NOAA COASTAL MAPPING PROGRAM
PROJECT COMPLETION REPORT

PROJECT AK1706-CM-N

Kotzebue Sound, Cape Krusenstern to Cape Blossom, Alaska

Introduction

NOAA Coastal Mapping Program (CMP) Project AK1706-CM-N provides a highly accurate dataset of coastal feature data for a portion of the northern shore of Kotzebue Sound from Cape Krusenstern to Cape Blossom on the Baldwin Peninsula, in Alaska. 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

Photographic mission instructions for AK1706-CM-N were designed by the Requirements Branch (RB) of the Remote Sensing Division (RSD). RB formulated photographic mission instructions following the guidelines of the Photo Mission Standard Operating Procedures, which discussed the project's purpose, area of coverage, scope and priority, image requirements, Global Positioning System (GPS) data collection procedures and guidelines, instructions for data recording and handling, and mission communication protocols. RB created a Project Layout Diagram, flight maps and input files for the aircraft flight management system.

Field Operations

The field operations consisted of the collection of static and kinematic GPS data and Inertial Measurement Unit (IMU) data, and the acquisition of digital aerial imagery. Aerial survey operations for Project AK1706-CM-N were conducted in July 2017 with the NOAA King Air aircraft (N68RF), in which 23 flight lines of natural color (RGB) and near-infrared (NIR) imagery were acquired concurrently using an Applanix Digital Sensor System (DSS) 580/560 camera. The imagery was not collected in coordination with local stages of tide. All imagery was acquired at a nominal altitude of 7,500 feet, resulting in an approximate ground sample distance (GSD) of 0.24 meters for RGB images. The NIR imagery was not used for this project.

Direct Georeferencing Data Processing

The 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. Airborne kinematic data was processed using Applanix POSPac MMS (ver. 7.1) software in September 2017. For further information refer to the Airborne Positioning and Orientation Reports (APOR) on file with other project data within the RSD Electronic Data Library.

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 the Exterior Orientation Total Propagated Uncertainty (EO-TPU) tool developed by NGS. Using this tool, the predicted horizontal uncertainty at the 95% confidence level for all project imagery was calculated to be 0.64 meters.

Compilation

The data compilation phase of this project was accomplished by RSD Applications Branch (AB) personnel in January 2024. Digital feature data was compiled from aerial imagery, using stereo feature extraction capabilities within Esri's ArcGIS Pro software (ver. 3.2). Feature identification and attribution within the GC were based on image analysis of the aerial imagery and information extracted from the largest scale NOAA nautical chart products 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.

Spatial data accuracies for Project AK1706-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 1.3 meters. This predicted accuracy of compiled well-defined points is derived by doubling the horizontal uncertainty calculated from the EO-TPU tool. The table below provides information on the imagery used to complete this project:

Date	Time (UTC)	Flight Line	Color Imagery		Tide Level *
			Roll	Strip/Images	
8-Jul-2017	20:04 – 20:07	45-001	17VC30	05807 – 05824	0.7 m
8-Jul-2017	20:10 – 20:15	45-005	17VC30	05825 – 05862	0.6 – 0.7 m
8-Jul-2017	20:21 – 20:23	45-002	17VC30	05863 – 05880	0.6 – 0.7 m
8-Jul-2017	20:27 – 20:30	45-004	17VC30	05881 – 05901	0.6 – 0.7 m
8-Jul-2017	20:34 – 20:37	45-003	17VC30	05902 – 05921	0.6 – 0.7 m
8-Jul-2017	20:40 – 20:49	45-006	17VC30	05922 – 05979	0.6 – 0.7 m
8-Jul-2017	20:53 – 20:55	45-007	17VC30	05980 – 05990	0.6 m
8-Jul-2017	20:59 – 21:02	45-009	17VC30	05991 – 06011	0.6 m
8-Jul-2017	21:06 – 21:09	45-008	17VC30	06012 – 06033	0.6 m
8-Jul-2017	21:15 – 21:18	45-013	17VC30	06034 – 06052	0.6 m
8-Jul-2017	21:22 – 21:25	45-011	17VC30	06053 – 06071	0.6 m

8-Jul-2017	21:29 – 21:32	45-012	17VC30	06072 – 06092	0.6 m
8-Jul-2017	21:36 – 21:38	45-010	17VC30	06093 – 06103	0.6 m
8-Jul-2017	21:41 – 21:44	45-015	17VC30	06104 – 06123	0.5 m
8-Jul-2017	21:49 – 21:52	45-014	17VC30	06124 – 06140	0.5 – 0.6 m
8-Jul-2017	21:55 – 22:00	45-020	17VC30	06141 – 06174	0.5 – 0.6 m
8-Jul-2017	22:05 – 22:09	45-022	17VC30	06175 – 06198	0.6 m
8-Jul-2017	22:15 – 22:17	45-023	17VC30	06199 – 06218	0.5 m
8-Jul-2017	22:23 – 22:24	45-021	17VC30	06219 – 06230	0.5 m
8-Jul-2017	22:30 – 22:35	45-019	17VC30	06231 – 06261	0.5 m
8-Jul-2017	22:39 – 22:41	45-018	17VC30	06262 – 06274	0.5 m
8-Jul-2017	22:46 – 22:49	45-016	17VC30	06275 – 06292	0.5 m
8-Jul-2017	22:54 – 22:57	45-017	17VC30	06293 – 06311	0.5 m

* Tide levels are given in meters above MLLW and were calculated using the Pydro software tool with a TCARI grid referenced to verified water level observations at the time of photography from various NOS gauges in the vicinity of the project. The elevation of the MHW tidal datum in the project area ranges between 0.18 – 0.23 meters above MLLW.

Quality Control / Final Review

Quality control tasks were conducted during all phases of project completion by a senior member of RSD. The final QC review was completed in January 2024. The review process included analysis of 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 software (ver. 10.8.2) software. All project data was evaluated for compliance to CMP requirements.

Comparisons of the largest scale NOAA Electronic Navigational Charts (ENC) with source imagery and compiled project data resulted in creation of the Chart Evaluation File (CEF). The following ENCs were used in the comparison process:

- ENC US4AK6XT, 1st Ed., SEP. 2020, Scale 1:40,000
- ENC US4AK6YS, 1st Ed., SEP. 2020, Scale 1:40,000
- ENC US4AK6YT, 1st Ed., SEP. 2020, Scale 1:40,000
- ENC US4AK6ZR, 1st Ed., SEP. 2020, Scale 1:40,000
- ENC US4AK6ZS, 1st Ed., SEP. 2020, Scale 1:40,000
- ENC US4AK6ZT, 1st Ed., SEP. 2020, Scale 1:40,000
- ENC US4AK7AE, 1st Ed., NOV. 2019, Scale 1:40,000

End Products and Deliverables

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

Remote Sensing Division Electronic Data Library

- Project database
- Airborne Positioning and Orientation Report (APOR)
- GC11994 in shapefile format
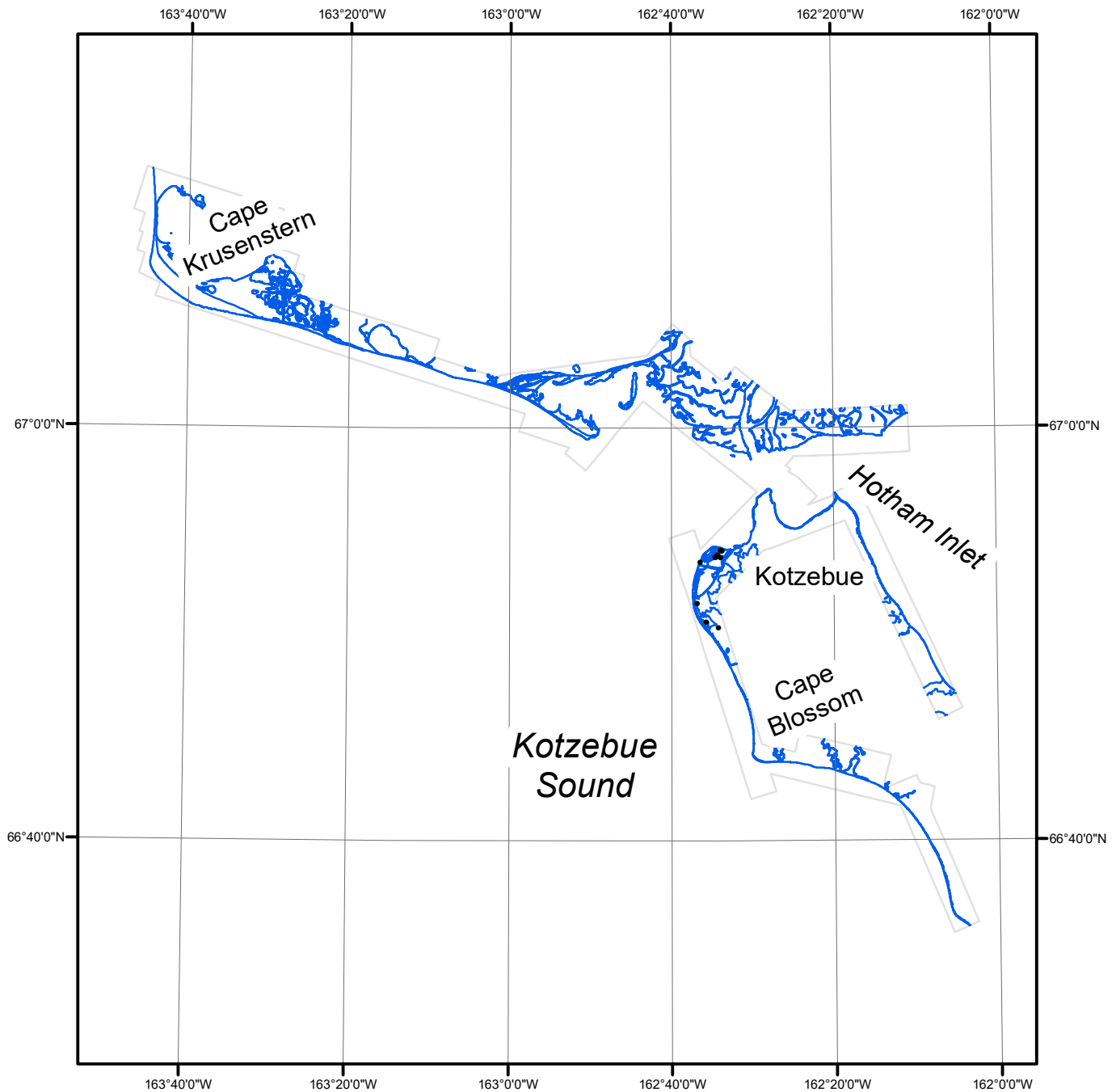- Project Completion Report (PCR)
- CEF in shapefile format

NOAA Shoreline Data Explorer

- GC11994 in shapefile format
- Metadata file for GC11994
- PCR in Adobe PDF format

End of Report

KOTZEBUE SOUND, CAPE KRUSENSTERN TO CAPE BLOSSOM

ALASKA

163°40'0"W 163°20'0"W 163°0'0"W 162°40'0"W 162°20'0"W 162°0'0"W

67°0'0"N

66°40'0"N

Cape Krusenstern

Hotham Inlet

Kotzebue

Cape Blossom

Kotzebue Sound

Overview

AK

AK1706-CM-N

GC11994