

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT TX1502A-CS-N

Port of Houston, Texas

Introduction

Coastal Mapping Program (CMP) Project TX1502A-CS-N provides highly accurate digital shoreline data for key areas of change for the port of Houston, Texas, including the Houston Ship Channel from Galveston Bay to the city of Houston. 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 design of Project TX1502A-CS-N was accomplished by the Requirements Branch (RB) of the Remote Sensing Division (RSD) in response to the need for expedited updates to the NOAA chart suite in key ports. Project requirements were formulated as a result of analysis conducted within the Coast and Shoreline Change Analysis Program (CSCAP), in which NOAA nautical chart products are compared to contemporary high resolution imagery in order to ascertain the need for more current shoreline data. Orthomosaics from aerial photography were utilized for the CSCAP analysis. A Chart Evaluation File (CEF) was created once the change analysis was complete. Refer to the CSCAP memorandum of April 15, 2015 for details of the chart comparison process.

Field Operations

Field operations consisted of the collection of static and kinematic Global Positioning System (GPS) data and Inertial Measurement Unit (IMU) data, and the acquisition of aerial imagery. Project TX1502A-CS-N is part of a larger aerial photography acquisition (TX1502-CS-N) in which a total of seventeen strips of imagery were acquired. Aerial survey operations for TX1502A-CS-N were conducted on February 13, 2015 with the NOAA King Air (N68RF) aircraft. A total of ten strips of RGB (color) imagery were acquired (224 images) utilizing an Applanix DSS-539 digital camera at a nominal altitude of 10,500 feet, resulting in an approximate ground sample distance (GSD) of 0.36 m. Though not strictly coordinated with local tides, the goal was to acquire all photographs at a stage of tide below Mean High Water (MHW).

GPS Data Reduction

GPS/IMU data was collected and processed by RSD personnel to yield precise positions and orientations of camera centers for application as photogrammetric control in the aerotriangulation (AT) phase. 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 in

March 2015 using POSPac MMS 7.1. For further information refer to the Airborne Positioning and Orientation Report (APOR), on file with other project data within the RSD Applications Branch (AB) Project Archive.

Aerotriangulation

Routine softcopy AT methods were applied to establish the network of precise camera positions as control for mapping, and to provide model parameters and orientation elements required for digital compilation. This work was completed by AB personnel in April 2015 utilizing a digital (softcopy) photogrammetric workstation (DPW). The color images were measured and adjusted as a single block using BAE Systems' SOCET SET (ver. 5.6) photogrammetric software in conjunction with the Multi-Sensor Triangulation (MST) module. Upon completion of the AT process, the simultaneous solve tool within MST provided the standard deviations for each aerotriangulated ground point, which were used to compute a predicted horizontal circular error of 0.46 meters based on a 95% confidence level. An AT Report was written and is on file with other project data within the RSD project archive. Positional data is based on the UTM Coordinate System (zone 15), and referenced to the North American Datum of 1983.

Compilation

The data compilation phase of this project was accomplished by a member of AB in May 2015. Digital mapping was performed using a DPW in conjunction with the SOCET SET (ver. 5.6) Feature Extraction module. Feature identification and attribution within the GC were based on analysis of the digital imagery and information extracted from the appropriate NOAA nautical chart products 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 TX1502A-CS-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 0.9 meter at the 95% confidence level. This value was derived by doubling the circular error computed from the AT statistics in order to conservatively predict the accuracy of compiled well defined points.

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

Date	Time (UTC)	Roll #	Strip / Frame #s	Tide Level*
13-FEB-2015	15:37-15:44	15NC16	53-012 / 2411-2454	0.0 to -0.1 m
13-FEB-2015	15:50-15:55	15NC16	53-015 / 2455-2488	-0.1 to 0.0 m
13-FEB-2015	16:00-16:03	15NC16	53-017 / 2489-2506	0.0 m
13-FEB-2015	16:08-16:09	15NC16	53-014 / 2507-2516	-0.1 m
13-FEB-2015	16:15-16:19	15NC16	53-016 / 2517-2538	-0.1 m
13-FEB-2015	16:25-16:28	15NC16	53-011 / 2539-2563	-0.1 m
13-FEB-2015	16:32-16:36	15NC16	53-010 / 2564-2584	-0.1 m

13-FEB-2015	16:39-16:42	15NC16	53-013 / 2585-2601	-0.1 to 0.0 m
13-FEB-2015	16:49-16:52	15NC16	53-009 / 2602-2623	-0.1 m
13-FEB-2015	16:57-16:59	15NC16	53-008 / 2624-2634	0.0 m

* 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 reference tide gages in the vicinity. The elevation of the MHW tidal datum in the project area varies between 0.4 - 0.5 meters above MLLW.

Quality Control / Final Review

The final QC review was completed in June 2015 by a senior member of RSD. The review process included analysis of the AT 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. The entire suite of project products was evaluated for compliance to CMP requirements.

End Products and Deliverables

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

RSD Applications Branch Archive

- Hardcopy of the Airborne Positioning and Orientation Report (APOR)
- Hardcopy of the Aerotriangulation Report
- Hardcopy of the Project Completion Report (PCR)
- Page size graphic plot of GC11149 file contents, attached to PCR
- Hardcopy of the CSCAP evaluation memorandum

Remote Sensing Division Electronic Data Library

- GC11149 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

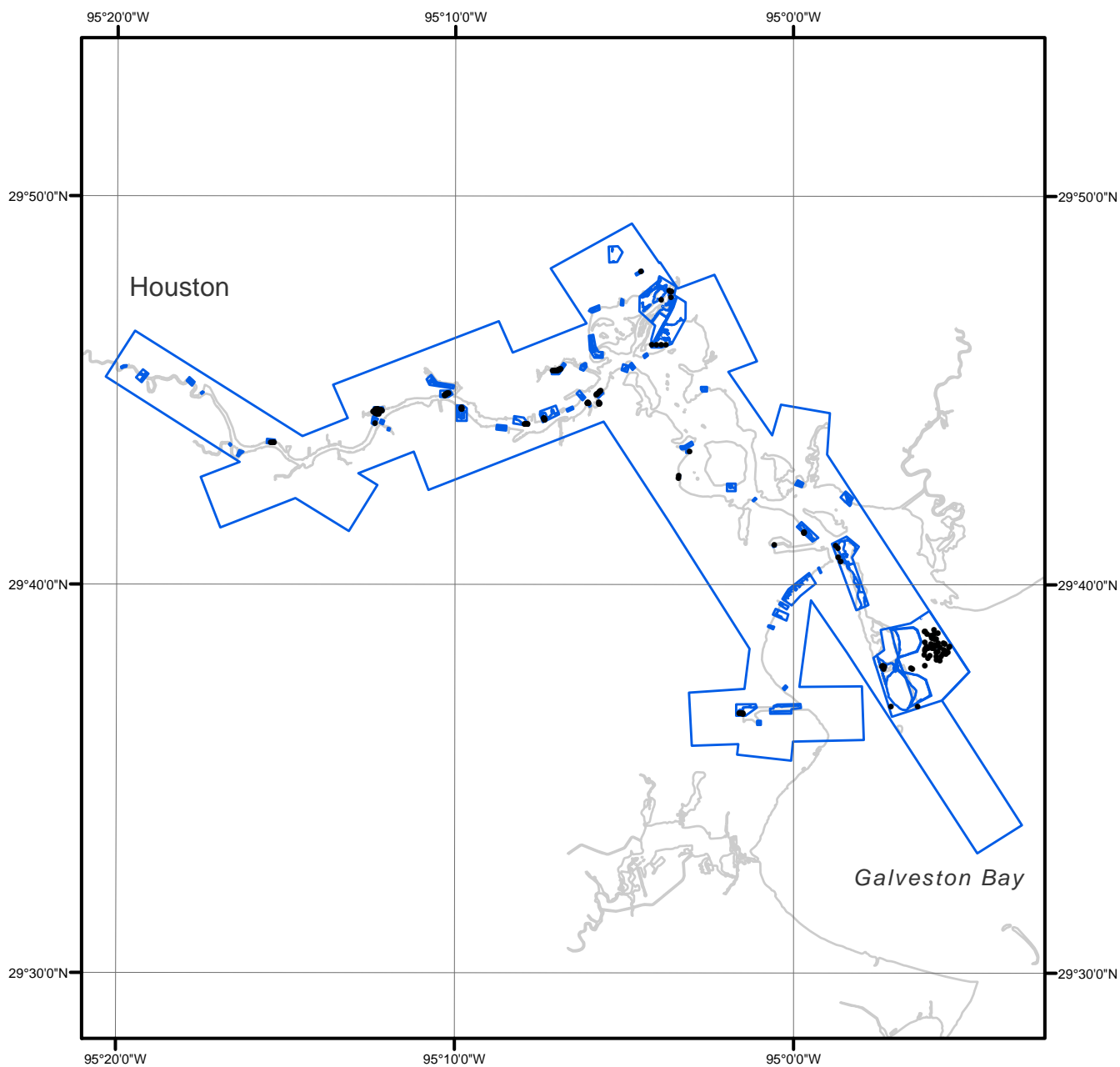
NOAA Shoreline Data Explorer

- GC11149 in shapefile format
- Metadata file for GC11149
- Digital copy of the PCR in Adobe PDF format

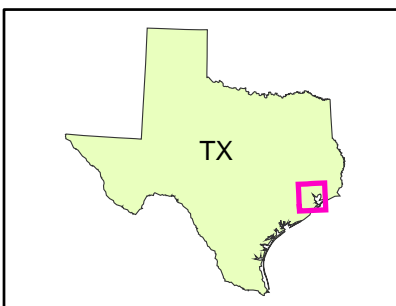
End of Report

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Overview



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GC11149