

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT SC1401A-CM-N

Southern Edisto Island, South Carolina

Introduction

NOAA Coastal Mapping Program (CMP) Project SC1401A-CM-N provides a highly accurate database of new digital shoreline data for the southwestern portion of Edisto Island, South Carolina, including St. Pierre Creek and other smaller waterways in the vicinity. Project SC1401A-CM-N is a subset of a larger project, SC1401-CU-N, covering areas of the coast and rivers between Pine Island and North Charleston, South Carolina. 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) designed Project SC1401-CU-N to support the Continually Updated Shoreline Product (CUSP), a seamless database of high resolution shoreline data. Project SC1401A-CM-N was subsequently designed in response to a request for shoreline data from the Marine Chart Division of NOAA's Office of Coast Survey in support of charting requirements. RB formulated the photographic mission instructions for this project following the guidelines of the Photo Mission Standard Operating Procedures. The instructions discussed the project's purpose, geographic area of coverage, scope and priority, image requirements, Global Positioning System (GPS) data collection procedures and guidelines, instructions for data recording and handling, and mission communication protocols. RB created a Project Layout Diagram, flight maps and input files for the aircraft 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. Aerial survey operations for SC1401-CU-N were conducted from February through May 2014 with the NOAA King Air 350CER aircraft (N68RF). Project imagery included thirty eight flight lines of natural color and near-infrared (NIR) imagery acquired concurrently using an Applanix DSS-439 dual head digital camera system (two 60 mm lenses). Only seven flight lines were necessary for the completion of subproject SC1401A-CM-N. 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 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 using Applanix POSPac MMS 6.2 GPS/IMU software in April and June 2014. For further information refer to the Airborne Positioning and Orientation Reports (APOR) on file with other project data within the RSD Applications Branch (AB) Project Archive.

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 Excel spreadsheet based Exterior Orientation Total Propagated Uncertainty (EO-TPU) tool developed by NGS. Using this tool, the predicted horizontal uncertainty at the 95% confidence level was calculated to be 1.4 meters.

Compilation

The data compilation phase of this project was accomplished by RSD AB personnel in March 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 chart 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 SC1401A-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 2.8 meters. This predicted accuracy of well-defined points measured during the compilation phase was derived by doubling the imagery accuracy computed from the EO-TPU tool.

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

Date	Time (UTC)	Roll #	Photo #s	Tide Level*
2/18/2014	14:50 – 14:51	14NC20	5097 – 5108	1.9 – 1.8 m
2/18/2014	15:23 – 15:25	14NC20	5191 – 5207	1.8 – 1.9 m
4/22/2014	17:33 – 17:35	14NC37	8563 – 8579	1.9 – 2.0 m
4/22/2014	17:39 – 17:42	14NC37	8580 – 8596	2.0 m
5/8/2014	20:19 – 20:21	14NC42	9787 – 9802	1.8 m
5/8/2014	20:25 – 20:27	14NC42	9803 – 9817	1.8 m
5/8/2014	20:32 – 20:34	14NC42	9818 – 9827	1.8 m

* Tide levels are given in meters above MLLW and were calculated using the Pydro software tool with discrete tidal zoning referenced to verified water level observations at the time of photography from various NOS gauges in the vicinity of the project. The elevation of the MHW tidal datum in the project area is 1.8 – 2.0 m. 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 June 2015. 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 10.2.2 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:

- 11517, St. Helena Sound, SC, 1:40,000 scale, 18th Ed., Dec. /07
- 11522, Stono and North Edisto Rivers, SC, 1:40,000 scale, 21st Ed., Apr. /10

End Products and Deliverables

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

RSD Applications Branch Archive

- Hardcopy of the SC1401-CU-N Data Acquisition Summary
- Hardcopy of the Airborne Positioning and Orientation Reports (APOR)
- Hardcopy of the Project Completion Report (PCR)
- Page-size graphic plot of GC11126 file contents, attached to PCR

Remote Sensing Division Electronic Data Library

- Project database
- GC11126 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

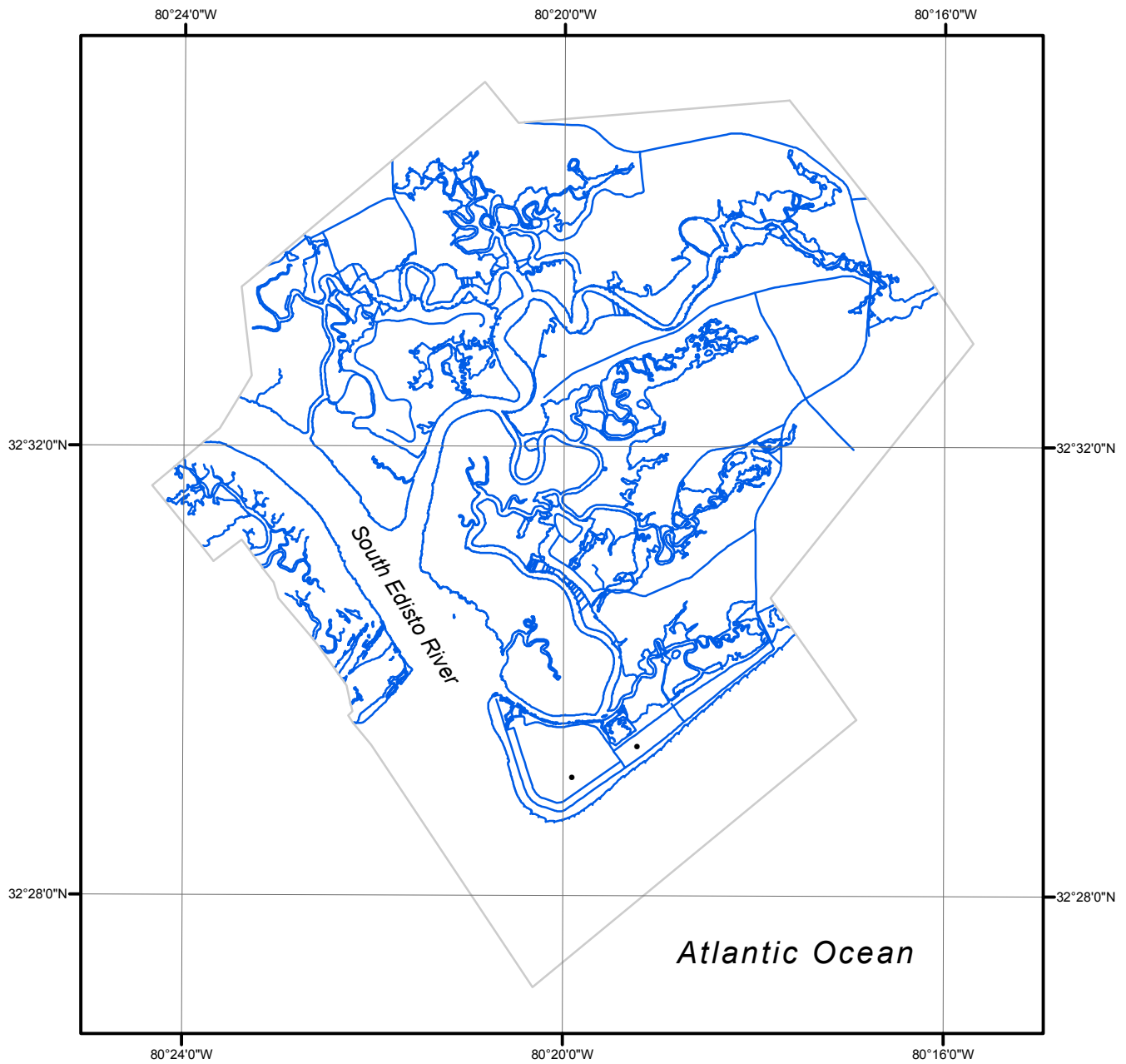
NOAA Shoreline Data Explorer

- GC11126 in shapefile format
- Metadata file for GC11126
- Digital copy of the PCR in Adobe PDF format

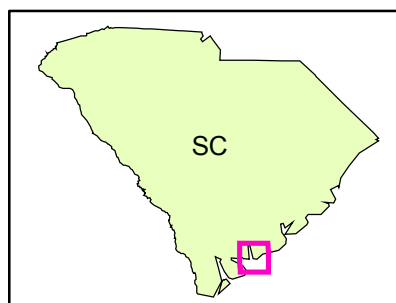
End of Report

SOUTHERN EDISTO ISLAND

SOUTH CAROLINA



Overview



SC1401A-CM-N

GC11126