

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT TX1403B-CM-N

Padre Island, Port Mansfield Channel to Brazos Santiago Pass, Texas

Introduction

NOAA Coastal Mapping Program (CMP) Project TX1403B-CM-N provides highly accurate digital shoreline data for Padre Island, from Port Mansfield Channel to Brazos Santiago Pass, Texas. TX1403B-CM-N is a subproject of a larger acquisition project TX1403-CU-N, which extends from the Rio Grande River to Port Mansfield, Texas. 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 TX1403-CU-N to support the Continually Updated Shoreline Product (CUSP), a seamless shoreline database. Photographic mission instructions were formulated following the guidelines of RSD's 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.

The northern back-bay portion of this project is located in a non-tidal area of Laguna Madre, where a Mean Water Level (MWL) datum and a Low Water Datum (LWD) are established in lieu of the standard Mean High Water and Mean Lower Low Water tidal datums, respectively. MWL is an adjusted average equivalent to Mean Sea Level (MSL), and LWD is determined by subtracting 0.5 ft. from the MWL datum. The southern back-bay and outer coast portions of this project area do include the standard MHW and MLLW tidal datums.

Field Operations

The field operations consisted of the collection of static and kinematic GPS data, Inertial Measurement Unit (IMU) data, and the acquisition of aerial imagery. The photographic mission operations were conducted with the NOAA King Air aircraft in October 2014 and February 2015. In October, natural color and near-infrared (NIR) images were acquired concurrently with an Applanix Digital Sensor System (DSS) 439 dual-camera, and in February only natural color images were acquired with a DSS 439 single-camera system, due to only the RGB camera being available. The October 2014 imagery acquisition was coordinated with the Mean Sea Level (MSL) datum. The February 2015 imagery acquisition was not tide-coordinated except for outer coast strips 53-001, 53-002, and 53-003 being collected at the Mean High Water (MHW) datum. All images were acquired at a nominal altitude of 10,500 feet, resulting in an approximate ground sample distance (GSD) of 0.37 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 (ver. 6.2 & 7.1) software in November 2014 and March 2015. For further information refer to the Airborne Positioning and Orientation Report (APOR) that is 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 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 1.08 meters.

NGS third order control was 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 completed by a member of the Applications Branch (AB) of RSD in February 2019. The Feature Extraction module of BAE Systems' SOCET SET (ver. 5.6) photogrammetric software was used to compile feature data from imagery. Feature identification and the assignment of cartographic codes were based on image analysis of the project digital images and information extracted from the appropriate NOAA Nautical Charts, U.S. Coast Guard Light List 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 TX1403B-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 2.2 meters at the 95% confidence level. This predicted accuracy of compiled well-defined points measured during the compilation phase was 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		Water Level
		Roll	Strip/Images	Roll	Strip/Images	
15-OCT-2014	19:17 – 19:20	14NC92	53-039/20634 – 20652	14NR82	53-039/17164 – 17182	0.1 – 0.0*
15-OCT-2014	19:24 – 19:25	14NC92	53-041/20653 – 20658	14NR82	53-041/17183 – 17188	0.0 m*

15-OCT-2014	19:29 – 19:30	14NC92	53-040/20659 – 20666	14NR82	53-040/17189 – 17196	0.0 m*
15-OCT-2014	19:34 – 19:39	14NC92	53-038/20667 – 20698	14NR82	53-038/17197 – 17228	0.1 – 0.0*
15-OCT-2014	19:44 – 19:48	14NC92	53-026/20699 – 20726	14NR82	53-026/17229 – 17256	0.0 m*
25-FEB-2015	19:54 – 19:56	15NC22	53-016/3836 – 3851	n/a		NO DATA
25-FEB-2015	20:02 – 20:05	15NC22	53-002/3852 – 3867	n/a		0.5 m **
25-FEB-2015	20:59 – 21:02	15NC22	53-015/3939 – 3961	n/a		NO DATA
25-FEB-2015	21:08 – 21:17	15NC22	53-001/3962 – 4013	n/a		0.5 m **

* Water levels for the 2014 back-bay (Laguna Madre) images are given in meters above **MSL** and are based on verified observations at the TCOON gauges at Port Mansfield (8778490) and Realitos Peninsula (8779280).

** Water levels for the 2015 outer coast images are given in meters above **MLLW** and are based on verified observations at the NOS gauge at Bob Hall Pier (8775870) in Corpus Christi, with time and height offsets applied to tidal zones in the project area.

NO DATA: Water levels could not be determined due to Realitos Peninsula gauge failure.

Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a senior member of RSD. The final QC review was completed in February 2019. The review process included analysis of aerotriangulation 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 (ver. 10.5.1) software. All project data was evaluated for compliance to CMP requirements.

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

- 11302, ICW, Stover Point to Port Brownsville, 34th Ed., Jan. 2014,
- 11303, ICW, Laguna Madre - Chubby Island to Stover Point, 22nd Ed., Jan. 2014
- 11306, ICW, Laguna Madre - Middle Ground to Chubby Island, 22nd Ed., Oct. 2012

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

- Project database
- Airborne Positioning and Orientation Report (APOR)
- GC11435 in shapefile format
- Project Completion Report (PCR)
- CEF in shapefile format

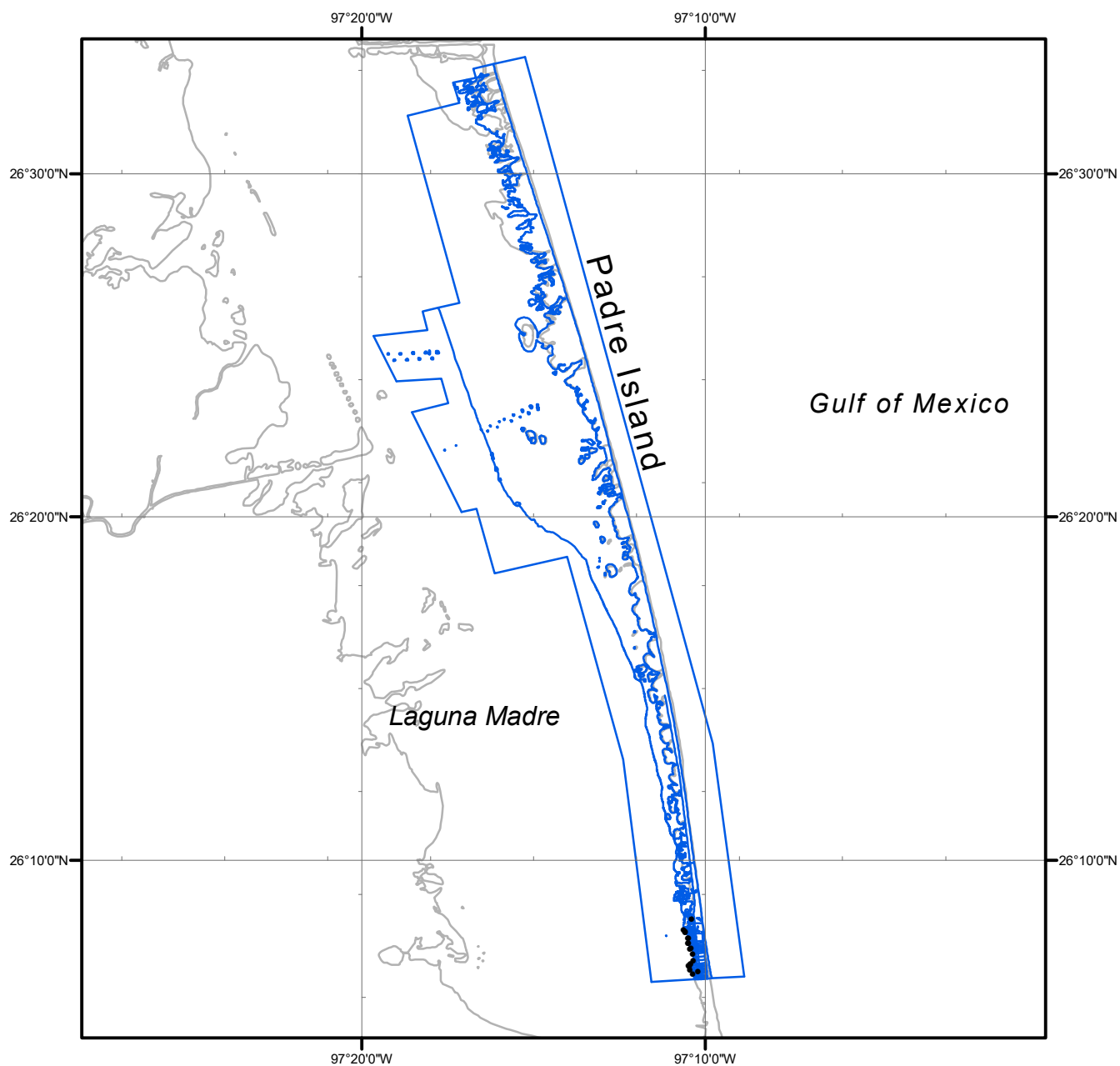
NOAA Shoreline Data Explorer

- GC11435 in shapefile format
- Metadata file for GC11435
- PCR in Adobe PDF format

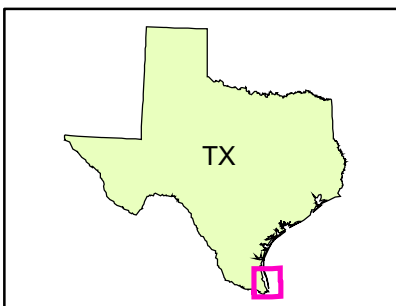
End of Report

PADRE ISLAND, PORT MANSFIELD CHANNEL TO BRAZOS SANTIAGO PASS

TEXAS



Overview



TX1403B-CM-N

GC11435