

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT NY0501B

Lake Erie, Sturgeon Point to Buffalo, and Niagara River, New York

Introduction

NOAA Coastal Mapping Program (CMP) Project NY0501B provides new digital shoreline data for the portion of Lake Erie, from Sturgeon Point to Buffalo, and Niagara River, NY. Project NY0501B is a sub-project of a larger project, NY0501, which includes the area of eastern Lake Erie and the Niagara River from Conneaut, Ohio to the mouth of the Niagara in Lake Ontario.

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. 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 operations were conducted on April 30, 2007 with the NOAA Cessna Citation II (N52RF) aircraft. Four strips of natural color 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 Niagara Falls International 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. 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 April 2007 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. 4.4) software in January 2008. An Airborne Positioning and Orientation 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 March 2008 utilizing a Digital Photogrammetric Workstation (DPW), which is a configuration of computer hardware, modular software components and other associated peripheral devices. The color photographs were measured and adjusted as four separate blocks using BAE Systems' SOCET SET (version 5.3) photogrammetric software. The Multi-Sensor Triangulation (MST) module, within SS, was used for the AT portion of the project. The RMS of the standard deviations of the residuals for each aerotriangulated ground point was calculated using a full covariance solve strategy within the MST aerotriangulation module. These values were used to compute a 95% horizontal circular error of 1.4 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 June 2008. 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 NY0501B were determined according to standard Federal Geographic Data Committee (FGDC) practices. The predicted accuracy 2.7 meters for compiled, well defined points, at the 95% confidence level, is derived by doubling the circular error from the aerotriangulation statistics.

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

| Date | Time (UTC) | Roll Number | Photo Numbers | Scale (nominal) | Lake Level* |
|----------|-------------|-------------|---------------|-----------------|-------------|
| 04-30-07 | 15:52-16:02 | 07ACN05 | 0502-0521 | 1:30,000 | 174.3 |
| 04-30-07 | 16:07-16:15 | 07ACN05 | 0522-0546 | 1:30,000 | 174.3 |
| 04-30-07 | 16:21-16:35 | 07ACN05 | 0547-0573 | 1:30,000 | 174.3 |

*NOTE: Lake levels are given in meters above IGLD 1985 and are based on actual observations recorded by the NOS gauge at Buffalo, New York (Id # 9063020) at the time of photography.

Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a senior member of RSD Applications Branch (AB). Final QC review was completed in September 2008, 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 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:

- 14816, Lake Ontario, Lower Niagara River NY, 1:30,000 scale, 24th edition, Feb.2004
- 14824, Lake Ontario-Lake Erie, Approaches to Niagara River and Welland Canal NY, 1:80,000 scale, 32nd edition, Aug. 2005
- 14832, Lake Erie, Upper Niagara River NY, 1:30,000 scale, 34th edition, Oct. 2002
- 14833, Lake Erie, Buffalo Harbor NY, 1:15,000 scale, 26th edition, Feb.2004

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 GC10716 file contents, attached to PCR

Remote Sensing Division Electronic Data Library

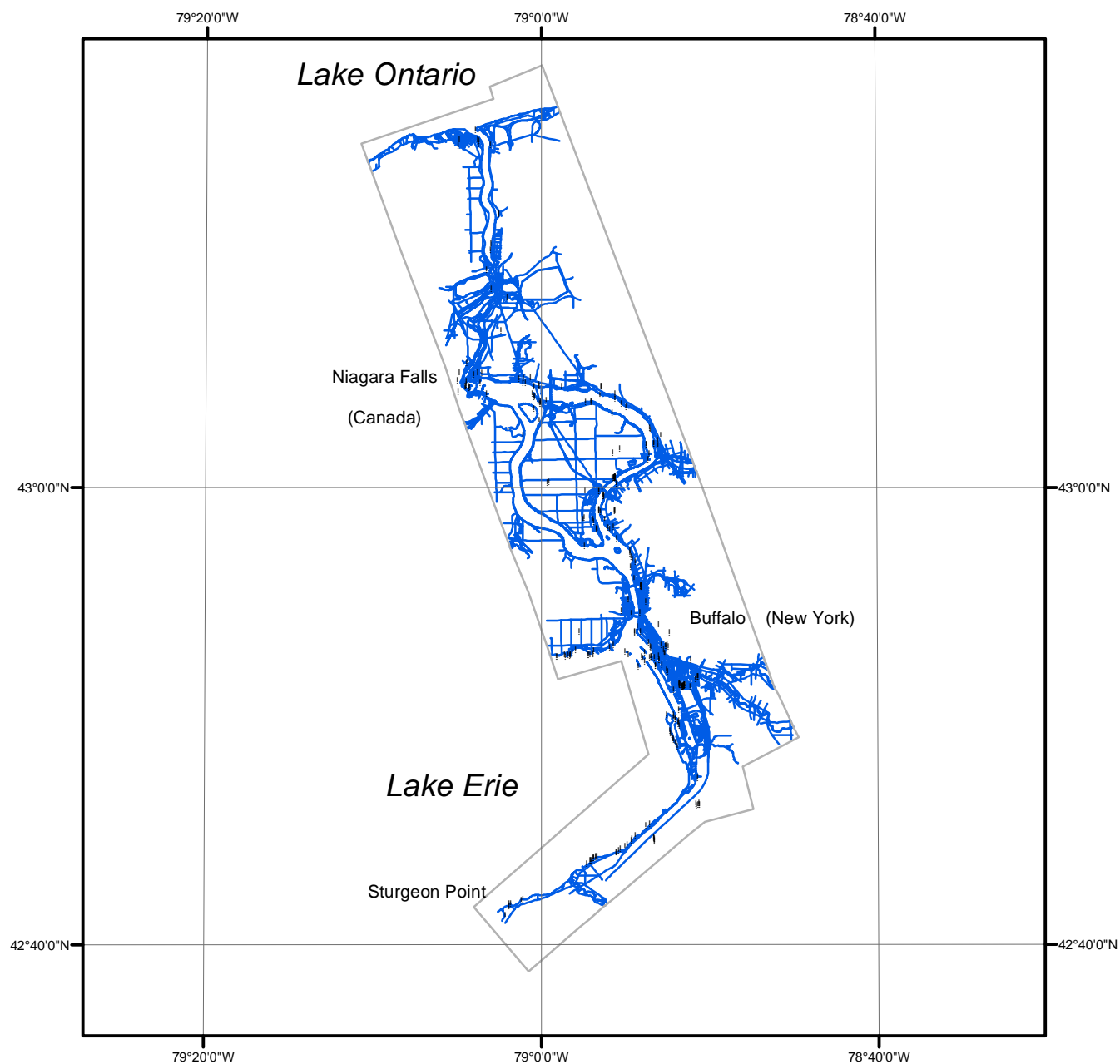
- Project database
- GC10716 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

NOAA Shoreline Data Explorer

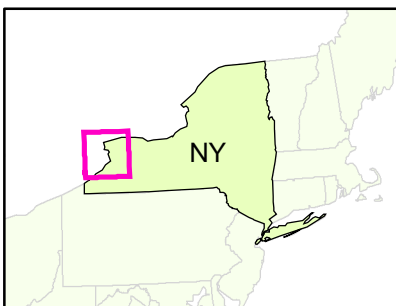
- GC10716 in shapefile format
- Metadata file for GC10716
- Digital copy of the PCR in Adobe PDF format

End of Report

LAKE ERIE, STURGEON POINT TO BUFFALO, AND NIAGARA RIVER, NEW YORK



Overview



NY0501B

GC10716