

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

## ***PROJECT AL1101***

### ***Port of Mobile, Alabama***

#### **Introduction**

Coastal Mapping Program (CMP) Project AL1101 provides highly accurate digital shoreline data for key areas of change within the Port of Mobile, Alabama, including the Mobile River, Chickasaw Creek, and Theodore Ship Channel. 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 AL1101 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 May 23, 2011 for more 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 February 17, 2011 with the NOAA King Air aircraft (N68RF). Four strips of natural color photographs 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 meters. 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 as a means of rendering accurately georeferenced digital images. A local GPS base station was established for use as a reference station for kinematic GPS processing operations. The position of the base station was determined using the NGS Online Processing User Service (OPUS), which computed fixed baseline solutions from nearby CORS stations. The airborne kinematic data was initially processed in April 2011 using Applanix POSPac (ver. 5.3) software, and then was

reprocessed in May 2012 to achieve a tightly coupled solution. For further information refer to the Airborne Positioning and Orientation Reports (APOR) on file with other project data within the RSD AB Project Archive.

## **Aerotriangulation**

The aerotriangulation (AT) phase of project completion is normally performed *prior to* the compilation phase and is therefore described in this report in its usual placement. However, for this project, AT was actually performed in February 2013, *after* completion of feature compilation, as a means of verifying the accuracy of feature data compiled from imagery georeferenced from processed GPS/IMU alone (direct georeferencing). Due to the increased accuracy required of navigationally significant port infrastructure compiled for this project, all feature data was adjusted to match the improved georeferencing achieved through AT.

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 senior 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 SET (ver. 5.6) photogrammetric suite in conjunction with the Multi-Sensor Triangulation (MST) software module. Upon completion of the AT process, the simultaneous solve tool within the MST module provided the standard deviations for each aerotriangulated ground point, which were used to compute a predicted horizontal circular error of 0.36 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 referenced to the North American Datum of 1983 (NAD 83).

## **Compilation**

The data compilation phase of this project was initiated by AB in October 2012. Digital feature data was compiled using a DPW in conjunction with the SOCET SET (ver. 5.6) Feature Extraction software module. Feature attribution within the GC 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 AL1101 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 the imagery used to complete this project:

Date	Time (UTC)	Roll Number	Photo Numbers	GSD (nominal)	Tide Level*
2-17-2011	18:16 – 18:19	11NC17	2799 - 2822	0.35 m	-0.1 m
2-17-2011	18:24 – 18:27	11NC17	2823 - 2846	0.35 m	-0.1 m
2-17-2011	18:32 – 18:34	11NC17	2847 - 2855	0.35 m	-0.1 m
2-17-2011	18:38 – 18:40	11NC17	2856 - 2865	0.35 m	0.0 m

\* Tide levels are given in meters above MLLW and are based on actual observations recorded by the NOS gauge at Mobile State Docks, AL at the time of photography. The difference in elevation between the MLLW and MHW tidal datums is 0.47 meters.

## Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a senior member of AB. The final QC review was completed in February 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 Aerotriangulation Report
- Hardcopy of the Project Completion Report (PCR)
- Page size graphic plot of GC10950 file contents, attached to PCR
- Hardcopy of the CSCAP evaluation memorandum

### Remote Sensing Division Electronic Data Library

- GC10950 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

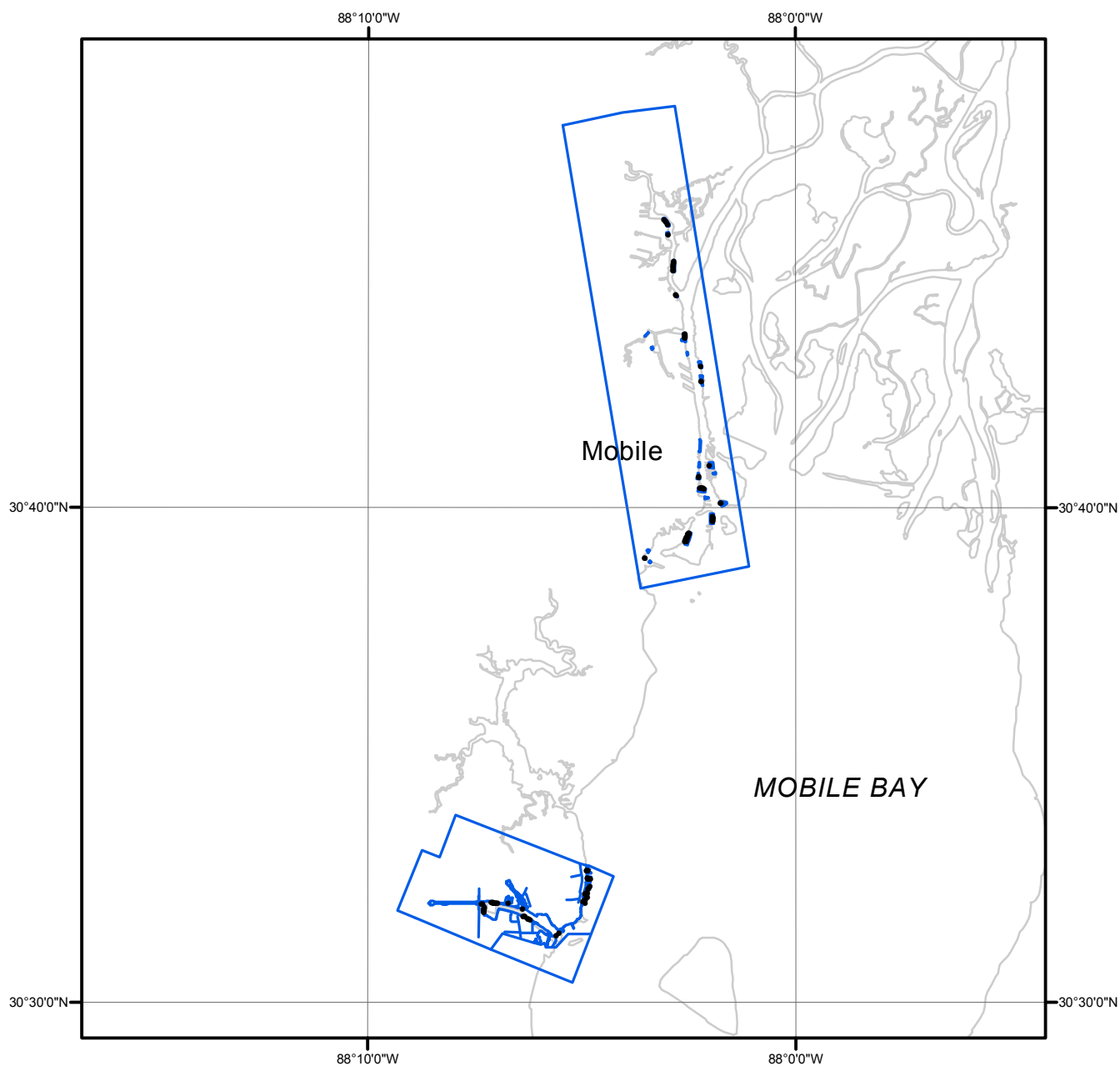
### NOAA Shoreline Data Explorer

- GC10950 in shapefile format
- Metadata file for GC10950
- Digital copy of the PCR in Adobe PDF format

## End of Report

# PORT OF MOBILE

## ALABAMA



Overview



AL1101

GC10950