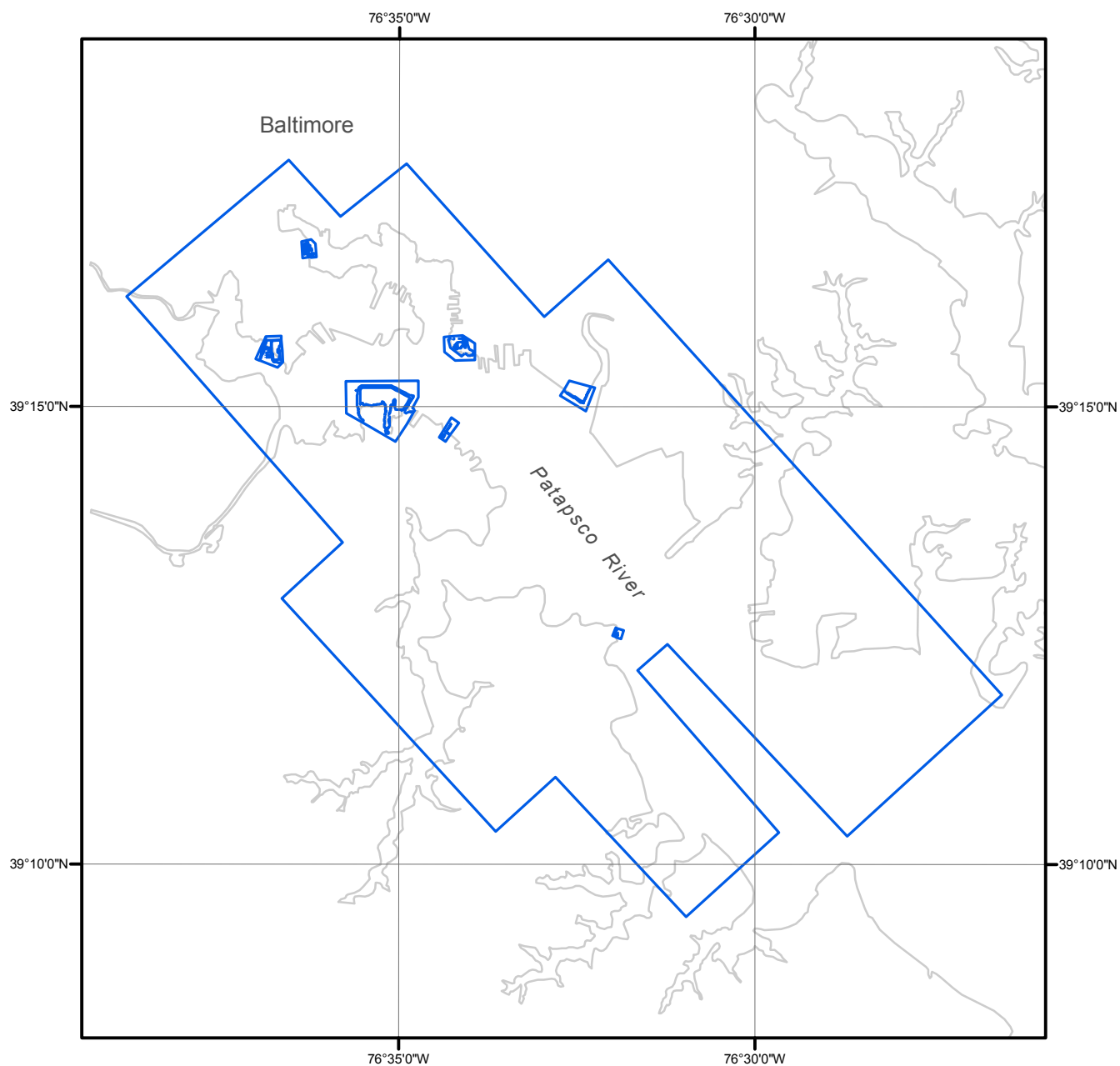
NOAA Shoreline Data Explorer

- GC11009 in shapefile format
- Metadata file for GC11009
- Digital copy of the PCR in Adobe PDF format

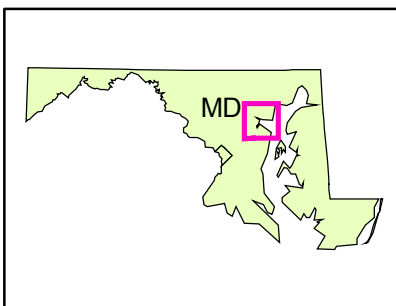
End of Report

PORT OF BALTIMORE

MARYLAND



Overview



MD1102

GC11009