

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT ME1001

Whiting Bay to Cobscook Bay, Maine

Introduction

NOAA Coastal Mapping Program (CMP) Project ME1001 provides a highly accurate database of new digital shoreline data for a portion of the coastline from Whiting Bay to Cobscook Bay, Maine, including Falls Island and several other small islands. 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

Project ME1001 was designed in response to a request for shoreline data from the Navigation Services Division of NOAA's Office of Coast Survey. 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 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 were conducted on June 21, 2011 with the NOAA Hawker Beechcraft King Air B300CER aircraft (N68RF). Project imagery included two 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). All imagery was acquired at a nominal altitude of 10,000 feet, resulting in an approximate ground sample distance (GSD) of 0.35 meters. Both flight lines were acquired twice, the second coordinated with MLLW. However the MLLW-coordinated acquisition had to be terminated prematurely due to the presence of clouds in the project area.

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 (ver. 5.4) software in July 2011. 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 1.3 meters.

Two NGS third order geodetic control points (“LITTLE 2 1886” and “TASK”) were used to verify 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 RSD AB personnel in November 2012. 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 ME1001 were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 2.7 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	~ GSD	Tide Level*
6/21/2011	13:18 – 13:19	11NC57	18372 – 18381	0.35 m	0.6 – 1.1 m
6/21/2011	13:18 – 13:19	11NR34	11926 – 11935	0.35 m	0.6 – 1.1 m
6/21/2011	13:24 – 13:25	11NC57	18382 – 18392	0.35 m	0.6 – 0.9 m
6/21/2011	13:24 – 13:25	11NR34	11936 – 11946	0.35 m	0.6 – 0.9 m
6/21/2011	14:05 – 14:07	11NC57	18508 – 18518	0.35 m	0.3 – 0.4 m
6/21/2011	14:05 – 14:07	11NR34	12062 – 12072	0.35 m	0.3 – 0.4 m
6/21/2011	14:18	11NC57	18519 – 18521	0.35 m	0.3 m
6/21/2011	14:18	11NR34	12073 – 12075	0.35 m	0.3 m

* Tide levels are given in meters above MLLW and are based on actual observations at the Eastport reference station with corrections applied to substations within the project area. The mean range of tide in the project area is approximately 5.3 meters.

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 November 2012. 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 9.3.1 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 chart was used in the comparison process:

13394, Grand Manan Channel Northern Part, 1:50,000, 3rd Ed., Jul./02

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 ME1001 Data Acquisition Summary
- Hardcopy of the Airborne Positioning and Orientation Report (APOR)
- Hardcopy of the Project Completion Report (PCR)
- Page-size graphic plot of GC10949 file contents, attached to PCR

Remote Sensing Division Electronic Data Library

- Project database
- GC10949 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

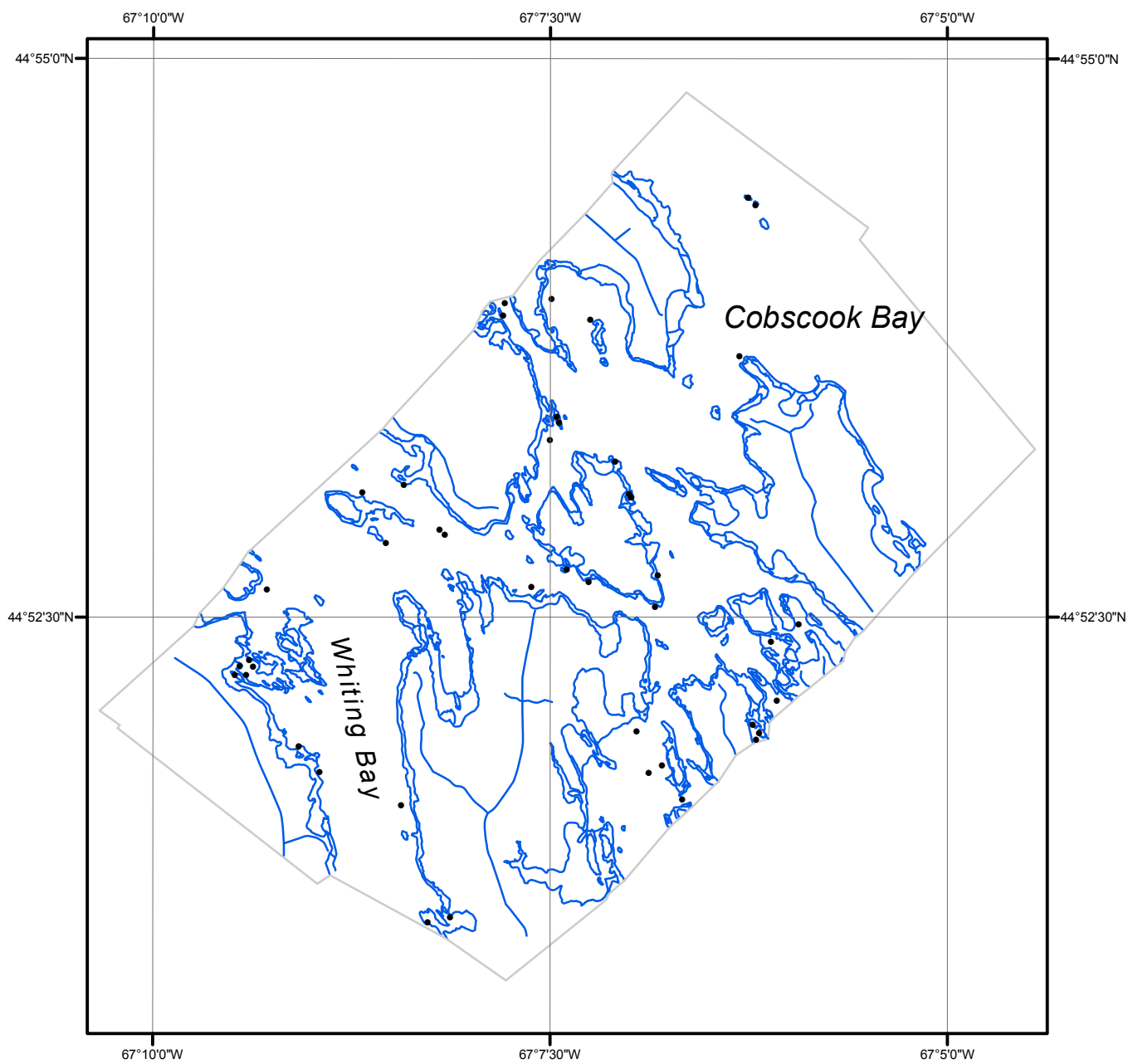
NOAA Shoreline Data Explorer

- GC10949 in shapefile format
- Metadata file for GC10949
- Digital copy of the PCR in Adobe PDF format

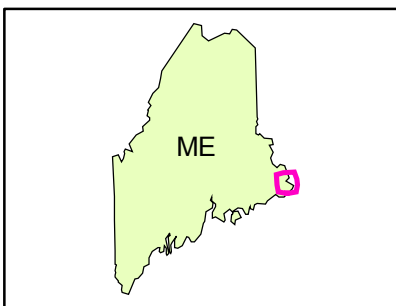
End of Report

WHITING BAY TO COBSCOOK BAY

MAINE



Overview



ME1001

GC10949