

# **NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT**

## ***PROJECT WI1602-CS-N***

### ***Port of Milwaukee, Wisconsin***

#### **Introduction**

Coastal Mapping Program (CMP) Project WI1602-CS-N provides highly accurate digital shoreline data for key areas of change within the Port of Milwaukee, Wisconsin. The Geographic Cell (GC) may be used in support of the NOAA Nautical Charting Program (NCP) as well as geographic information systems (GIS) for a variety of coastal zone management applications.

#### **Project Design**

The design of Project WI1602-CS-N was accomplished by the Requirements Branch (RB) of the Remote Sensing Division (RSD) in response to the need for timely updates to the NOAA chart suite within key U.S. ports. Project requirements were formulated as a result of analysis conducted within the Coast and Shoreline Change Analysis Program (CSCAP), in which NOAA nautical chart products are compared to contemporary high resolution imagery in order to ascertain the need for more current shoreline data. A Chart Evaluation File (CEF) was forwarded to the Applications Branch (AB) of RSD once the change analysis was complete. Refer to the change analysis memorandum of October 23, 2017 for details of the chart comparison process.

#### **Field Operations**

The field operations consisted of the collection of static and kinematic Global Positioning System (GPS) data and Inertial Measurement Unit (IMU) data and the acquisition of aerial imagery. Two strips of digital images utilized for this project were acquired with the NOAA King Air (N68RF) aircraft on August 8, 2017 using an Applanix Digital Sensor System (DSS) aerial camera at a nominal altitude of 10,500 feet, resulting in an approximate ground sample distance (GSD) of 0.33 meters. Color (RGB) and near infrared (NIR) imagery was acquired in tandem, but only the color images were used.

#### **GPS Data Reduction**

The GPS/IMU data were processed by RSD personnel to yield precise camera positions in order to provide a control network necessary for aerotriangulation. The base station's geodetic position was derived using the NGS Online Processing User Service (OPUS), which computed fixed baseline solutions from nearby CORS stations. The kinematic GPS data was processed using Applanix POSPAC (ver. 7.1) software on September 18, 2017. For further information refer to the Airborne Positioning and Orientation Report (APOR) that is on file with other project data within the Remote Sensing Division Electronic Data Library.

#### **Aerotriangulation**

Routine softcopy aerotriangulation methods were applied to establish a network of precise camera positions and other control for mapping, and to provide model parameters and orientation

elements required for digital compilation. Aerotriangulation was completed February 2018 utilizing SOCET SET (ver. 5.6) software on a Digital Photogrammetric Workstation (DPW). The RGB images were measured and adjusted as a single block using the Multi-Sensor Triangulation (MST) module of SOCET SET. Upon successful completion of this process, MST provided the standard deviations for each aerotriangulated ground point, which were used to compute a predicted horizontal circular error of 0.55 meters based on a 95% confidence level. An Aerotriangulation Report was written and is on file with other project data within the RSD Electronic Data Library. Positional data is referenced to the North American Datum of 1983 (NAD83).

## Compilation

The data compilation was completed in February 2018. Digital feature data was compiled from the aerotriangulated RGB imagery using the Feature Extraction software module of SOCET SET. 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 WI1602-CS-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 1.1 meters at the 95% confidence level. This predicted accuracy of compiled well-defined points is derived by doubling the circular error calculated from the aerotriangulation statistics.

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

Date	Time (UTC)	Roll #	Flight Line / Photo #s	Lake Level*
8-AUG-2017	16:07 – 16:10	17VC47	64-001 / 12096 – 12109	177.0 m
8-AUG-2017	16:15 – 16:18	17VC47	64-002 / 12110 – 12123	177.0 m

\* Lake water levels are in meters above IGLD 1985 which are based on verified observations at the Milwaukee station in Wisconsin. The Low Water Datum (LWD) for Lake Michigan is 176.0 meters above IGLD 1985.

## Quality Control / Final Review

The final review of the project was completed by a senior member of RSD in March 2018, and 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 ArcMap GIS software (v10.5). All project data was evaluated for compliance to CMP requirements.

## End Products and Deliverables

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

**Remote Sensing Division Electronic Data Library**

- CSCAP evaluation memorandum
- Airborne Positioning and Orientation Report (APOR)
- Aerotriangulation Report
- Project database
- Project Completion Report (PCR)
- GC11404 in shapefile format
- Chart Evaluation File (CEF) in shapefile format

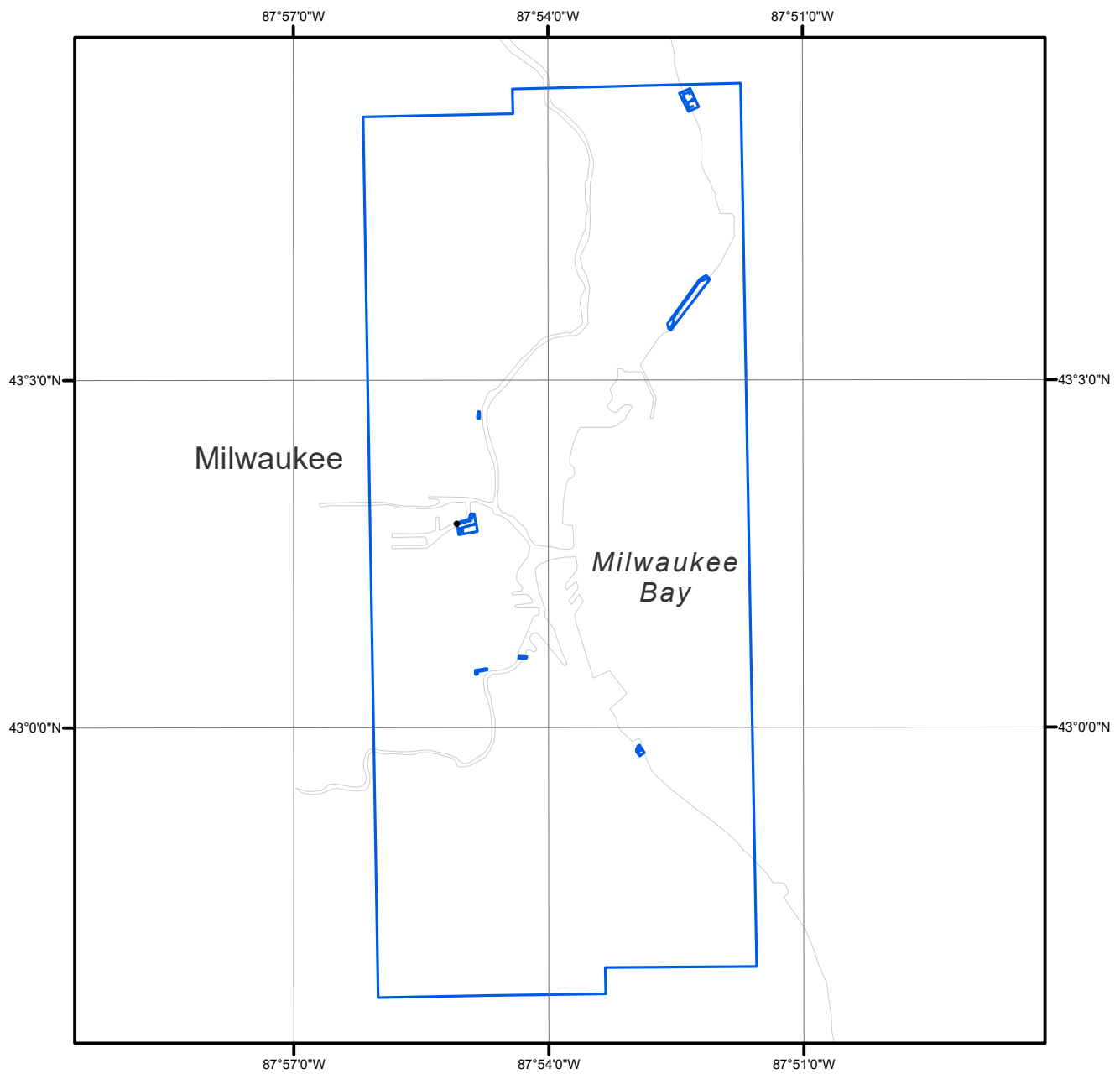
**NOAA Shoreline Data Explorer**

- GC11404 in shapefile format
- Metadata file for GC11404
- PCR in Adobe PDF format

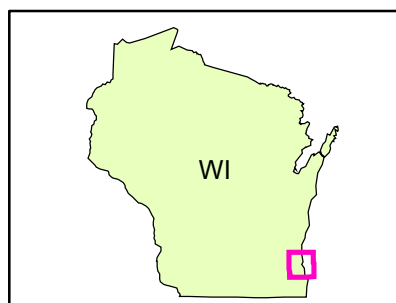
**End of Report**

# PORT OF MILWAUKEE

## WISCONSIN



Overview



WI1602-CS-N

GC11404