

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT MS1401

Ship Island to Petit Bois Island, Mississippi

Introduction

Coastal Mapping Program (CMP) Project MS1401 provides highly accurate digital shoreline data for several barrier islands along the Mississippi Gulf Coast, and includes coverage of Dog Keys Pass and Horn Island Pass. The Geographic Cell (GC) may be used in support of the NOAA Nautical Charting Program (NCP) as well as geographic information systems (GIS) for coastal zone management applications.

Project Design

The design of Project MS1401 was initiated in response to a specific request from the Atlantic Hydrographic Branch (AHB) of NOAA for new shoreline data for Little Dog Keys Pass to complement recently acquired hydrographic survey data. Previously flown aerial imagery was obtained and assessment of the requested area conducted. The presence of additional areas of shoreline change resulted in the project area being enlarged, and newer satellite imagery was then obtained in order to conduct further assessment and delineate the latest shoreline positions and alignments for the most critical areas within the project. Satellite imagery used for this purpose included four orthorectified WorldView and QuickBird images from DigitalGlobe, Inc.

Field Operations

Field operations consisted of the collection of static and kinematic Global Positioning System (GPS) data, Inertial Measurement Unit (IMU) data, and the acquisition of aerial imagery. Aerial imagery was acquired using Applanix Digital Sensor System (DSS 439) cameras with NOAA aircraft. The first photographic mission was conducted on October 10, 2010 as part of a larger emergency response effort (ER1005) during the ongoing Deepwater Horizon Oil Spill in the Gulf of Mexico, and yielded imagery suitable for compiling data for the majority of project area. A subsequent emergency response mission in the Gulf of Mexico following Hurricane Isaac (ER1202), from August 31 through September 3, 2012, yielded further imagery useful for validating the locations of shorelines as well as providing limited updates. A subset of seven strips of color images was used from ER1005, and orthomosaic tiles derived from six strips of color imagery acquired September 1, 2012 were used from ER1202. Airborne kinematic GPS data was collected in conjunction with IMU data to determine precise camera positions and orientations for all aerial imagery.

GPS Data Reduction

GPS and IMU data were processed by RSD personnel to yield precise camera positions and orientations for direct georeferencing (DG) of aerial imagery. Local GPS base stations were established for use as reference stations in kinematic GPS processing operations. The positions of the base stations were determined using the NGS Online Processing User Service (OPUS) software, which computed fixed baseline solutions from nearby CORS stations. Airborne kinematic data was processed in November 2010 (ER1005) and February 2014 (ER1202) using Applanix POSPAC software (ver. 5.3 and 6.1 respectively). Positional data is referenced to the North American Datum of 1983 (NAD83).

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 EO Total Propagated Uncertainty (TPU) tool developed by NGS. Using this tool, the predicted horizontal uncertainty at the 95% confidence level was calculated to be 0.7 meters for ER1005 data and 1.2 meters for ER1202 data.

Satellite Image Georeferencing

Rigorous refinement of the georeferencing of the satellite images used for compilation was not necessary since image positioning compared well spatially with sources used to check the geopositioning, and since the vendor provided acceptable accuracy assessments for the imagery. The vendor-reported accuracy of the WorldView imagery is 8.4 meters and the QuickBird imagery is 25.4 meters at the 90% confidence level (CE90). These reported accuracies are exclusive of viewing geometry and terrain distortions.

Compilation

Data compilation was performed by RSD personnel in February 2014. Initial compilation of feature data was accomplished utilizing the October 2010 emergency response imagery on a Digital Photogrammetric Workstation (DPW) in conjunction with the SOCET SET (ver. 5.6) Feature Extraction software module. Subsequent analysis and compilation was performed using commercial satellite imagery, acquired in March 2013 and August 2013, and using orthomosaic tiles from the second set of emergency response imagery, which was acquired in September 2012.

Feature identification and attribution within the Geographic Cell (GC) were based on image analysis of the digital photographs and information extracted from the appropriate 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.

All spatial data accuracies for MS1401 were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features compiled from aerial photography were compiled to meet a horizontal accuracy of 1.4 meters (ER1005)

or 2.4 meters (ER1202). These predicted accuracies of compiled, well-defined points are derived by doubling the horizontal uncertainty values derived from the DG data. Features compiled from satellite imagery were compiled to meet a horizontal accuracy of 9.6 meters (WorldView) or 29.0 meters (QuickBird), based on the vendor reported CE90 accuracies converted to the 95% confidence level (CE95).

The following table provides information on the imagery used in the project completion:

Aerial photos					
Date	Time (UTC)	Roll #	Strip / Photo #s	~GSD	Tide *
10/10/2010	16:21-16:23	10NC82	138020 / 47592 - 47604	0.25 m	0.1 m
10/10/2010	16:28-16:29	10NC82	138021 / 47605 - 47616	0.25 m	0.1 m
10/10/2010	16:32-16:33	10NC82	138022 / 47617 - 47624	0.25 m	0.1 m
10/10/2010	16:38-16:42	10NC82	138023 / 47625 - 47663	0.25 m	0.1 m
10/10/2010	16:47-16:51	10NC82	138024 / 47664 - 47699	0.25 m	0.1 m
10/10/2010	16:57-16:59	10NC82	138025 / 47700 - 47715	0.25 m	0.1 m
10/10/2010	17:04-17:05	10NC82	138026 / 47716 - 47728	0.25 m	0.1 m
9/1/2012	14:43-14:45	12NC56	138066 / 13935 - 13943	0.27 m	0.5 m
9/1/2012	14:51-14:53	12NC56	138065 / 13944 - 13954	0.27 m	0.5 m
9/1/2012	14:59-15:04	12NC56	138063 / 13955 - 13977	0.27 m	0.5 m
9/1/2012	15:09-15:11	12NC56	138064 / 13978 - 13987	0.27 m	0.5 m
9/1/2012	15:18-15:20	12NC56	138059 / 13988 - 13995	0.27 m	0.5 m
9/1/2012	15:26-15:28	12NC56	138058 / 13996 - 14003	0.27 m	0.5 m
Satellite imagery					
Image Source	Acquisition Date/Time	Derivative Image File		Resolution	Tide *
WorldView-2	3/15/2013 16:55 GMT	20130315_165522_WV02_ORI.jp2		0.5 m	0.4 m
QuickBird	8/3/2013 15:59 GMT	20130803_155919_QB_ORI.jp2		0.6 m	0.4 m
WorldView-2	8/22/2013 16:59 GMT	20130822_165927_WV02_ORI.jp2		0.5 m	0.6 m
WorldView-2	8/22/2013 16:59 GMT	20130822_165946_WV02_ORI.jp2		0.5 m	0.6 m

* Tide levels are given in meters above MLLW and are based on actual observations recorded by NOS gauges at Pascagoula, MS (#8741533 and 8741041). The elevation of MHW in Pascagoula is 0.4 meters above MLLW.

Final Review

The final review of the project was completed by a senior member of RSD in February 2014, and 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 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:

Chart 11372, Dog Keys Pass to Waveland, 1:40,000 scale, 35th Ed., Sep. /12
Chart 11374, Dauphin I. to Dog Keys Pass, 1:40,000 scale, 37th Ed., Oct. /13

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 Project Completion Report (PCR)
- Page-size graphic of GC11050 file contents, attached to PCR

Remote Sensing Division Electronic Data Library

- Project database
- GC11050 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

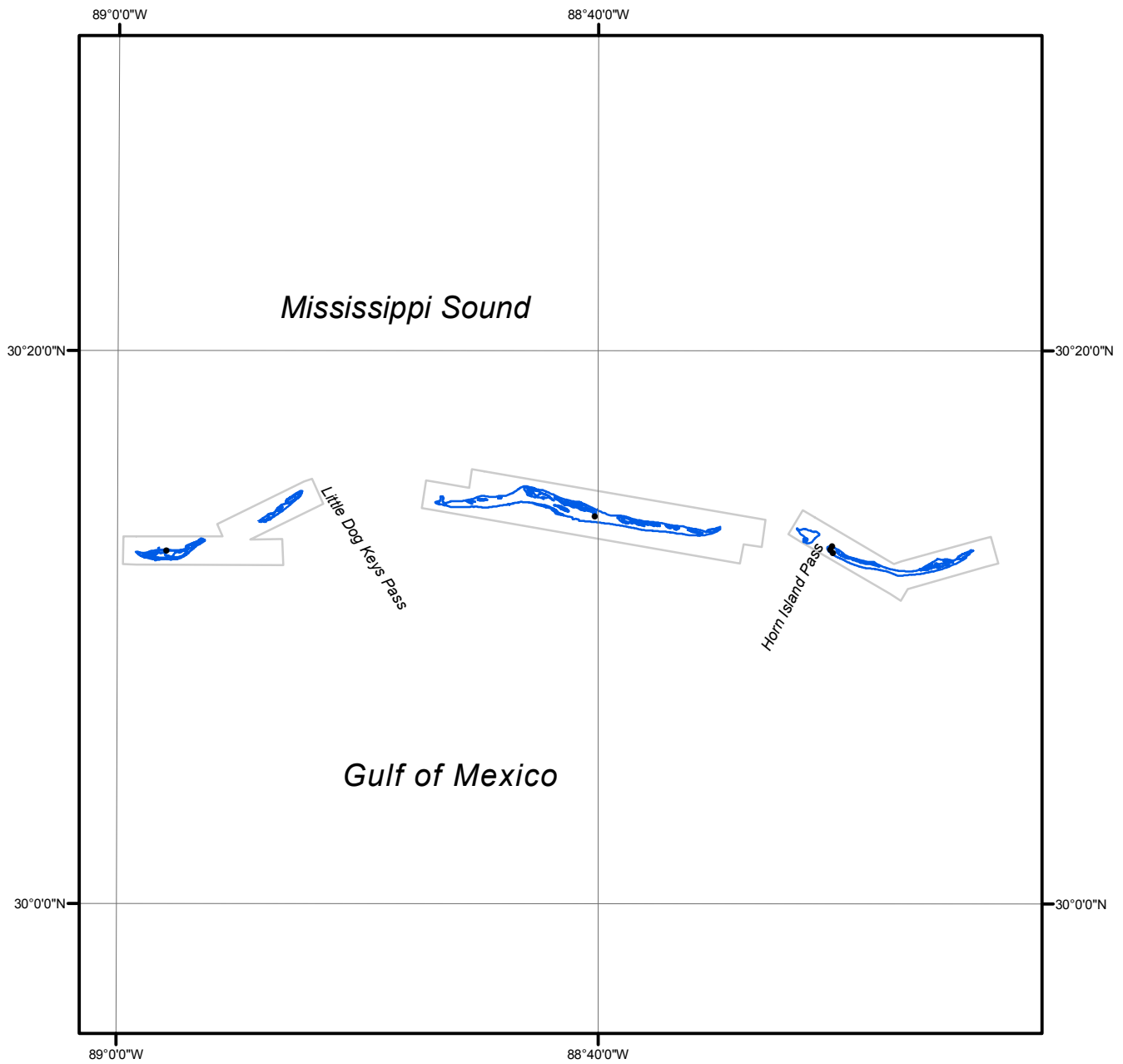
NOAA Shoreline Data Explorer

- GC11050 in shapefile format
- Metadata file for GC11050
- Digital copy of the PCR in Adobe PDF format

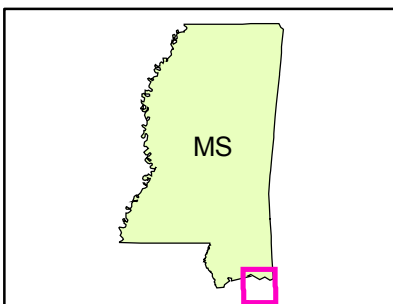
End of Report

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Overview



MS1401

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