

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT WA1205

Port of Everett, Washington

Introduction

Coastal Mapping Program (CMP) Project WA1205 provides highly accurate digital shoreline data for key areas of change within the port of Everett, Washington. 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 original design of Project WA1205 was accomplished by the Requirements Branch (RB) of the Remote Sensing Division (RSD) in response to the general need for updates to NOAA's Electronic Navigational Chart (ENC) series. A standard change analysis was conducted within the Coast and Shoreline Change Analysis Program (CSCAP), in which NOAA nautical chart products are compared to contemporary high resolution imagery to ascertain the need for more current shoreline data. A Chart Evaluation File (CEF) was forwarded from RB to the Applications Branch (AB) of RSD upon completion of the CSCAP analysis. Refer to the RB CSCAP memorandum of June 11, 2012, for more details of the chart comparison process.

Field Operations

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. Aerial survey operations were conducted on April 21, 2012 with the NOAA King Air (N68RF) aircraft. Four strips of digital RGB (color) images were acquired with an Applanix DSS-439 medium format digital camera at a nominal altitude of 10,000 feet. All photography was acquired when local tides were below MHW.

Direct Georeferencing Data Processing

GPS/IMU data were processed by RSD personnel to yield precise camera positions and orientations for direct georeferencing (DG) of the imagery. 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. The airborne kinematic data was processed using Applanix POSPAC (ver. 5.4.0) software in May 2012. For further information on steps used to process this data, refer to the Airborne Positioning and Orientation Report (APOR) on file within the AB Project Archive. The DG imagery was then used to produce orthorectified mosaics for CSCAP

analysis. NGS third order geodetic control points were used to assess the accuracy of the mosaics, which were determined to be suitable for feature compilation.

The processed GPS/IMU data were used to derive precise exterior orientation (EO) values of the camera centers required for digital feature extraction. The predicted horizontal accuracy of the imagery was determined by propagating sensor EO and image measurement uncertainties through the photogrammetric collinearity equations using an Excel spreadsheet based EO Total Propagated Uncertainty (TPU) tool developed by NGS. Using this tool, the predicted horizontal uncertainty at the 95% confidence level was calculated to be 1.4 meters.

Compilation

Data compilation was performed by RSD personnel in December 2013. Digital feature data was compiled in shapefile format from the orthomosaic imagery using Esri's ArcGIS 9.3.1 desktop GIS software. 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.

Spatial data accuracies for WA1205 were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 2.8 meters. This predicted accuracy of compiled, well-defined points is derived by doubling the horizontal uncertainty value derived from the DG data.

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

Date	Time (UTC)	Roll #	Strip / Frame #s	~GSD	Tide Level
4/21/2012	17:01 - 17:03	12NC26	50-003 / 7284-7296	0.35 m	n/a
4/21/2012	17:08 - 17:10	12NC26	50-002 / 7297-7309	0.35 m	n/a
4/21/2012	17:14 - 17:16	12NC26	50-001 / 7310-7321	0.35 m	n/a
4/21/2012	17:22 - 17:23	12NC26	50-004 / 7322-7331	0.35 m	n/a

Quality Control / Final Review

Quality control tasks were conducted by a senior member of RSD in December 2013. The review process included analysis of the direct 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 9.3.1. All project products were 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:

RSD Applications Branch Archive

- Hardcopy of the Project Completion Report (PCR)
- Page size graphic plot of GC11036 file contents, attached to PCR
- Hardcopy of the CSCAP evaluation memorandum

Remote Sensing Division Electronic Data Library

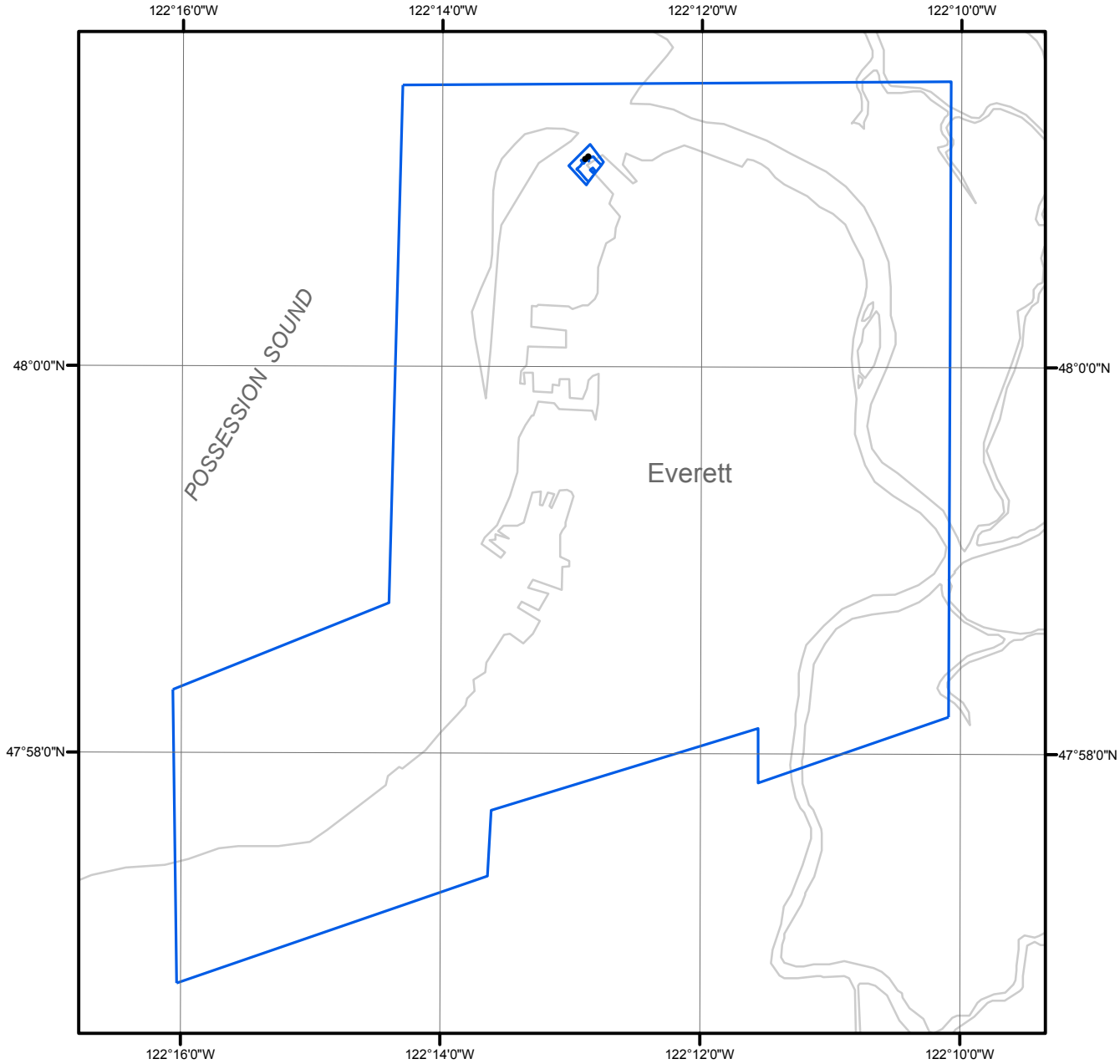
- GC11036 in shapefile format
- Digital copy of the PCR in Adobe PDF format
- CEF in shapefile format

NOAA Shoreline Data Explorer

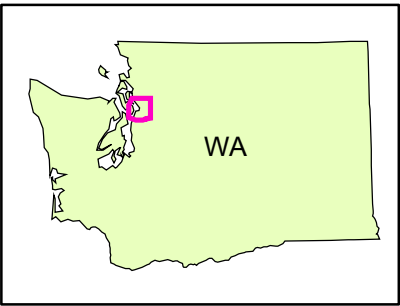
- GC11036 in shapefile format
- Metadata file for GC11036
- Digital copy of the PCR in Adobe PDF format

End of Report

PORT OF EVERETT
WASHINGTON



Overview



WA1205

GC11036