

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

## ***PROJECT CA0611***

### ***Port of Humboldt Bay, California***

#### **Introduction**

Coastal Mapping Program (CMP) Project CA0611 provides highly accurate digital shoreline data for key areas of change for the Port of Humboldt Bay, California, from Arcata Bay in the north to South Bay in the south. 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 (7/1/93). 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**

Field operations consisted of the collection of static and kinematic Global Positioning System (GPS) data and acquisition of aerial imagery. The photographic mission operations were conducted on July 13, 2007, with the NOAA Cessna Citation II aircraft. Two strips of natural color photographs were acquired, with a nominal scale of 1:30,000, through use of an RC-30 Aerial mapping Camera.

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

#### **GPS Data Reduction**

GPS/IMU data were processed by RSD personnel to provide precise positions of camera centers for application as photogrammetric control in the aerotriangulation phase. The static GPS base station data were processed via the National Geodetic Surveys (NGS) Online Positioning User Service (OPUS) software to compute an NAD83 position for the base station. The airborne kinematic data was processed using Applanix POSPac (ver. 4.3) software in July 2007 and the static GPS data was processed in August 2007. Refer to the 07ACV194 Airborne Positioning and Orientation Report (APOR) for further information on the GPS data processing and results.

## 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. This work was completed by RSD personnel in August 2008 utilizing the BAE Systems SOCET SET (v. 5.4) Digital Photogrammetric Workstation (DPW). The color photographs were aero-triangulated (AT) and adjusted as a single block using the Multi-Sensor Triangulation (MST) module. Upon successful completion of the aerotriangulation, MST provided an RMS of the standard deviations for each aero-triangulated ground point. These were then used to compute a 95% Confidence Circle (95% CC) of 0.7 meters. An AT 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 (NAD83).

## Compilation

The data compilation phase of this project was initiated by RSD personnel in August 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 the digital 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 CA0611 were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 1.4 meters at the 95% confidence level. This predicted accuracy of compiled, well defined points is calculated by doubling the circular error derived from the aerotriangulation statistics.

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

Date	Time (UTC)	Roll Number	Photo Numbers	Scale (nominal)	Tide Level*
07-13-07	16:00-16:02	07ACN12	1751-1755	1:30,000	0.6 m
07-13-07	16:02-16:03	07ACN12	1756-1759	1:30,000	0.5 m
07-13-07	16:09-16:11	07ACN12	1761-1765	1:30,000	0.5 m
07-13-07	16:12-16:14	07ACN12	1766-1770	1:30,000	0.6 m

\*Tide levels are given in meters above MLLW and are based on actual observations recorded by the NOS gauge at North Spit, Humboldt Bay, CA, with offsets applied to the Fields Landing and Eureka substations. The height of mean high water in the project area varied between 1.9 and 2.0 m.

## **Quality Control / Final Review**

Quality control tasks were conducted during all phases of project completion by a senior member of the RSD Applications Branch (AB). The final QC review was completed in August 2008. The review process included analysis of the georeferencing 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. The entire suite of project products was evaluated for compliance to CMP requirements.

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

Chart 18622 Humboldt Bay, CA, 54<sup>th</sup> Ed., April 2006, Scale 1:25,000

## **End Products and Deliverables**

The following specifies the location and identification of end 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 GC10720 file contents, attached to PCR

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

- Project database
- GC10720 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- Chart Evaluation File in shapefile format

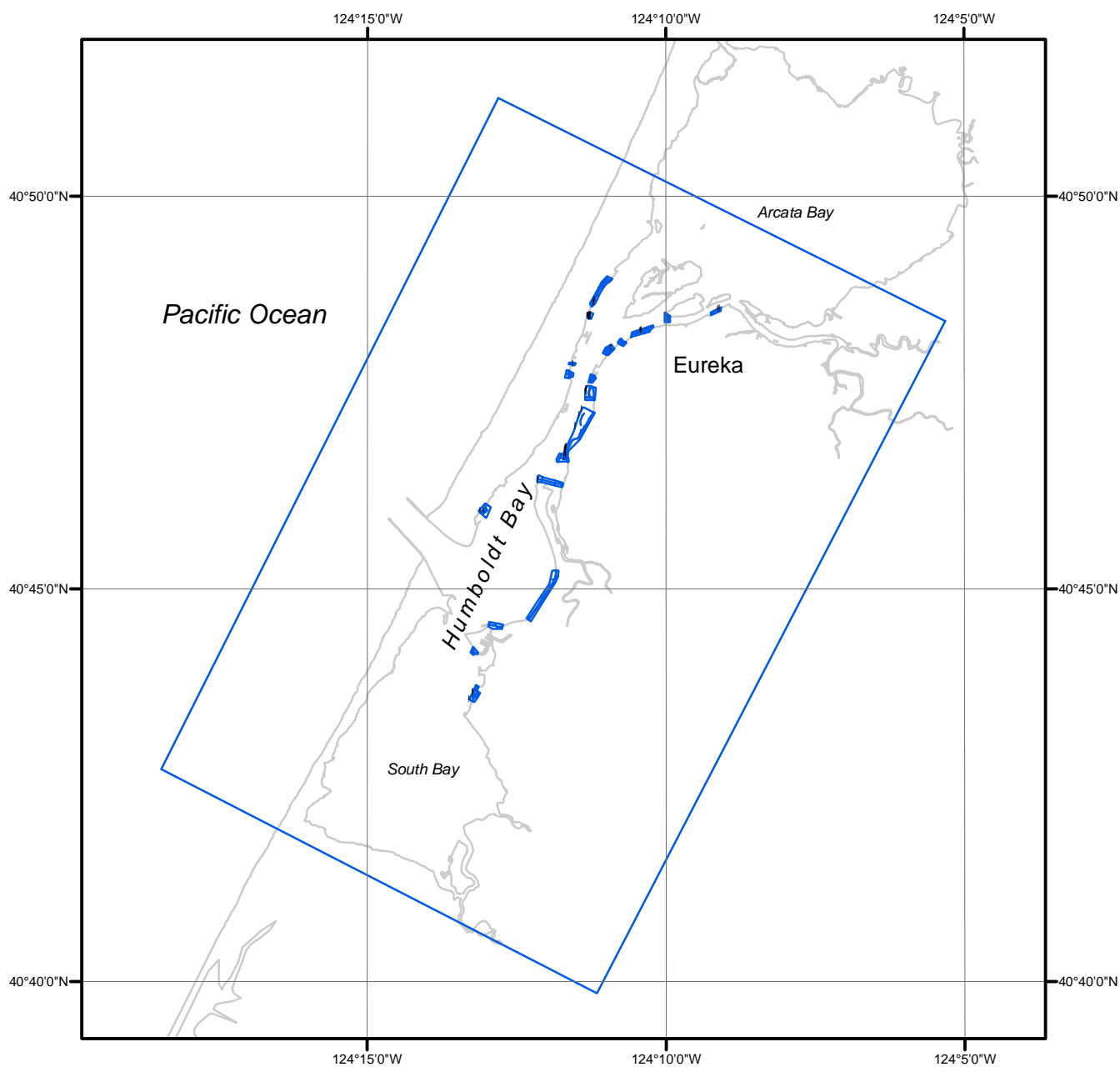
### **NOAA Shoreline Data Explorer**

- GC10720 in shapefile format
- Metadata file for GC10720
- Digital copy of the PCR in Adobe PDF format

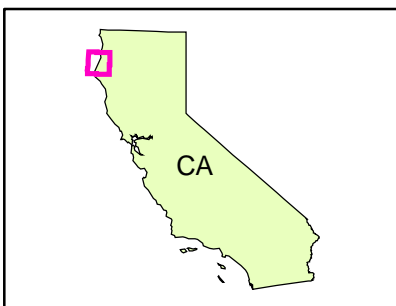
## **End of Report**

# PORT OF HUMBOLDT BAY

## CALIFORNIA



Overview



CA0611

GC10720