

# NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

## *PROJECT LA1002E*

### *Mississippi River, Wilder Flats to Duvic, Louisiana*

#### **Introduction**

NOAA Coastal Mapping Program (CMP) Project LA1002E provides a highly accurate database of new digital shoreline data for a portion of the Mississippi River and the surrounding waterways. The project extends from Wilder Flats to Duvic and includes several small bays and tributaries of the river. Project LA1002E is a sub-project of the larger project LA1002 which covers the Mississippi River from Baton Rouge to Southwest Pass.

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 complements 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. 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. RB provided copies of the descriptions of selected geodetic control stations at airports that may have been used as bases of operation.

#### **Field Operations**

The field operations for LA1002 consisted of the collection of static and kinematic Global Positioning System (GPS) data and the acquisition of aerial imagery. The photographic mission operations were conducted between March 13<sup>th</sup> and 15<sup>th</sup>, 2010 with the NOAA King Air aircraft. Fifty-nine strips of natural color and near infrared digital

images were acquired with an approximate ground sample distance of 0.35 meters through the use of an Applanix Digital Sensor System (DSS) 439 digital camera.

A base station was established at New Orleans Lakefront Airport, New Orleans using static GPS. Airborne kinematic GPS data was collected in conjunction with an Inertial Measurement Unit (IMU) to determine precise camera positions and orientations.

Photo Science, Inc. (PSI) was contracted by RSD to collect twelve (12) ground control points to supplement the airborne kinematic GPS. The points were photo-identifiable features taken from well-defined discrete locations and were only located within the three sub-projects tasked to PSI.

### **GPS Data Reduction**

GPS and IMU data was collected and processed by RSD personnel to yield precise positions and orientations of camera centers as a means of rendering accurately georeferenced digital images. The static GPS base station data was processed in May 2010 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 POSPAC (ver. 4.4.0) software in May 2010.

### **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 PSI personnel in November 2010 utilizing a Digital Photogrammetric Workstation (DPW), which is a configuration of computer hardware, modular software components and other associated peripheral devices. BAE SOCET SET version 5.4.1 software was used for both project setup and aerotriangulation, with point mensuration performed using the Multi-Sensor Triangulation (MST) module. Only the natural color images were used, and all of these images were tied into a single block. BINGO aerotriangulation software was used to perform the final bundle block adjustment. 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 0.5 meters based on a 95% confidence level. An Aerotriangulation Report was written and is on file with other project data within the RSD Applications Branch (AB) Project Archive.

The project database consists of project parameters and options, camera calibration data, 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 PSI in January 2011. 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 digital natural color 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 LA1002E were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 1.0 meters at the 95% confidence level. The predicted accuracy of compiled, well defined points is derived by doubling the circular error derived from aerotriangulation statistics.

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

<b>Date</b>	<b>Time (UTC)</b>	<b>Roll Number</b>	<b>Photo Numbers</b>	<b>GSD (nominal)</b>	<b>Tide Level*</b>
3/14/2010	15:12 – 15:14	10NC10	2726 – 2741	0.35 m	0.12 m
3/14/2010	16:14 – 16:14	10NC10	2966 – 2968	0.35 m	0.12 m
3/14/2010	16:42 – 16:43	10NC10	3093 – 3095	0.35 m	0.13 m
3/14/2010	17:13 – 17:14	10NC10	3221 – 3225	0.35 m	0.13 m
3/14/2010	17:30 – 17:33	10NC10	3310 – 3327	0.35 m	0.13 m
3/14/2010	17:48 – 17:49	10NC10	3396 – 3399	0.35 m	0.13 m
3/14/2010	18:05 – 18:08	10NC10	3486 – 3502	0.35 m	0.13 m
3/14/2010	18:30 – 18:31	10NC10	3598 – 3605	0.35 m	0.13 m

\* Tide levels are given in meters above MLLW, and are based on predicted water levels at the time of photography for the NOS gauge at Venice, LA. The height of the MHW tidal datum in the project area is 0.28 meters above MLLW.

### **Quality Control / Final Review**

Quality control tasks were conducted during all phases of project completion by a senior member of PSI. The final QC review was completed in September 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 photographs and compiled project data resulted in creation of the Chart Evaluation File (CEF). The following nautical charts were used in the comparison process:

- 11353, Baptiste Collette Bayou Extension, 1:20,000 scale, 6<sup>th</sup> Ed.
- 11361, Mississippi River Delta, LA, 1:80,000 scale, 76<sup>th</sup> Ed.

## **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 GC10897 file contents, attached to PCR

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

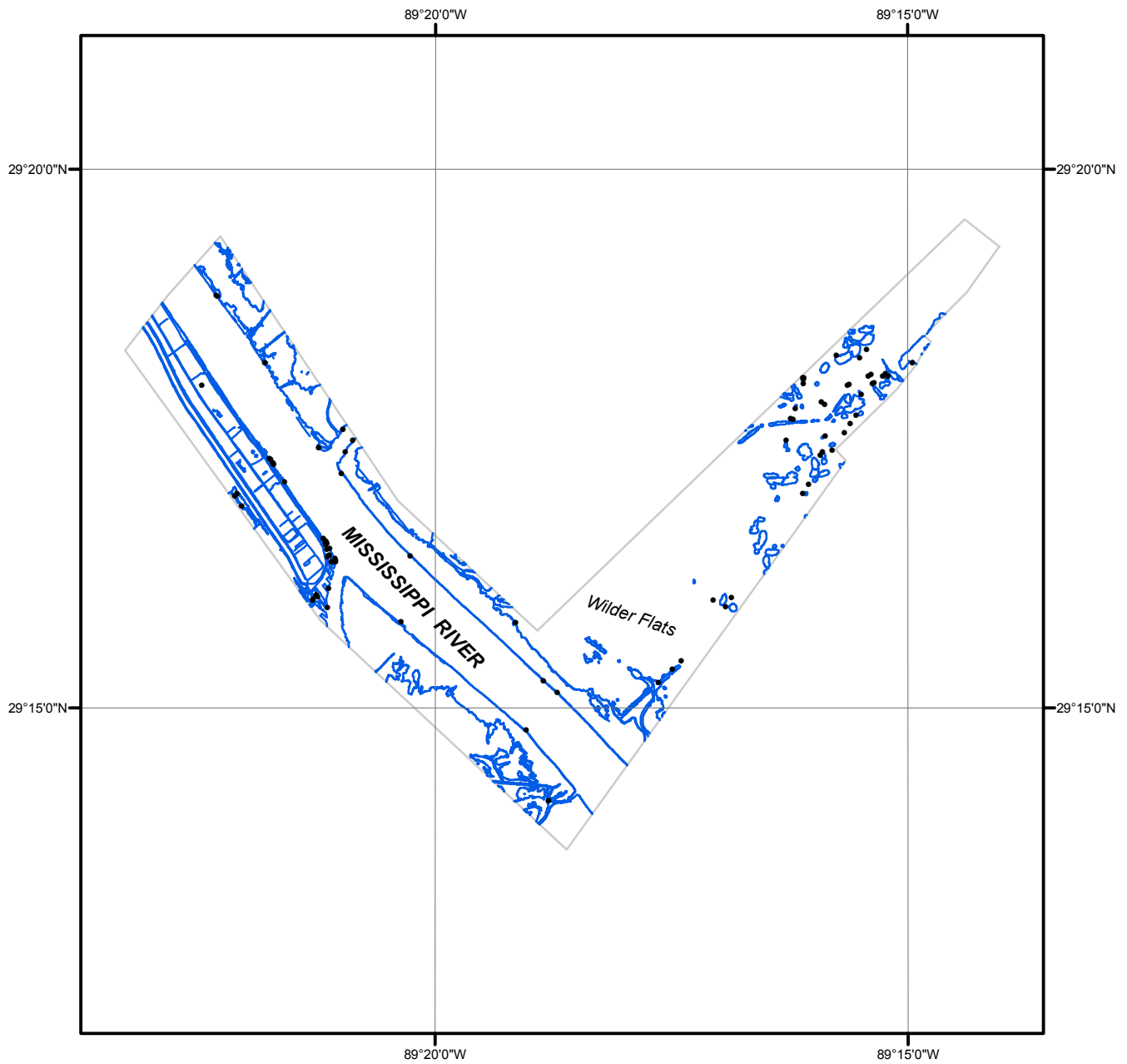
- Project database
- GC10897 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

### **NOAA Shoreline Data Explorer**

- GC10897 in shapefile format
- Metadata file for GC10897
- Digital copy of the PCR in Adobe PDF format

## **End of Report**

# MISSISSIPPI RIVER, WILDER FLATS TO DUVIC LOUISIANA



Overview



LA1002E

GC10897