

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT FL0703A

Pensacola Bay, Florida

Introduction

NOAA Coastal Mapping Program (CMP) Project FL0703A provides a highly accurate database of new digital shoreline data for Pensacola Bay and surrounding coastal areas. The project extends from Pensacola Bay entrance to East Bay and includes Santa Rosa Sound. Project FL0703A is a subproject of a larger project, FL0703, which extends from Pensacola Bay to Blackwater Bay.

Successful completion of this project resulted in controlled metric-quality aerial photographs; color digital orthophotos, 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 aerial 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. The Requirements Branch (RB) of the Remote Sensing Division (RSD) then provided Photo Science with the imagery to be used for the project. RB provided two boxes containing DVDs of scans for the color and B/W IR imagery.

Field Operations

The field operations consisted of the collection of static and kinematic GPS data and the acquisition of aerial imagery. The field operations consisted of the collection of static and kinematic GPS data and the acquisition of aerial imagery. Project imagery consisted of three sets of aerial photographs: Eight strips of B&W IR photos coordinated with Mean High Water (MHW) tide levels, eleven strips of B&W IR coordinated with Mean

Lower Low Water (MLLW) tide levels, and four strips of natural color photos generally taken at any tide stage below MHW.

All film was captured by NOAA at a nominal scale of 1:30,000. The camera used was a WILD RC-30 camera using the NOS "A" cone with a focal length of 153.28 mm. The color film was captured first between the dates of 2/6/2007 and 2/7/2007. The MLLW IR imagery was captured on 3/2/2008, 3/6/2008 and 3/10/2008. The MHW IR imagery was captured on 3/2/2008 and 3/10/2008 respectively.

Photo Science, Inc. was contracted to locate a total of fifteen (15) new photo control points for FL0703. The control points were photo-identifiable features and were taken from well-defined discrete locations. An additional 4 photo-identifiable features that were used as check points for the aerotriangulation were also surveyed. Please see the final ground control report for a listing of final coordinates, elevations, and descriptions.

A base station at Pensacola Regional Airport was positioned atop a PKNAIL and the geodetic position was derived, via the National Geodetic Survey's (NGS) Online Positioning Users Service (OPUS). Airborne kinematic GPS data was collected in conjunction with an Inertial Measurement Unit (IMU) to determine precise camera positions and orientations.

GPS Data Reduction

The mission static base station data were collected using an Ashtech UZ-12, ZE21 dual frequency GPS receiver. The airborne kinematic data for the survey was collected using the APPLANIX Position and Orientation System (POS) POS/AV510 GPS/IMU System in the NOAA Cessna Citation II (N52RF) aircraft with an embedded Trimble Dual frequency receiver and a Novatel-512 antenna. Data were processed on 07/06/2009 using POSPAC 4.4 GPS/IMU processing software.

Further information as to the particulars of the GPS/IMU processing and collection can be found by consulting the four separate APOR Reports for the project (corresponding to the four separate dates of the imagery). The four APOR Reports are titled: the FL0703 07PNS037 APOR, FL0703 07PNS038 APOR, FL0703 08PNS066 APOR, and the FL0703 08PNS070 APOR. They can be found in the Applications Branch (AB) Project archive.

Aerotriangulation

Aerotriangulation for this project was performed by Photo Science Inc. using a softcopy (digital) stereo photogrammetric system to establish the network of control required for the compilation phase. The project photography was bridged as two separate blocks and then merged together to form a single block of adjusted imagery. The first block included all of the 1:30,000 color photographs; and the second block included all of the 1:30,000 MHW and MLLW IR imagery. The softcopy system hardware consisted of a high-end Dell Precision™ Workstation with the Windows® XP Professional operating system, and stereo viewing capability. BAE Systems SOCET SET® v. 5.4.1 softcopy photogrammetry suite was used for both project setup and aerotriangulation, using its MultiSensor Triangulation (MST) module.

Upon successful completion of the aerotriangulation process, the BINGO software provided the RMS of the standard deviations of the residuals for each aerotriangulated ground point which were used to compute a predicted horizontal circular error of 0.8 meters for the aerotriangulation block of the three (3) photo missions based on a 95% confidence level. An Aerotriangulation Report was completed and is on file with other project data within the RSD Applications Branch (AB) Project Archive.

The project database consists of project parameters and options, camera calibration data, interior orientation parameters, ground control parameters, adjusted exterior orientation parameters, and positional listing of all measured points. Positional data is referenced to the North American Datum of 1983 (NAD 83).

Compilation

The data compilation phase of this project was completed by Photo Science in September 2010. 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 project photographs and information extracted from the appropriate NOAA nautical charts, US 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 FL0703A were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 1.6 meters at the 95% confidence level. The predicted accuracy of compiled, well defined points is derived by doubling the circular error derived from aerotriangulation statistics.

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

Date	Time (UTC)	Roll Number	Photo Numbers	Scale (nominal)	Tide Level*
02-06-07	20:08 – 20:15	07ACN03	0260 – 0281	1:30,000	-0.1
02-06-07	20:21 – 20:30	07ACN03	0283 – 0303	1:30,000	-0.1 – 0
02-06-07	20:34 – 20:40	07ACN03	0306 – 0324	1:30,000	-0.1
02-06-07	20:46 – 20:51	07ACN03	0325 – 0337	1:30,000	-0.1
03-02-08	16:00 – 16:03	08AR01	0051 – 0059	1:30,000	-0.1 – 0
03-02-08	16:12 – 16:15	08AR01	0067 – 0075	1:30,000	-0.1 – 0.1
03-02-08	16:20 – 16:23	08AR01	0076 – 0082	1:30,000	0 – 0.1
03-02-08	16:28 – 16:30	08AR01	0083 – 0089	1:30,000	0 – 0.1
03-02-08	16:35 – 16:38	08AR01	0090 – 0098	1:30,000	-0.1 – 0.1
03-02-08	16:47 – 16:51	08AR01	0109 – 0117	1:30,000	0 – 0.1
03-02-08	16:55 – 16:58	08AR01	0118 – 0126	1:30,000	-0.1 – 0.1

03-02-08	17:09 – 17:12	08AR01	0141 – 0149	1:30,000	0 – 0.1
03-02-08	20:45 – 20:47	08AR01	0153 – 0158	1:30,000	0.1 – 0.3
03-02-08	21:01 – 21:03	08AR01	0159 – 0165	1:30,000	0.3
03-02-08	21:09 – 21:11	08AR01	0166 – 0172	1:30,000	0.3
03-06-08	17:18 – 17:21	08AR02	0243 – 0248	1:30,000	0 – 0.1
03-10-08	15:40 – 15:44	08AR02	0312 – 0320	1:30,000	0.2 – 0.4
03-10-08	15:49 – 15:53	08AR02	0321 – 0329	1:30,000	0.2 – 0.4
03-10-08	16:04 – 16:07	08AR02	0342 – 0350	1:30,000	0.2 – 0.3
03-10-08	16:30 – 16:33	08AR02	0379 – 0387	1:30,000	0.2 – 0.3
03-10-08	16:45 – 16:47	08AR02	0400 – 0405	1:30,000	0.2
03-10-08	16:53 – 16:56	08AR02	0406 – 0414	1:30,000	0.2 – 0.3
03-10-08	17:20 – 17:23	08AR02	0431 – 0439	1:30,000	0.2 – 0.3

* Tide levels are given in meters above MLLW and are based on actual observations at various substations throughout the project area with corrections applied from the Pensacola, FL reference station. The mean tide range at the reference station is 0.4 meters.

Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a senior member of Photo Science. The Photo Science Project Manager worked closely with NOAA staff assigned to the project to relay any questions or concerns relating to the compilation process. The final QC review was completed in September 2010. 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 9.3 software. All project data was evaluated for compliance to CMP requirements.

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

11378, Intracoastal Waterway, Santa Rosa Sound to Dauphin I., 1:40,000, 36th Ed. Jul/09
 11382, Pensacola Bay and Approaches, 1:80,000, 41st Ed. May/10
 11383, Pensacola Bay, 1:30,000, 51st Ed. Jan/06
 11384, Pensacola Bay Entrance, 1:10,000, 35th Ed. Oct/06
 11385, Intracoastal Waterway, West Bay to Santa Rosa Sound, 1:40,000, 27th Ed. Feb/07

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 GC10824 file contents, attached to PCR

Remote Sensing Division Electronic Data Library

- Project database
- GC10824 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

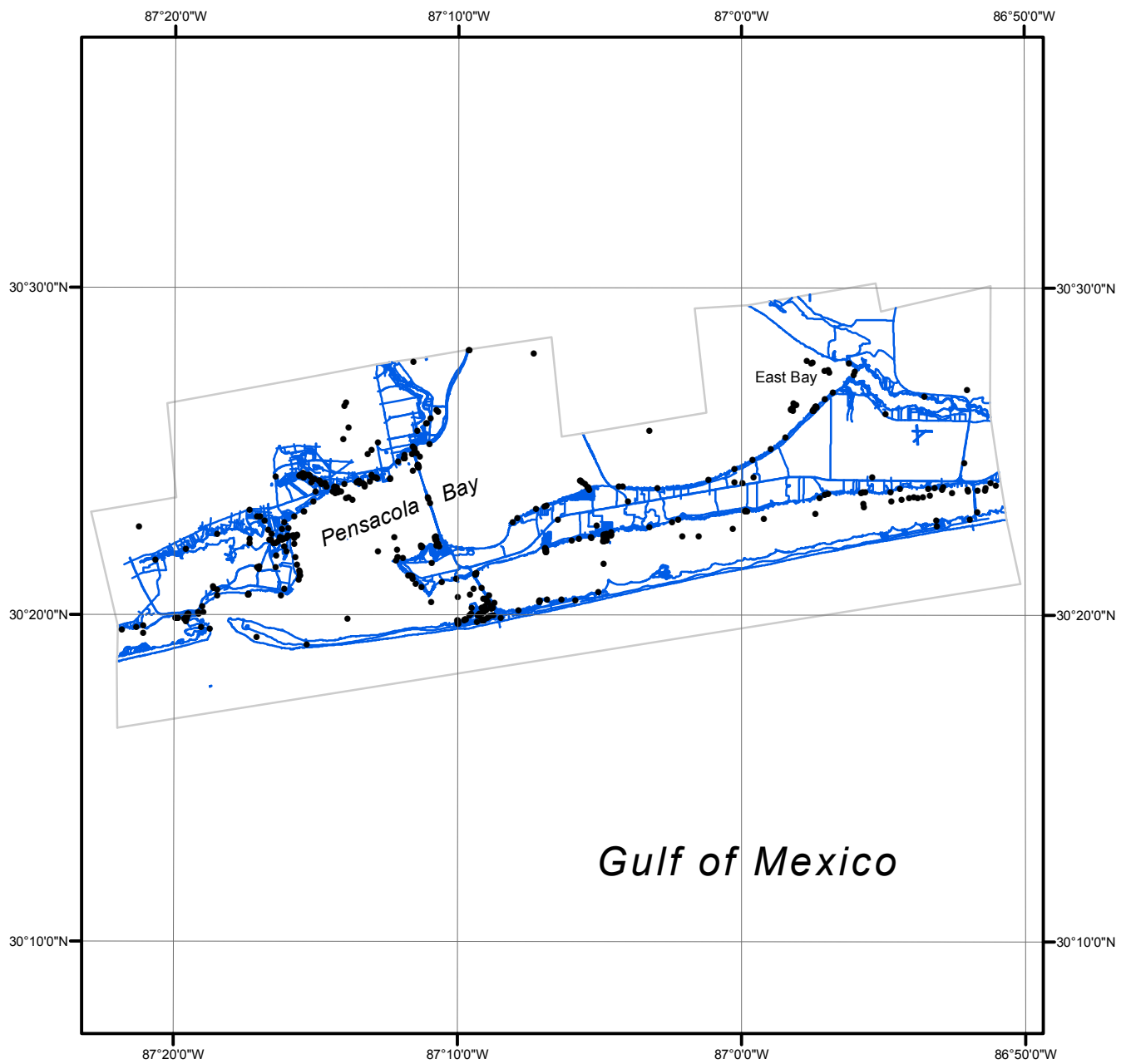
NOAA Shoreline Data Explorer

- GC10824 in shapefile format
- Metadata file for GC10824
- Digital copy of the PCR in Adobe PDF format

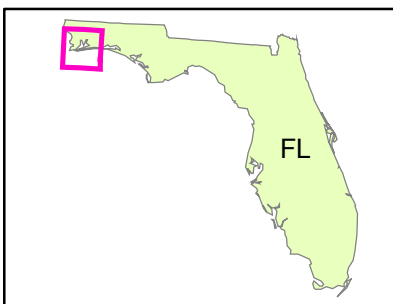
End of Report

PENSACOLA BAY

FLORIDA



Overview



FL0703A

GC10824