NOAA COASTAL MAPPING PROGRAM
PROJECT COMPLETION REPORT

PROJECT MA9901

BOSTON HARBOR, MASSACHUSETTS

Introduction

Coastal Mapping Program (CMP) Project MA9901 provides a highly accurate database of new digital shoreline data of Boston Harbor, Massachusetts. The geographic footprint of project MA9901 covers a portion of Boston Harbor, Massachusetts from the Mystic River to South Boston, and includes Spectacle Island.

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 a Digital Cartographic Feature File (DCFF) of the coastal zone which meet the requirements of the NOAA CMP.

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 survey data is referenced to the North American Datum 1983 (NAD 83).

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 III (2/01/97). The instructions discussed the project's purpose, geographic area of coverage, scope and priority; photographic requirements; flight line priority; tide coordination; 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.

The RB created a Project Layout Diagram, flight maps and input files for the aircraft's flight management system, and information on airports that may be used as a base of operation. Additional information disseminated at a briefing held for the photo mission crew included data on tide predictions, sun angle computations, flight line priorities, and geodetic control stations which could be used as GPS reference stations.

Field Operations

The photographic mission operation was conducted on October 15, 1999 with the NOAA Cessna Citation II aircraft. Natural color photographs were acquired through the use of a Wild RC-30 camera with the NOS "A" lens cone at a nominal scale of 1:30,000. Kinematic GPS data and ground control data were acquired for the photographs as an integral part of NOAA photographic mission operations in compliance with the aforementioned Photo Mission SOP.

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 acquisition of a static GPS dataset over the airport reference station and airborne kinematic GPS dataset was executed in compliance with GPS Controlled Photogrammetry Field Operations Manual, a RSD operational manual. The static GPS data was collected on October 7, 1999 and was processed in November 2002 using NGS's 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 for the flight on October 15, 1999 was processed using Applanix POSGPS (ver. 3.1) software in November 2002. The NGS computed precise satellite ephemeris and standard meteorologic data were applied during the data reduction process. A GPS Data Processing Report was written and is on file with other project data within the RSD 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 softcopy compilation. Three strips of natural color photographs were measured and adjusted as one block. This work was initiated by the RSD AB CMP personnel in November 2002 utilizing a Digital Photogrammetric Workstation (DPW) which is a configuration of a computer processor and monitors, softcopy photogrammetry software (Socet Set ver. 4.4.0), stereo viewing equipment, and associated peripheral devices. The ORIMA (v.4.0.7.) software module was utilized for the aerotriangulation process. Upon successful completion of the aerotriangulation process, the ORIMA software provided the RMS of the standard deviations for all aerotriangulated ground points which were used to compute a predicted horizontal circular error of 1.1 meters for the natural color photographs based on a 95% confidence level. An Aerotriangulation Report was written and is on file with other project data in the RSD AB Project Archive.

The project database consists of project parameters and options, camera calibration data, interior orientation parameters, airborne GPS antenna position and offset data, adjusted exterior orientation parameters, and positional listing of all measured points. Positional data is based on the North American Datum and was measured in the UTM Coordinate System, Zone 19.

Compilation

The compilation phase of the project was accomplished by the RSD Applications Branch (AB) in March 2003. Digital mapping was accomplished using a DPW in conjunction with the SocetSet Feature Extraction module. Feature identification and the assignment of cartographic codes were based on image analysis of 1:30,000 scale natural color photographs and information extracted from the appropriate NOAA Nautical Charts, U.S. Coast Guard Light List, and U.S. Geological Survey quadrangles. Cartographic feature attribution was assigned in compliance with the Coastal Cartographic Object Attribute Source Table (C-COAST). Nomenclature was assigned to selected cartographic features to refine general classification.

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 is derived by doubling the circular error derived from aerotriangulation statistics.

The following provides information on aerial photographs used in the project completion process:

Date of Acquisition	Time(GMT) Of Acquisition	Roll Number	Photograph Numbers	Scale (Nominal)	Stage Of Tide*
10-15-99	14:30 to 14:34	99ACN28	5114 thru 5132	1:30,000	.316 m
10-15-99	14:44 to 14:47	99ACN28	5133 thru 5147	1:30,000	.316 m
10-15-99	15:05 to 15:09	99ACN28	5151 thru 5166	1:30,000	.316 m

* The "Stage of Tide" is referenced to MLLW and are based on actual observations recorded by the NOS gauge at Boston, MA at the time of photography. The range of tide (MLLW to MHW) based on the Boston gauge is 2.86 meters.

Final Review

The final review was completed by a senior AB CMP team member in April 2003. The DCFF was evaluated for completeness and accuracy. Data review consisted of an on-line and off-line evaluation of digital compilation and hard copy products. The on-line review comprised of reviewing stereo models on a DPW for cartographic feature codes selection, positional accuracies of features, and nomenclature. The cartographic feature attribution was judged to conform to C-COAST specification. The offline evaluation compared hard copy plots of the project data with the largest scale nautical charts available and the natural color photographs.

A copy of the following NOAA nautical charts were used for chart comparison purposes:

13270 Boston Harbor, 1:25,000, 59th ed.
13272 Boston Inner Harbor, 1:10,000, 47th ed.

Project Final Data and Products

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

RSD Applications Branch Project Archive
- Hard copy of GPS Processing Report
- Hard copy of Aerotriangulation Report
- Hard copy of the Project Completion Report (PCR)

RSD Electronic Data Library:

- Project Database
- Feature Database
- Digital copy of Feature Database in ESRI Shapefile format
- Digital copy of the PCR in Adobe Acrobat PDF format

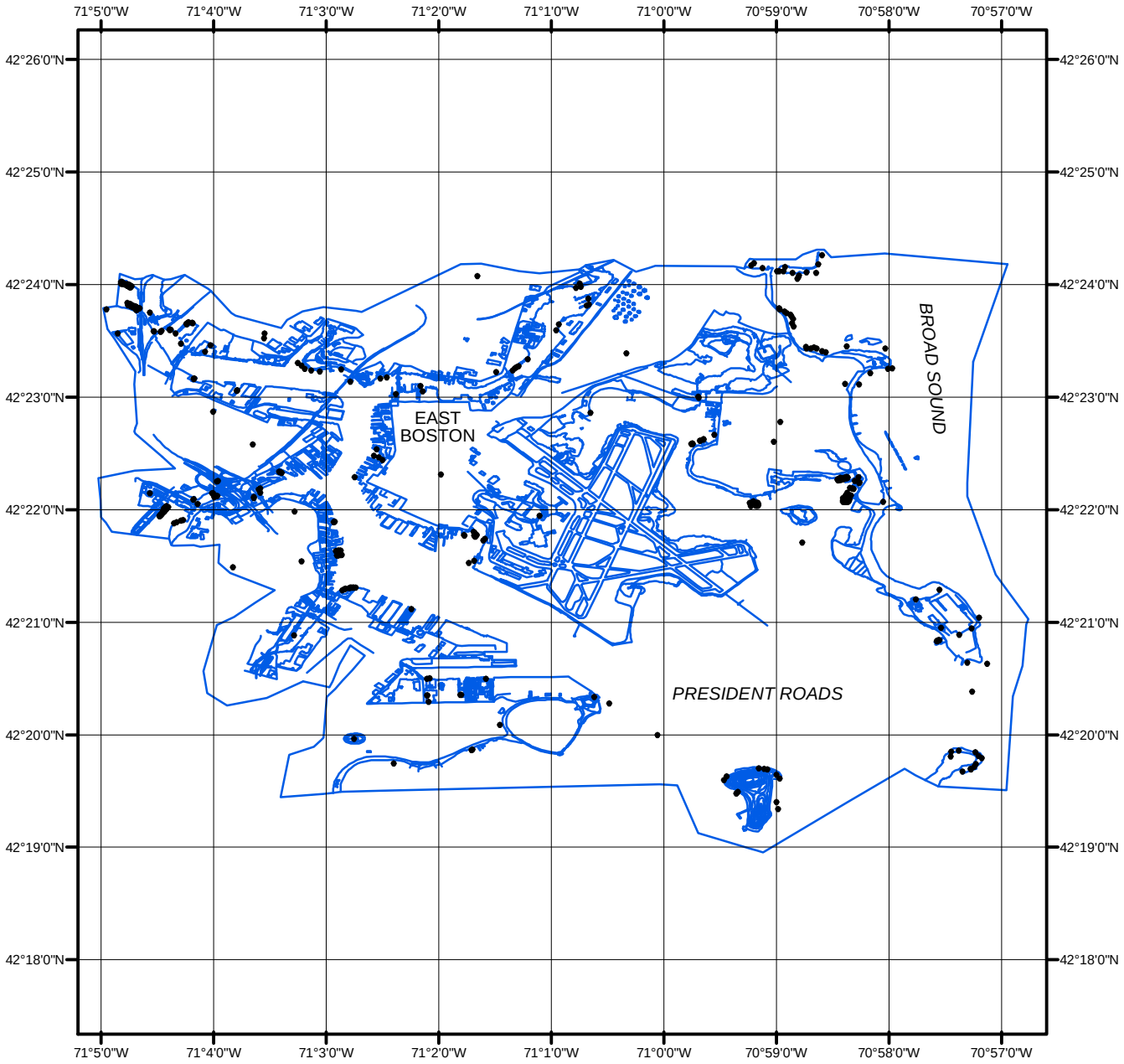
NOAA Shoreline Data Explorer

- Digital copy of Feature Database in ESRI Shapefile format
- Metadata file for GC-10525
- Digital copy of the PCR in Adobe Acrobat PDF format

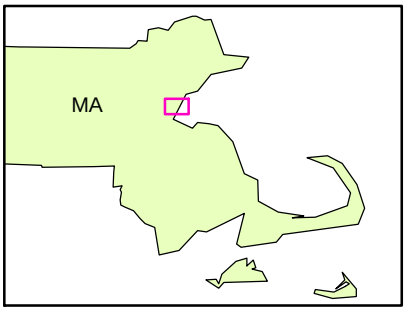
End of Report

BOSTON HARBOR

BOSTON, MASSACHUSETTS



Overview



MA9901

GC 10525