

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

## ***PROJECT GA1003A-CM-N***

### ***Savannah River, Augusta to Ring Jaw Point, Georgia and South Carolina***

#### **Introduction**

NOAA Coastal Mapping Program (CMP) Project GA1003A-CM-N provides a highly accurate database of new digital shoreline data for the Savannah River and surrounding coastal areas. The project extends from Augusta to Ring Jaw Point and includes several small bays and tributaries of the river. GA1003A-CM-N is a subproject of the larger project, GA1003-CM-N, which covers the Savannah River from Augusta to Port Wentworth. 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 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 collection of static and kinematic GPS data, Inertial Measurement Unit (IMU) data and the acquisition of digital aerial imagery. The photographic mission was conducted on March 7, 2010 with the NOAA King Air aircraft. Twenty strips of natural-color and infrared digital images were acquired concurrently at a nominal altitude of 10,000 feet resulting in an approximate ground sample distance (GSD) of 0.35 meters through the use of an Applanix Digital Sensor System (DSS-439) dual-head digital camera. No tide coordination was required and only the natural-color images were used for this project. A base station was established at Savannah International Airport using static GPS and no ground control was collected.

#### **GPS Data Reduction**

GPS/IMU data was collected and processed by RSD personnel to yield precise positions and orientations of camera centers for application as photogrammetric control in the aerotriangulation phase of the project. A local GPS base station was established for use as

a reference station for kinematic GPS processing operations. The position of the base station was determined using the NGS Online Processing User Service (OPUS), which computed fixed baseline solutions from nearby CORS stations. Airborne kinematic data was processed in May 2010 using POSPAC ver. 4.40 GPS/IMU processing software. For further information refer to the Airborne Positioning and Orientation Report (APOR) 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 completed by RSD personnel in September 2011 utilizing a softcopy photogrammetric workstation. All of the color images were measured and adjusted as a single block using BAE Systems' SOCET SET (ver. 5.5) photogrammetric software in conjunction with the Multi-Sensor Triangulation (MST) module and BINGO (ver. 5.6). Upon successful completion of the aerotriangulation process, the BINGO software provided the RMS of the standard deviations of the residuals for each aerotriangulated ground point which were used to compute a predicted horizontal circular error of 0.3 meters based on a 95% confidence level. An Aerotriangulation Report was written to provide detailed information on this phase of project completion, and is on file with other project data within the AB Project Archive.

The project database consists of project parameters and options, camera calibration data, interior orientation 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 the project was initiated by PhotoScience Inc. (PSI) personnel in October 2011. The work was accomplished using a Digital Photogrammetric Workstation (DPW), which is a configuration of computer hardware, modular software components and other associated peripheral devices. The Feature Extraction module was used within BAE Systems' SOCET SET (version 5.6) photogrammetric software. Feature identification and the assignment of cartographic codes were based on image analysis of the project digital images and information extracted from the appropriate NOAA Nautical Charts, U.S. Coast Guard Light List and other ancillary sources. Feature attribution was assigned in compliance with the Coastal Cartographic Object Attribute Source Table (C-COAST). Selected features were further modified with additional descriptive information to refine general classification.

Spatial data accuracies for Project GA1003A-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 0.6 meters at the 95% confidence level. This predicted accuracy of well-defined points is based on a doubling of the circular error derived from aerotriangulation statistics.

The following table provides information on the imagery used to complete this project:

<b>Date</b>	<b>Time (UTC)</b>	<b>Roll Number</b>	<b>Photo Numbers</b>	<b>GSD (nominal)</b>	<b>Tide Level*</b>
3/07/2010	17:27 – 17:28	10NC08	1753 – 1760	0.35 m	N/A
3/07/2010	17:35 – 17:43	10NC08	1761 – 1809	0.35 m	N/A
3/07/2010	17:45 – 17:49	10NC08	1810 – 1831	0.35 m	N/A
3/07/2010	17:54 – 17:57	10NC08	1832 – 1850	0.35 m	N/A
3/07/2010	18:02 – 18:04	10NC08	1851 – 1866	0.35 m	N/A
3/07/2010	18:09 – 18:11	10NC08	1867 – 1880	0.35 m	N/A
3/07/2010	18:16 – 18:19	10NC08	1881 – 1898	0.35 m	N/A
3/07/2010	18:24 – 18:27	10NC08	1899 – 1918	0.35 m	N/A
3/07/2010	18:33 – 18:36	10NC08	1919 – 1937	0.35 m	N/A
3/07/2010	18:40 – 18:43	10NC08	1938 – 1955	0.35 m	N/A
3/07/2010	18:49 – 18:56	10NC08	1956 – 2004	0.35 m	N/A

\* Tide levels are not applicable to this project. River water levels on the date of the imagery were near (within one foot of) their long-term averages.

## **Quality Control / Final Review**

Quality control for the aerotriangulation phase was conducted by RSD personnel. Quality control of all other phases of the project was completed by a senior member of PSI. The final QC review was completed in November 2011. The review process 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 ArcGIS 10.1 software. All project data was evaluated for compliance to CMP requirements.

Comparisons of the largest scale NOAA nautical charts with natural-color images and compiled project data resulted in creation of the Chart Evaluation File (CEF). The following nautical chart was used in the comparison process:

- 11515, Savannah River, Brier Creek to Augusta, 1:20,000 scale, 18<sup>th</sup> Ed., Oct. 2014

## **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 GC10906 file contents, attached to PCR

#### **Remote Sensing Division Electronic Data Library**

- Project database
- GC10906 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- Chart Evaluation File in shapefile format

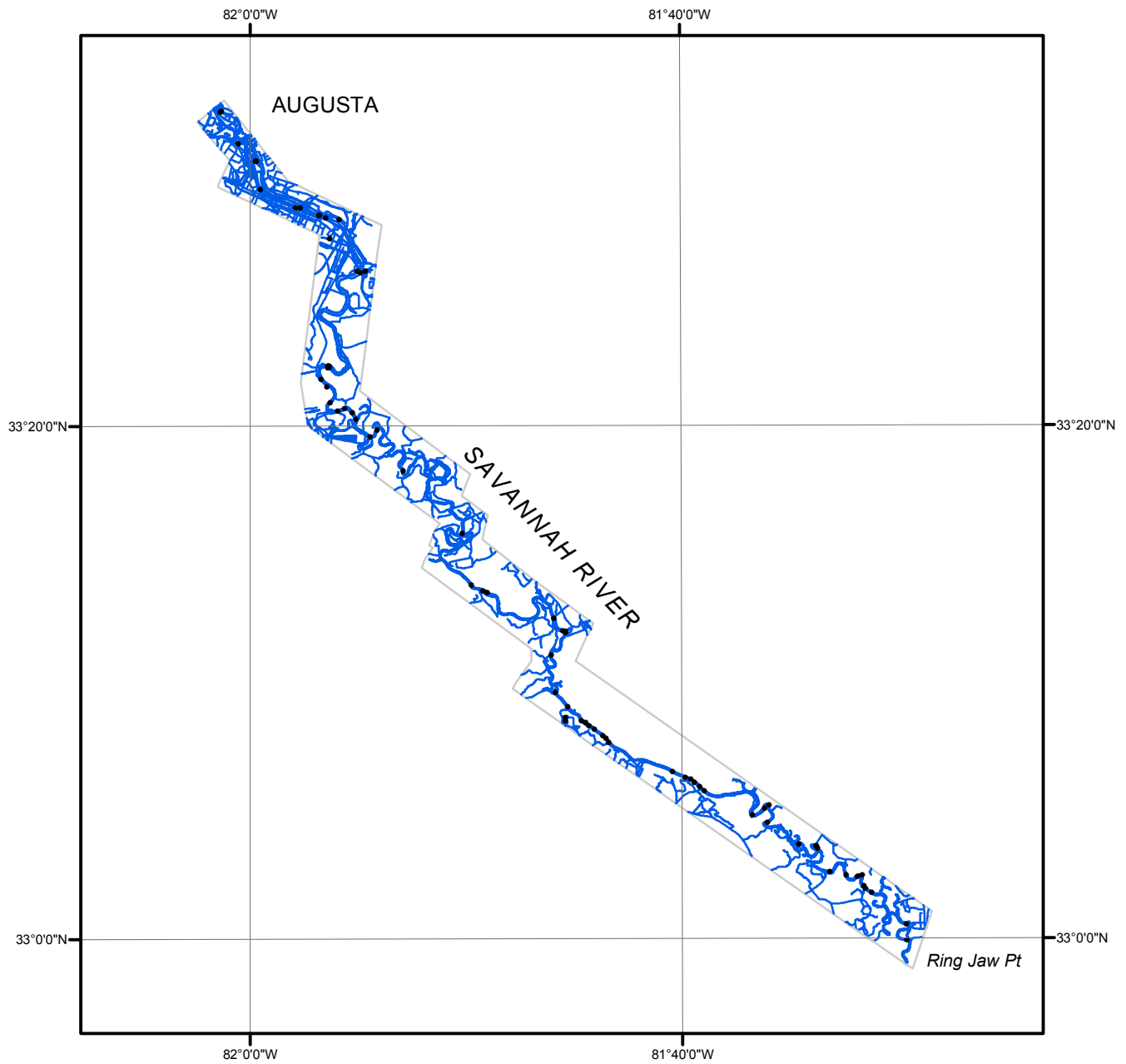
#### **NOAA Shoreline Data Explorer**

- GC10906 in shapefile format
- Metadata file for GC10906
- Digital copy of the PCR in Adobe PDF format

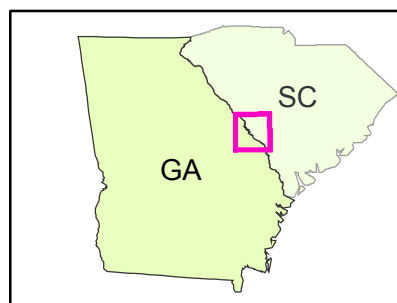
**End of Report**

# SAVANNAH RIVER, AUGUSTA TO RING JAW POINT

## GEORGIA AND SOUTH CAROLINA



Overview



GA1003A

GC10906