# NOAA COASTAL MAPPING PROGRAM
# PROJECT COMPLETION REPORT

## *PROJECT CA0803*

## *Port of Hueneme and Channel Islands Harbor, California*

### Introduction

Coastal Mapping Program (CMP) Project CA0803 provides highly accurate digital shoreline data for the port of Hueneme and Channel Islands Harbor in California. The Geographic Cell (GC) may be used in support of the NOAA Nautical Charting Program (NCP) as well as geographic information systems (GIS) for coastal zone management applications.

### Project Design

The design of Project CA0803 was accomplished by the Requirements Branch (RB) of the Remote Sensing Division (RSD) in response to the need for updates to NOAA's Electronic Navigational Chart series. 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. Refer to the Hueneme CSCAP Analysis Memorandum for details regarding the 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. The photographic mission operations were conducted on April 11, 2008 with the NOAA Twin Otter aircraft (N48RF). Two strips of natural color digital images were acquired with an approximate ground sample distance of 0.34 meters through use of an Applanix Digital Sensor System (DSS-439) single camera digital system.

No base station was established for field operations. Airborne kinematic GPS data was collected to determine precise camera positions. IMU data was collected to determine camera orientations.

### GPS Data Reduction

GPS data were processed by RSD personnel to yield precise camera positions in order to provide a control network necessary for aerotriangulation. One CORS station (VNCO) and one UNAVCO station were processed using the NGS Online Processing User Service (OPUS) to compute fixed baseline solutions for these stations so they could serve as base stations during GPS processing. Airborne kinematic data was processed using Applanix POSPAC (ver. 4.4) software in November 2010.

## 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 initiated by RSD personnel in December 2010 utilizing a Digital Photogrammetric Workstation (DPW), which is a configuration of computer hardware, modular software components, and other associated peripheral devices. The digital images were measured and adjusted as a single block using BAE Systems SOCET SET (version 5.5.0) photogrammetric suite including the Multi-Sensor Triangulation (MST) module and in conjunction with the Bingo (version 5.6) aerotriangulation software. Upon successful completion of the aerotriangulation process, the Bingo software provided the standard deviations for each aerotriangulated ground point, which were used to compute a predicted horizontal circular error of 0.45 meters based on a 95% confidence level. 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, 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 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 the digital photographs 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), 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 CA0803 were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 0.9 meters at the 95% confidence level. The predicted accuracy of compiled, well defined points is derived by doubling the circular error computed from aerotriangulation statistics.

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

| Date | Time (UTC) | Roll Number | Photo Numbers | GSD (nominal) | Tide Level* |
|---|---|---|---|---|---|
| 04-11-08 | 19:31-19:33 | 08NC57 | 16144-16158 | 0.34 m | 0.2 |
| 04-11-08 | 19:42-19:44 | 08NC57 | 16159-16173 | 0.34 m | 0.2 |

* Tide levels are given in meters above MLLW and are based on actual observations recorded by the NOS tide gauge at Los Angeles, with offsets applied to the tidal substation at Hueneme. The elevation of MHW at the Hueneme substation is 1.4 meters above MLLW.

## Final Review

The final review of the project was completed by a senior member of RSD in January 2011, 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 ArcGIS 9.3 software. All project data was evaluated for compliance to CMP requirements.

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

18724, Port Hueneme and Approaches, CA, 1:20,000 scale, 2nd Ed.
Including Port Hueneme Inset, 1:12,500 scale

## 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 GC10861 file contents, attached to PCR

**Remote Sensing Division Electronic Data Library**

- Project database
- GC10861 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

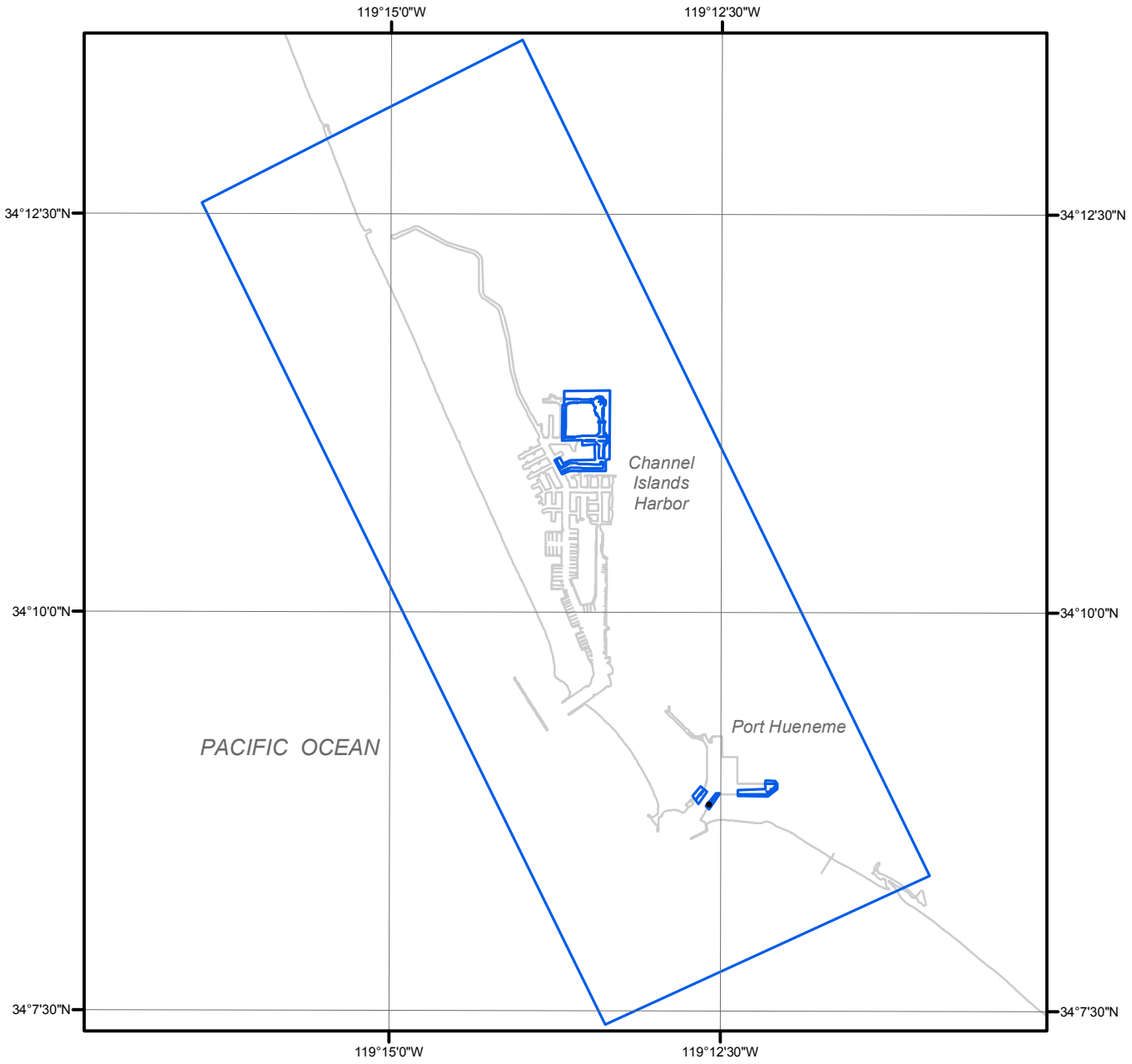
**NOAA Shoreline Data Explorer**

- GC10861 in shapefile format
- Metadata file for GC10861
- Digital copy of the PCR in Adobe PDF format

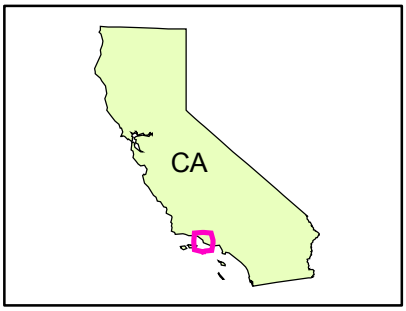
## End of Report

# PORT HUENEME AND CHANNEL ISLANDS HARBOR

# CALIFORNIA




Overview




CA0803

GC10861