

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT MA0601

New Bedford Harbor and Acushnet River, Massachusetts

Introduction

NOAA Coastal Mapping Program (CMP) Project MA0601 provides a highly accurate database of new digital shoreline data for the portion of the Southern Massachusetts, extending from Round Hill Point in the Southwest to Pope Beach in the Northeast. The project includes the area of New Bedford harbor and its approaches.

Successful completion of this project resulted in a densification of the National Spatial Reference System (NSRS), a set of controlled metric-quality aerial photographs, and digital feature data of the coastal zone which compliments 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 (7/1/93). 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 GPS data and the acquisition of aerial photographs. The photographic mission operation was conducted on August 09, 2006, with the NOAA Cessna Citation II (N52RF) aircraft. Two strips of natural color photographs and two strips of black and white infrared at MHW and two strips at MLLW tide stage photographs were acquired through use of a Wild RC-30 camera with the NOS "A" lens cone at the nominal scale of 1:30,000.

A base station was established at the New Bedford Airport using static GPS. Airborne kinematic GPS data was collected to determine precise camera positions in order to

establish a control network necessary for aerotriangulation. GPS data collection operations were conducted in accordance with the GPS Controlled Photogrammetry Field Operations Manual (10/25/99). Photo-identifiable ground control was collected to supplement the airborne kinematic GPS.

GPS Data Reduction

Global Positioning System (GPS) data was collected and processed to provide precise positions of camera centers for application as photogrammetric control in the aerotriangulation phase of project completion. The static GPS base station data was processed in October 2006 using the NGS Online Processing User Service (OPUS) software to compute fixed baseline solutions from three CORS stations. The final NAD83 position reported by OPUS was the average of these three baseline solutions. The airborne kinematic data was processed using Applanix POSGPS (ver. 4.2) software in November 2006. A GPS Data Processing Report was written and is on file with other project data within the RSD Applications Branch (AB) Project Archive.

Aerotriangulation

Routine softcopy aerotriangulation methods were applied to establish the 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 November 2006 utilizing a Digital Photogrammetric Workstation (DPW), which is a configuration of computer hardware, modular software components and other associated peripheral devices. The color photographs and black and white infrared photographs were measured and adjusted as one block using BAE Systems' SOCET SET (version 5.3) photogrammetric software. The Multi-Sensor Triangulation (MST) module, within SOCET SET, was used for the AT portion of the project. The Color and B+W photographs were "tied" into a single bundle adjustment. Using the root mean square (RMS) from the standard deviations of all image points, the 95% confidence circle for the project was calculated as 0.7 meters. 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, 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 initiated by RSD in February 2007. 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 1:30,000 scale 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 MA0601 were determined according to standard Federal Geographic Data Committee (FGDC) practices. For all photographs cartographic features were compiled to meet a horizontal accuracy of 1.4 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 photographs used in the project completion:

Date	Time (UTC)	Roll Number	Photo Numbers	Scale (nominal)	Tide Level*
8/9/06	12:45-12:47	06ACN11	1237-1243	1:30,000	1.3 m
8/9/06	12:52-12:55	06ACN11	1230-1236	1:30,000	1.3 m
8/9/06	13:46-13:48	06AR08	1245-1251	1:30,000	1.2 m
8/9/06	13:53-13:55	06AR08	1252-1258	1:30,000	1.1 m
8/9/06	17:00-17:03	06AR08	1267-1273	1:30,000	0.0 m
8/9/06	16:52-16:55	06AR08	1260-1266	1:30,000	0.0 m

*NOTE: Tide levels are given in meters above MLLW and are based on actual observations at the Newport, RI station, with corrections applied to the Clarks Point, MA and New Bedford, MA sub-stations. The mean tide range in the project area is 1.1 meters.

Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a senior member of AB. Final QC review was completed in September 2007, including 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 9.1 software. All project data was evaluated for compliance to CMP requirements.

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

- 13232, New Bedford Harbor and Approaches, 1:20,000 scale, 4th edition
- 13228, Westport River and Approaches, 1: 20,000 scale, 11th 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 Aerotriangulation Report
- Hardcopy of the Project Completion Report (PCR)

- Page-size graphic plot of GC10694 file contents, attached to PCR

Remote Sensing Division Electronic Data Library

- Project database
- GC10694 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

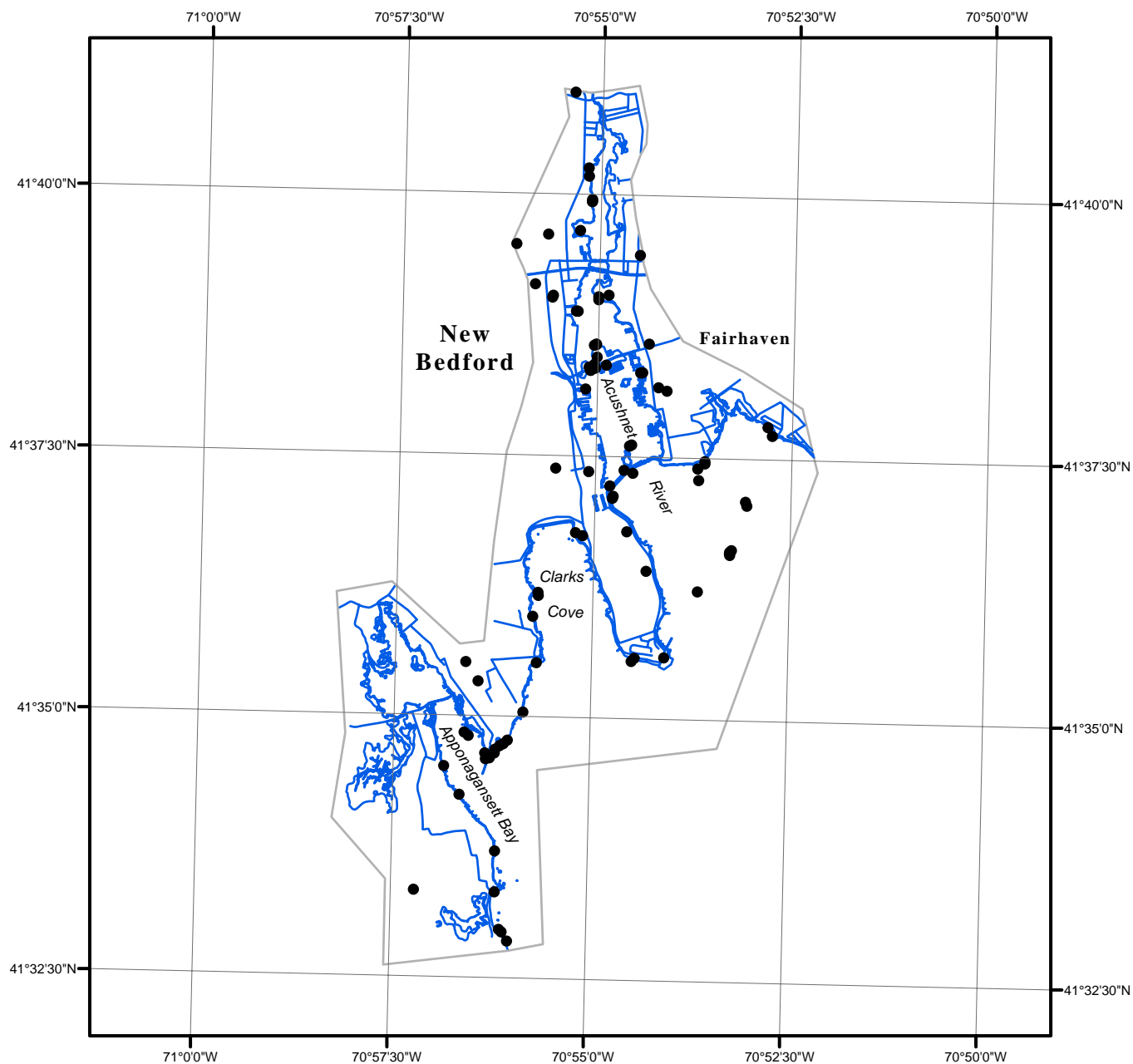
NOAA Shoreline Data Explorer

- GC10694 in shapefile format
- Metadata file for GC10694
- Digital copy of the PCR in Adobe PDF format

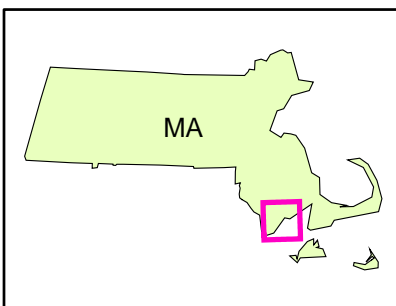
End of Report

NEW BEDFORD HARBOR AND ACUSHNET RIVER

MASSACHUSETTS



Overview



MA0601

GC10694