

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT PR1102

Tallaboa Bay and Guayanilla River, Puerto Rico

Introduction

Coastal Mapping Program (CMP) Project PR1102 provides highly accurate digital shoreline data for Tallaboa Bay and Guayanilla River, in southern Puerto Rico. 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. Successful completion of this project resulted in a densification of the National Spatial Reference System (NSRS), a set of controlled metric-quality digital photographs, and digital feature data of the coastal zone which complements the Nautical Charting Program (NCP) as well as geographic information systems (GIS) for a variety of coastal zone management applications.

The project database consists of information measured and extracted from digital photographs and metadata related to photogrammetric compilation. Base mapping was conducted in a digital environment using stereo softcopy photogrammetry and associated cartographic practices.

Project Design

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 Procedure Version II. The instructions discussed the project's purpose, geographic area of coverage, scope and priority; photographic requirements; flight line priority; Global Positioning System (GPS) data collection procedures and guidelines for both kinematic and static surveys; data recording and handling instructions; and contact and communication information. RB created a Project Layout Diagram, flight maps and input files for the aircraft's flight management system.

Field Operations

The 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. The photographic mission operations were conducted on March 25, 2011 with the NOAA's King Air 350ER aircraft (N68RF). Eleven strips of natural color digital images were acquired with an approximate ground sample distance of 0.15 meters through the use of an Applanix Digital Sensor System (DSS-439) Single Cam digital camera. No base stations or ground control survey points were established for field operations.

GPS Data Reduction

GPS data were processed by Remote Sensing Division (RSD) personnel to yield precise camera positions in order to provide a control network necessary for aerotriangulation. Two CORS stations and one UNAVCO station were processed using the NGS Online Processing User Service (OPUS) software to compute fixed baseline solutions for these stations so they could be used as base stations during GPS processing. The airborne kinematic data was processed using Applanix POSPAC 5.3.0 GPS/IMU software in April 2011.

Aerotriangulation

Routine softcopy aerotriangulation methods were applied to establish a network of precise camera positions and other control for mapping, and to provide model parameters and orientation elements required for digital compilation. This work was initiated by RSD personnel in May 2012 utilizing a Digital Photogrammetric Workstation (DPW), which is a configuration of computer hardware, modular software components, and other associated peripheral devices. The digital images were measured and adjusted as a single block using BAE Systems SOCET SET (version 5.6.0) photogrammetric suite in conjunction with the Bingo (version 5.6) aerotriangulation software. Upon successful completion of the aerotriangulation process, the Bingo software provided the standard deviations for each aerotriangulated ground point, which were used to compute a predicted horizontal circular error of 0.2 meters based on a 95% confidence level. An Aerotriangulation Report was written and is on file with other project data within the RSD Project Archive.

The project database consists of project parameters and options, camera calibration data, interior orientation parameters, adjusted exterior orientation parameters, and positional listing of all measured points. Positional data is referenced to the North American Datum of 1983 (NAD83).

Compilation

The data compilation phase of this project was initiated by RSD in July 2012. Digital mapping was performed using a DPW in conjunction with the SOCET SET Feature Extraction software module. 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, 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 PR1102 were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 0.4 meters at the 95% confidence level. The

predicted accuracy of compiled, well defined points is derived by doubling the circular error computed from aerotriangulation statistics.

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

Date	Time (UTC)	Roll Number	Photo Numbers	GSD (nominal)	Tide Level*
3-25-2011	13:38 – 13:39	11NC14	2555 – 2571	0.15 m	0.05 m
3-25-2011	13:43 – 13:44	11NC14	2573 – 2578	0.15 m	0.04 m
3-25-2011	13:51 – 13:51	11NC14	2579 – 2583	0.15 m	0.04 m
3-25-2011	13:55 – 13:55	11NC14	2585 – 2588	0.15 m	0.04 m
3-25-2011	13:59 – 14:00	11NC14	2589 – 2603	0.15 m	0.03 m
3-25-2011	14:04 – 14:04	11NC14	2605 – 2608	0.15 m	0.03 m
3-25-2011	14:08 – 14:09	11NC14	2609 – 2623	0.15 m	0.03 m
3-25-2011	14:14 – 14:15	11NC14	2625 – 2640	0.15 m	0.02 m
3-25-2011	14:21 – 14:22	11NC14	2641 – 2655	0.15 m	0.03 m
3-25-2011	14:31 – 14:31	11NC14	2657 – 2665	0.15 m	0.03 m
3-25-2011	14:37 – 14:37	11NC14	2667 – 2674	0.15 m	0.02 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 NOS gauges. The height of the MHW tidal datum in the project area is 0.21 meters above MLLW.

Final Review

The final review of the project was completed by a senior member of RSD in September of 2012, and 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 10.0 software. All project data was evaluated for compliance to CMP requirements.

Comparisons of the largest scale NOAA nautical chart with natural color digital images and compiled project data resulted in the creation of the Chart Evaluation File (CEF). The following nautical chart was used in the comparison process:

- 25681, Bahia de Guayanilla and Bahia de Tallaboa, 1:10,000 scale, 18th edition

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 Airborne Positioning and Orientation Report (APOR)
- Hardcopy of the Aerotriangulation Report
- Hardcopy of the Project Completion Report (PCR)
- Page-size graphic plot of GC10943 file contents, attached to PCR

Remote Sensing Division Electronic Data Library

- Project database
- GC10943 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

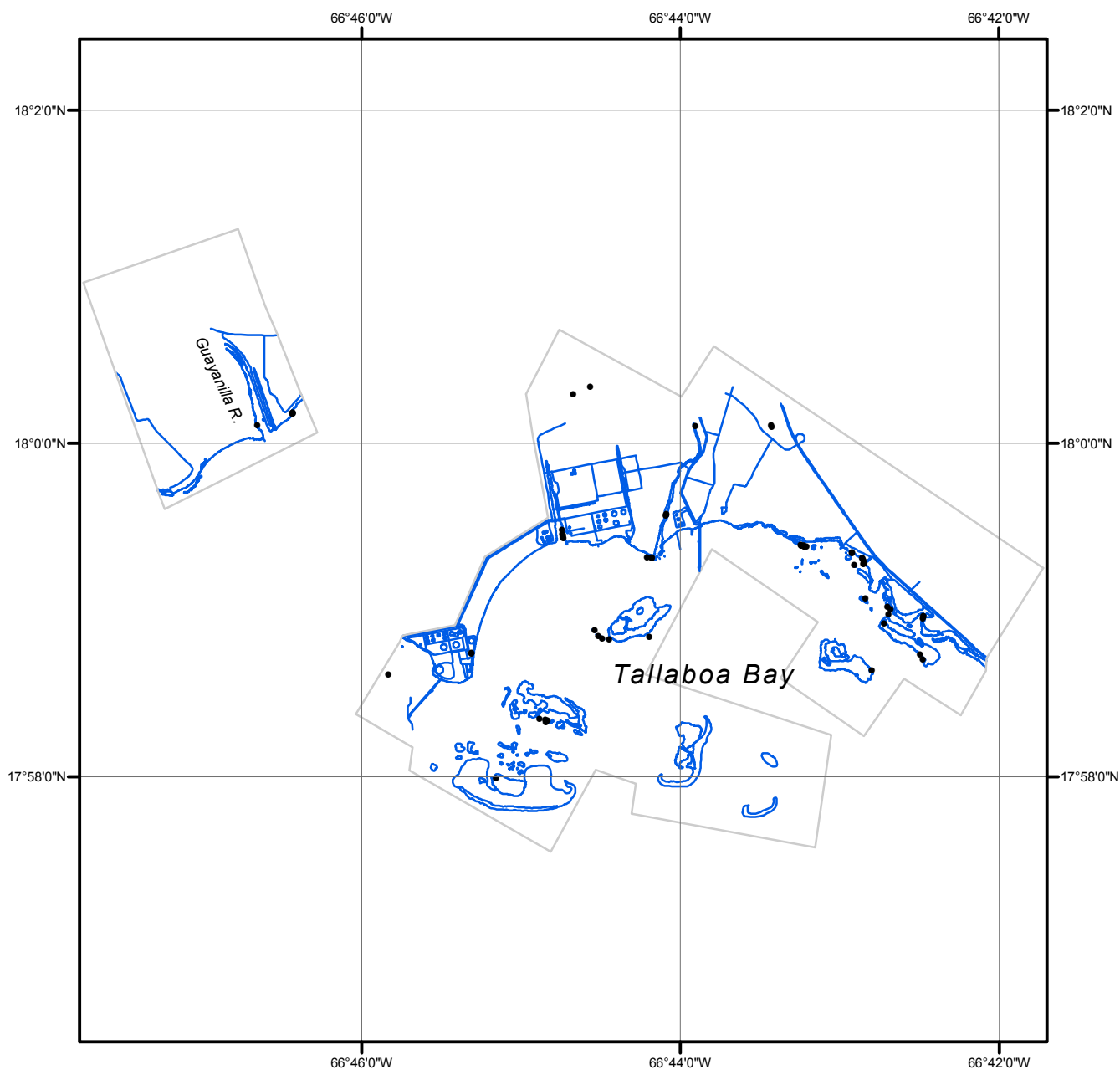
NOAA Shoreline Data Explorer

- GC10943 in shapefile format
- Metadata file for GC10943
- Digital copy of the PCR in Adobe PDF format

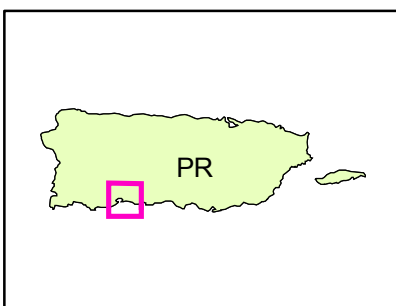
End of Report

TALLABOA BAY AND GUAYANILLA RIVER

PUERTO RICO



Overview



PR1102

GC10943