

# **NOAA COASTAL MAPPING PROGRAM**

## **PROJECT COMPLETION REPORT**

### ***PROJECT AK9702G***

#### ***SOUTHERN SHORE OF ETOLIN ISLAND, ERNEST SOUND AND CLARENCE STRAIT, SOUTHEAST ALASKA***

##### **Introduction**

Project AK9702G, a subproject of AK9702, provides a highly accurate database of new digital shoreline data of southeastern Alaska. The subproject covers the southern portion of Etolin Island as well as smaller islands nearby in Clarence Strait and Ernest Sound.

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 Cartographic Feature Files (DCFF) of the coastal zone which compliment the Nautical Charting Program (NCP) and other geographic information systems.

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 survey data is referenced to the North American Datum of 1983 (NAD 83).

##### **Project Design**

The Requirements Branch (RB) of the Remote Sensing Division (RSD) formulated the photographic mission instructions for this project following standard operating guideline of the photo mission standard operating procedure version III (2/01/1997). The instructions discussed the project's purpose, geographic area of coverage, scope and priority; tide coordination 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.

The RB created a Project Layout Diagram, flight maps and input files for the aircraft's flight management system, and information on airports that may be used as a base of operation. Additional information disseminated at a briefing held for the photo mission crew included data on tide predictions, sun angle computations, flight line priorities, and geodetic control stations which could be used as GPS reference stations.

##### **Field Operations**

The photographic mission operations were conducted on August 9<sup>th</sup>, 10<sup>th</sup>, 11<sup>th</sup> and 16<sup>th</sup> of 1997 and on May 15<sup>th</sup> and 30<sup>th</sup> of 1998 with the NOAA Cessna Citation II aircraft. Three strips of

natural color photographs, three strips of panchromatic photographs, and five strips of infrared photographs were acquired through use of a Wild RC-30 camera with the NOS "A" lens cone at the nominal scale of 1:40,000. Kinematic GPS data was acquired for the color and panchromatic photographs, but not for the infrared photographs.

## **GPS Data Reduction**

Global Positioning System (GPS) data was collected and processed to provide precise positions of camera centers for application as photogrammetric control in the aerotriangulation phase of project completion. The acquisition of a static GPS dataset of the airport reference station and airborne kinematic GPS dataset was executed in compliance with GPS Controlled Photogrammetry Field Operations Manual, a RSD operational manual. Static GPS data of the airport reference station was collected on August 9, 1997 and processed in August 1997 using the NGS OMNI software to compute two fixed baseline solutions from the nearest CORS station. The final position of the GPS base station was the average of these two baseline solutions. The airborne kinematic data for all project mission flights were processed by RSD Applications Branch (AB) personnel using Trimble GPSurvey (ver. 2.30) software between March 1999 and January 2000. The NGS-computed precise satellite ephemeris and standard meteorologic data were applied during the data reduction process. A GPS Data Processing Report was written and is on file with other project data within the RSD 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 initiated by RSD AB CMP personnel in October of 2003 utilizing a digital photogrammetric workstation (DPW), a configuration of computer processor and monitors, softcopy photogrammetry software (SOCET SET v. 4.4.1), stereographic viewing equipment, and associated peripheral devices. The SOCET SET ORIMA (ver. 6.01) software module was utilized for the aerotriangulation process. The three strips of color and three strips of panchromatic aerial photographs were measured and adjusted as one block, three strips of infrared photographs were measured and adjusted as another block, and two strips of infrared photos were measured and adjusted as yet another block. Upon completion of the aerotriangulation process, the ORIMA software provided the RMS of the standard deviations of the residuals for all aerotriangulated ground points which were used to compute a predicted horizontal circular error of 1.1 meters for the color and panchromatic photographs, 2.7 meters for strips 19, 20 and 21 of the infrared photographs and 2.0 meters for strips 23 and 24 of the infrared photographs. All accuracies were based on a 95% confidence level. An Aerotriangulation Report 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, airborne GPS antenna position and offset data, adjusted exterior orientation parameters, and positional listing of all measured points. Positional data is based on the North American Datum of 1983, and is referenced to the UTM Coordinate System, zone 8N.

## Compilation

The data compilation phase of the project was accomplished by the RSD Applications Branch (AB) in May of 2004. The digital mapping was performed using a DPW in conjunction with the Socet Set (v. 5.0) Feature Extraction module. Feature identification and the assignment of cartographic codes were based on image analysis of 1:40,000 scale natural color, panchromatic, and infrared photographs and information extracted from the appropriate NOAA Nautical Charts, US Coast Guard Light List and US Coast Pilot. Cartographic feature attribution was assigned in compliance with the Coastal Cartographic Object Attribute Source Table (C-COAST). Nomenclature was assigned to selected cartographic features to refine general classification.

Most cartographic features were compiled to meet a horizontal accuracy of 2.2 meters based on the natural color and panchromatic photographs. Features such as mean lower low water, ledges, rocks and obstructions were compiled to meet a horizontal accuracy of 5.5 meters based on strips 19, 20 and 21 of the infrared photographs, and 4.0 meters based on strips 23 and 24 of the infrared photographs. All accuracies were based at the 95% confidence level. This predicted accuracy of compiled, well defined points is derived by doubling the circular error derived from aerotriangulation statistics.

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

Date	Time (UTC)	Roll Number	Strip Number	Photo Numbers	Scale (nominal)	Tidal Stage (m) (MLLW)
8/09/97	23:55-23:57	97ACN11	19	2062-2068	1:40,000	3.7 to 3.8
8/10/97	00:06-00:09	97ACN11	20	2069-2076	1:40,000	3.8 to 3.9
8/10/97	23:51-23:56	97ACN11	21	2240-2251	1:40,000	3.2
8/11/97	00:26-00:31	97AP02	22	2266-2279	1:40,000	3.3
8/16/97	21:30-21:33	97AP03	23	2479-2507	1:40,000	3.4 to 4.0
8/16/97	21:39-21:42	97AP03	24	2508-2515	1:40,000	3.4 to 4.0
5/15/98	19:16-19:19	98AR03	19R	1818-1824	1:40,000	-0.04
5/15/98	19:28-19:30	98AR03	20R	1825-1831	1:40,000	-0.04
5/30/98	20:17-20:22	98AR04	21R	2150-2160	1:40,000	-0.01 to -0.35
5/30/98	19:36-19:42	98AR04	23R	2117-2128	1:40,000	-0.01 to -0.35
5/30/98	19:28-19:30	98AR04	24R	2107-2112	1:40,000	-0.01 to -0.35

\*The Tidal Stage is based on actual observations recorded by the NOS gauge at Ketchikan, AK at the time of photography. All measurements are in meters.

## **Final Review**

The final review was completed by a senior AB CMP team member in November of 2004. The DCFF was evaluated for completeness and accuracy. Data review consisted of an on-line and off-line evaluation of digital compilation and hard copy products. The on-line review comprised of reviewing stereo models on a DPW for cartographic feature codes selection, positional accuracies of features, and nomenclature. The cartographic feature attribution was judged to conform to C-COAST specification. The offline evaluation compared hard copy plots of the project data with the largest scale nautical charts available and the natural color photographs. A copy of NOAA nautical chart 17385 Ernest Sound-Eastern Passage and Zimovia Strait 1:80,000, 14<sup>th</sup> edition, 17423 Clarence Strait and Behm Canal using the inset Dewey Anchorage at 1:20,000, 13<sup>th</sup> ed., 17382 Zarembo Island and Approaches, 1:80,000, 15<sup>th</sup> ed. and 17420 Hecate Strait to Etolin Island 1:229,376, 26<sup>th</sup> ed. were used for the chart comparison process.

## **Project Final Data and Products**

The following specifies the location and identification of the products generated during the completion of this project:

### **RSD Applications Branch Archive**

- Hardcopy of the GPS Processing Report
- Hardcopy of the Aerotriangulation Report
- Hardcopy of the Project Completion Report (PCR)
- Page-size graphic plot of GC10549 file contents, attached to PCR

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

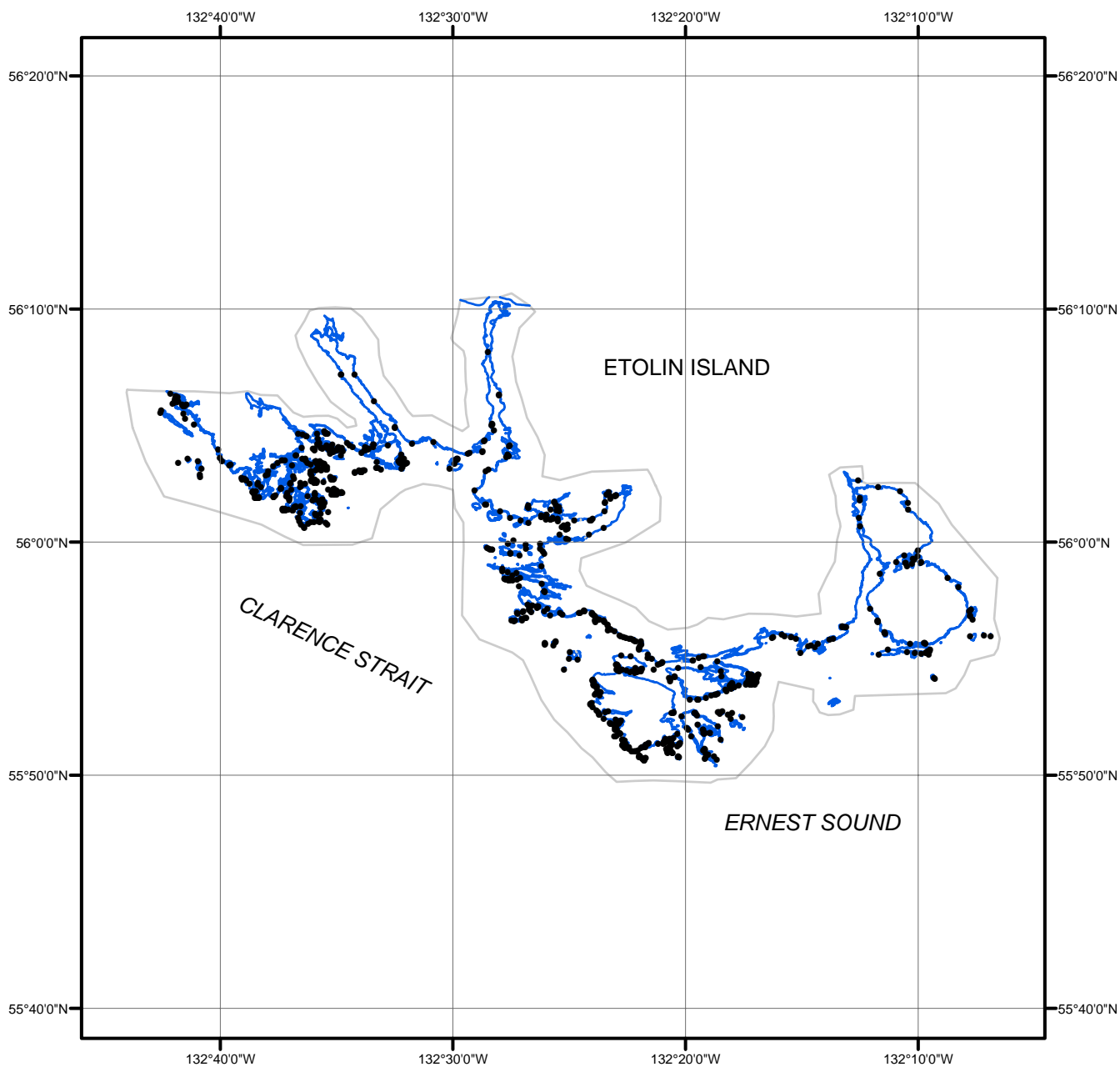
- Project Database
- Digital copy of DCFF GC10564 in ESRI shapefile format
- Digital copy of the PCR in Adobe PDF format
- Chart Evaluation File in shapefile format

### **NOAA Shoreline Data Explorer**

- DCFF for GC10549
- Metadata file for GC10549
- Digital copy of the PCR in Adobe PDF format

## **End of Report**

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Overview



AK9702G

GC10549