

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT VA0203 VIRGINIA NEWPORT NEWS AND NORFOLK

Introduction

Coastal Mapping Program (CMP) Project VA0203 provides a highly accurate database of new digital shoreline data of the port of Norfolk.

The design of project VA0203 was based on a comparison of image analysis to cartographic detail depicted on the pertinent NOAA nautical charts of the project site. 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 cartographic feature files 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 UTM, Zone 18, North American Datum of 1983 (NAD 83).

Project Design

The Requirements Branch (RB) of the Remote Sensing Division (RSD) formulated the project instructions for this project following the guidelines of the Shoreline Mapping Scope of Work (SOW), version 12. The instructions discussed the project's purpose, geographic area of coverage, scope and priority, photographic requirements, flight line priority; 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, based on this Diagram NOVA ENGINEERING & SURVEYING, INC. created flight maps and input files for the aircraft's flight management system. NOVA provided copies of the descriptions of potential geodetic control stations at the bases of operation. In addition, some second order geodetic points as well as strategically located paneled control points were established within the project area. A briefing was held by NGS personnel in NOVA's office to review the entire assignment including the photographic mission, the triangulation and the mapping instructions.

Field Operations

The photographic mission operation was conducted on August 25 and September 29, 2003 utilizing the aircraft and camera of our sub consultant Sanborn Mapping Company. The aircraft was a Cessna model 401. Natural color photographs were acquired through use of a Wild RC-30 camera. There was no requirement to acquire tide coordinated black and white infrared photographs. All aerial photographs were acquired at the nominal scale of 1:25,000. Kinematic GPS data was acquired as an integral part of photographic mission operations in compliance with the aforementioned Shoreline Mapping SOW.

Additional information concerning the Field operations can be found in the Ground Control and Airport GPS Reports

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. Due to security concerns at the time no access to the Norfolk International Airport GPS station was available, the acquisition of a static GPS dataset of the reference station and the airborne kinematic GPS dataset was executed in compliance with the Shoreline Mapping SOW, version 12, Static GPS data of the VETERAN second order NGS geodetic station which was collected in August 25 and September 29, 2003, static GPS data from two CORS stations, and the kinematic GPS dataset were processed using Trimble® Office Geomatics software. The NGS computed precise satellite ephemeris and standard meteorological data were applied during the data reduction process. GPS data reduction was completed by NOVA ENGINEERING & SURVEYING, INC. project personnel in April 2003. A GPS Data processing Report was written and is on file with other project data within the RSD AB Project Archive.

Aerotriangulation

All photographs of the project were bridged using a softcopy 3D stereo photogrammetric system to establish the network of control required for the compilation phase. Measurements were made using the ISDM aerotriangulation module within Z/I Imaging in a Windows XP environment, on a Digital Photogrammetric Workstation. All photos were scanned at 25 micron resolution digital images in TIFF format, and subsequently compressed and minified. The GPS controlled images were initially measured by strip. All point measurements were then digitally transferred to crossing strips. Next, the nine strips were adjusted as a block, and after subsequent processing, analysis and refinement, a final analytical adjustment was performed. The RMS of the standard deviations for each triangulated ground point was calculated using the ISDM software triangulation module. Finally, the solution was tested against the aforementioned seven

GPS ground control sites as a means for assessing horizontal and vertical reliability. These values were then used to compute a predicted horizontal circular error of 0.2 meters, based upon a 95% confidence level. An Aerotriangulation Report was written and forwarded to the Contracting Officer Technical Representative, for information, approval and archiving.

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 1983, and is referenced to the UTM Coordinate System.

Compilation

The Compilation phase of the project was accomplished by NOVA ENGINEERING & SURVEYING, INC. February 2004. Digital mapping was accomplished using a Microstation ZI Imaging® Soft Copy Workstation and SocetSet Digital Workstation in conjunction with the SocetSet PRO600 Extraction module. Feature identification and the assignment of cartographic codes were based on image analysis of 1:25,000 scale natural color photographs and information extracted from the appropriate NOAA Nautical Charts, US Coast Guard Light List and US 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 0.4 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 of Acquisition	Roll Number	Photograph Numbers	Scale (Nominal)	Stage (*) of Tide
08-25-2003	14:54 to 16:18	0315CN02	01-77	1:25000	0.1 m
09-29-2003	14:08 to 14:40	0315CN03	78-117	1:25,000	1.3 m

(*) Station 8638863 – Chesapeake Bay Bridge Tunnel, referenced to MLLW.

Final Review

The final review was initiated by the project director in May 2004. The digital cartographic feature file (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 off-line evaluation compared hard copy plots of the project data with the largest scale nautical charts available and the natural color photographs. The following NOAA nautical charts were used for the chart comparison process:

<u>CHART</u>	<u>SCALE</u>	<u>EDITION</u>
12222 Chesapeake Bay - Cape Charles to Norfolk Harbor	1:40,000	46th May 04
12245 Hampton Roads	1:20,000	63rd May 04
12248 James River - Newport News to Jamestown Island	1:40,000	40th Sep 03
12253 Norfolk Harbor and Elizabeth River	1:20,000	43rd Jun 03
12254 Chesapeake Bay - Cape Henry to Thimble Shoal Light	1:20,000	44th Feb 04
12255 Little Creek Naval Amphibious Base	1:5,000	15th Feb 02

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
- Page size graphic plot of DCFF contents
- Hard copy of the Project Completion Report

RSD Electronic Data Library:

- Project Database
- DCFF: GC10551
- Digital copy of DCFF in Shapefile format
- Digital Copy of Project Completion Report

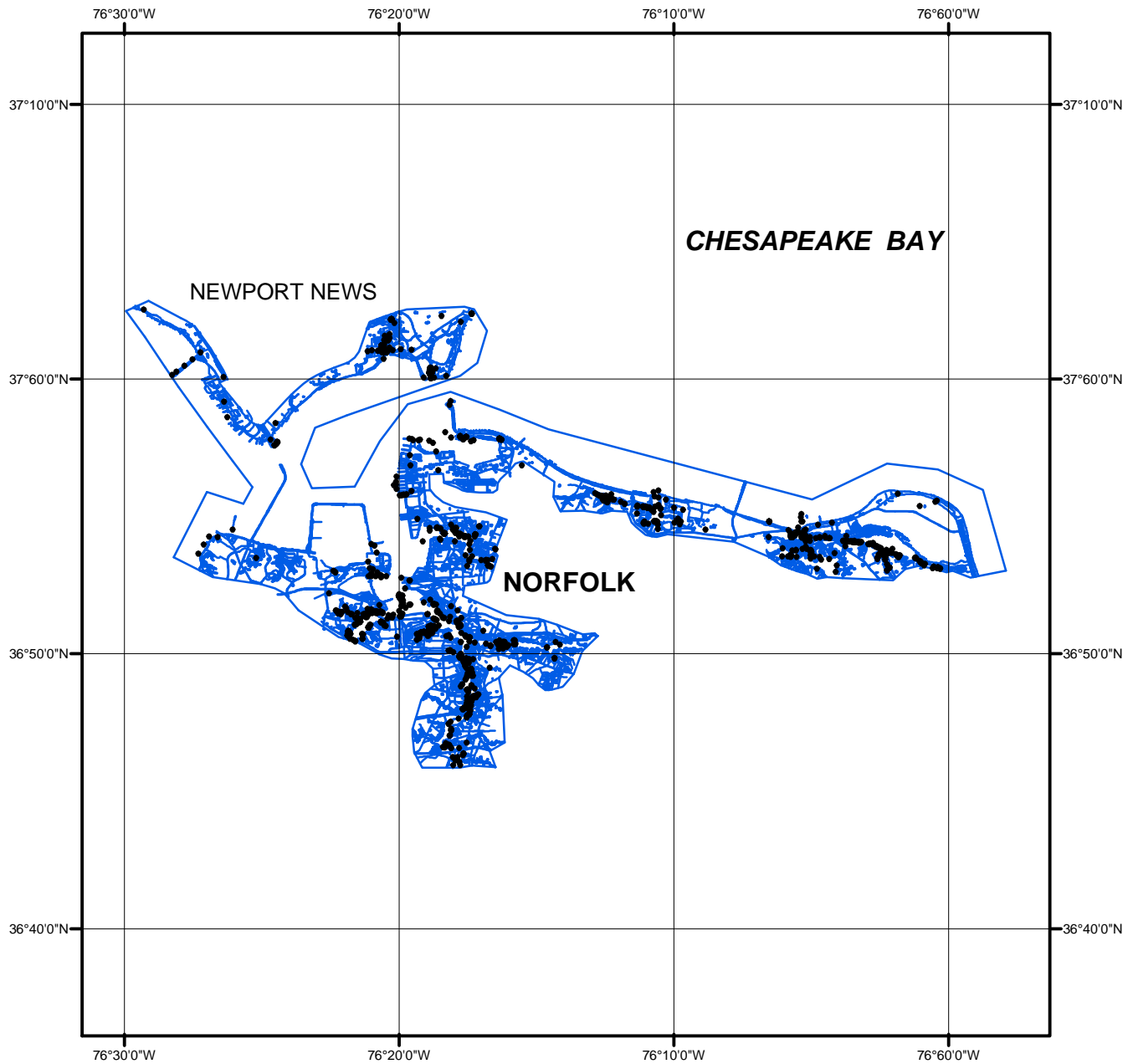
NOAA Shoreline Data Explorer

- DCFF: GC10551
- Metadata file for GC10551
- Digital Copy of the Project Completion Report

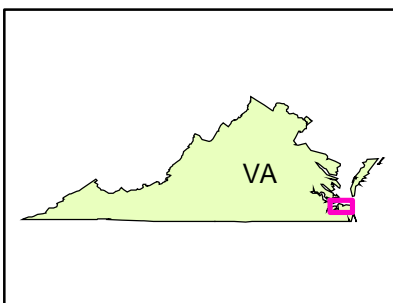
End of Report

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Overview



VA0203
GC10551