

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT AL0904-CM-N

Western Mobile Bay, Alabama

Introduction

NOAA Coastal Mapping Program (CMP) Project AL0904-CM-N provides a highly accurate database of new digital shoreline data for the western shore of Mobile Bay, Alabama. 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 Requirements Branch (RB) of the Remote Sensing Division (RSD) formulated the photographic mission instructions for this project following the guidelines of the Photo Mission Standard Operating Procedure. The instructions discussed the project's purpose, geographic area of coverage, scope and priority, photographic requirements, flight line priority, Global Positioning System (GPS) data collection procedures and guidelines for both kinematic and static surveys, data recording and handling instructions, and contact and communication information. RB created a Project Layout Diagram, flight maps and input files for the aircraft's flight management system.

Field Operations

The field operations consisted of the collection of static and kinematic GPS data and Inertial Measurement Unit (IMU) data, and the acquisition of digital aerial imagery. The photographic mission operations were conducted on October 7, 2012, with the NOAA King Air (N68RF) aircraft. Project imagery included fifteen flight lines of natural color (RGB) and near-infrared (NIR) imagery acquired concurrently using an Applanix DSS-439 dual head digital camera system in coordination with only the MLLW tide level. Although fifteen flight lines were acquired, only eight lines were used in the feature compilation phase due to overlap with other recent projects. All imagery was acquired at a nominal altitude of 10,000 feet, resulting in an approximate ground sample distance (GSD) of 0.35 meters.

Direct Georeferencing Data Processing

GPS/IMU data for project AL0904-CM-N were processed by RSD personnel to yield precise camera positions and orientations for direct georeferencing (DG) of the imagery. 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 processed November 21, 2012 using POSPac MMS 5.4.0 GPS/IMU processing software. For further information refer to the Airborne Positioning and Orientation Report (APOR) on file with other project data within the RSD Electronic Data Library. The processed GPS/IMU data were used to derive precise exterior orientation (EO)

values of the camera centers required for digital feature extraction. The predicted horizontal accuracy of the imagery was determined by propagating sensor EO and image measurement uncertainties through the photogrammetric collinearity equations using an NGS developed Exterior Orientation Total Propagated Uncertainty (EO-TPU) tool (ver. 2.1). Using this tool, the predicted horizontal uncertainty at the 95% confidence level was calculated to be 1.6 meters.

Three NGS third order geodetic control points were used to test the horizontal integrity of the DG data. All stereo-models were examined and found to have acceptable levels of parallax for mapping purposes.

Compilation

The data compilation phase of this project was accomplished by a member of the Applications Branch in December 2015. Digital mapping was performed using the Feature Extraction software module within SOCET SET (ver. 5.6). Feature identification and attribution within the Geographic Cell (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 AL0904-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 3.2 meters at the 95% confidence level. This predicted accuracy of compiled well-defined points is derived by doubling the horizontal uncertainty calculated 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	
10-07-2012	19:35 – 19:41	12NC80	28725 – 28764	12NR63	15506 – 15545	-0.1 to 0.0
10-07-2012	19:49 – 19:55	12NC80	28793 – 28837	12NR63	15574 – 15618	0.0 to -0.1
10-07-2012	20:06 – 20:13	12NC80	28873 – 28918	12NR63	15654 – 15699	-0.1 to 0.0
10-07-2012	20:22 – 20:28	12NC80	28947 – 28991	12NR63	15728 – 15772	0.0 to -0.1
10-07-2012	20:37 – 20:39	12NC80	29010 – 29028	12NR63	15791 – 15809	-0.1
10-07-2012	20:59 – 21:00	12NC80	29081 – 29090	12NR63	15862 – 15871	0.0
10-07-2012	21:09 – 21:11	12NC80	29098 – 29111	12NR63	15879 – 15892	0.0 to -0.1
10-07-2012	21:15 – 21:17	12NC80	29112 – 29125	12NR63	15893 – 15906	0.0

* 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 NOS gauges in the vicinity. The elevation of the MHW tidal datum in the project area varies between 0.38 – 0.48 meters above MLLW.

Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a member of the Applications Branch. The final QC review was completed in January 2016. 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 ArcGIS 10.2 software. All project data was evaluated for compliance to CMP requirements.

Comparisons of the largest scale NOAA nautical charts with source imagery and compiled project data resulted in creation of the Chart Evaluation File (CEF). The following nautical charts were used in the comparison process:

11376, Mobile Bay, 1:80,000, 58th Ed., Nov. 2015

11377, Mobile Bay – Approaches & Lower Half, 1:40,000, 11th Ed., Nov. 2015

11380, Mobile Bay – East Fowl River to Deer River Pt, 1:20,000, 4th Ed., Nov. 2015

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

- Airborne Positioning and Orientation Report (APOR)
- Direct Georeferencing Report
- Project Completion Report (PCR)
- Project Database
- GC11178 in shapefile format
- CEF in shapefile format

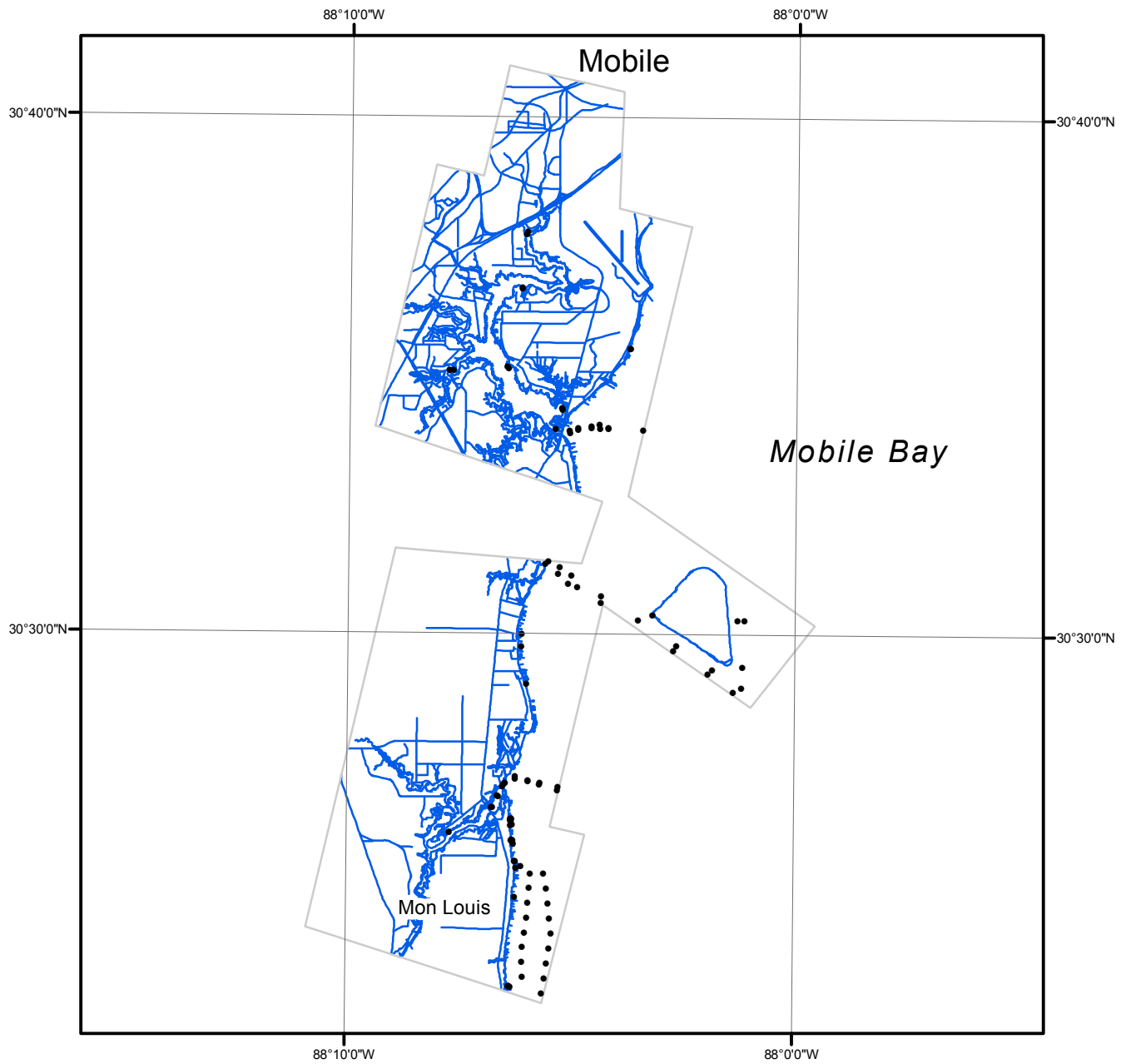
NOAA Shoreline Data Explorer

- GC11178 in shapefile format
- Metadata file for GC11178
- Digital copy of the PCR in Adobe PDF format

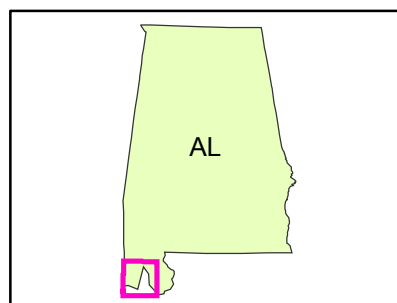
End of Report

WESTERN MOBILE BAY

ALABAMA



Overview



AL0904-CM-N

GC11178