

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

## ***PROJECT FL1305D-CM-N***

### ***Crystal Bay and River, Florida***

#### **Introduction**

NOAA Coastal Mapping Program (CMP) Project FL1305D-CM-N provides a highly accurate database of new digital shoreline data for Crystal Bay and River, on the west coast of Florida. Project FL1305D-CM-N is a subproject of a larger acquisition project, FL1305-CM-N, which extends from Tarpon Springs to Cedar Keys. 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**

Project FL1305-CM-N was designed in response to a request for shoreline data from the Marine Chart Division of NOAA's Office of Coast Survey. 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 Procedures. The instructions discussed the project's purpose, geographic area of coverage, scope and priority, image requirements, flight line priority, Global Positioning System (GPS) data collection procedures and guidelines, instructions for data recording and handling, and contact and communication information. RB created a Project Layout Diagram, flight maps and input files for the aircraft flight management system.

#### **Field Operations**

The field operations for the FL1305-CM-N project consisted of the collection of static and kinematic GPS data and Inertial Measurement Unit (IMU) data, the acquisition of digital aerial imagery by NOAA, followed by ground surveys performed under contract with Fugro Geospatial, Inc. Aerial survey operations included the acquisition of 32 strips of natural color and NIR imagery at both the MLLW and MHW tidal stage. The images were acquired using both the DSS- 439/539 dual camera system in 2014 and the DSS 580/560 dual camera system in 2016. All aerial imagery acquisition was accomplished with NOAA's King Air aircraft (N68RF) flying at an altitude of 10,000 feet. Refer to the FL1305 Acquisition Summary report for additional information and specific dates concerning the aerial survey operations.

Fugro was contracted by NGS to perform field operations limited to the surveying of ground control points (GCPs) and check points (CPs). The National Spatial Reference System (NSRS) was used to provide control for the network. As a subcontractor to Fugro, TerraSurv Inc. established 24 photo identifiable control points. Of the 24 collected control points, 14 were successfully located and used as ground control 6 were successfully located and used as check points. Refer to Fugro's Florida Coastal FL1305 (A-F) Survey Report for more information on ground survey operations.

## **GPS Data Processing**

All GPS/IMU data processing tasks were completed by NGS and the final processed data was supplied to Fugro Geospatial, Inc. GPS and IMU data was collected and processed by Remote Sensing Division (RSD) personnel to yield precise positions and orientations of camera centers as a means of rendering accurately georeferenced digital images. For further information refer to the multiple Airborne Positioning and Orientation Reports (APOR) that are on file within the RSD Electronic Data Library.

## **Aerotriangulation**

Fugro Geospatial, Inc. performed routine softcopy aerotriangulation methods that 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. The RGB and NIR images were measured and adjusted as two separate blocks. This work was completed in December 2017 using a softcopy photogrammetric workstation. The softcopy system hardware consisted of a high-end Dell Precision™ Workstation with the Windows® 7 Professional operating system, and stereo viewing capability. SOCET SET v 5.6 was used for project setup and the mensuration phase. The adjustment solution phase was accomplished with the ORIMA v. 11.01 module.

Upon successful completion of the aerotriangulation process, the overall RMS data for all of the adjusted ground point standard deviations (both x & y) were used to compute a predicted horizontal circular error (95% confidence level) of 0.53 meters for the RGB adjusted block solution and 0.59 meters for the NIR solution.

The project database consists of project parameters and options, camera calibration data, 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). An Aerotriangulation Report was completed and is on file with other project data within the RSD Electronic Data Library

## **Compilation**

The compilation for FL1305D-CM-N was completed by Fugro Geospatial, Inc., in June 2018. Digital mapping was performed using SOCET SET v 5.6 Stereo Softcopy workstations with the SOCET for ArcGIS module and ArcGIS 10.3. Feature identification and attribution within the GC were based on image analysis of 1:50,000 scale 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 FL1305D-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features were compiled to meet a horizontal accuracy of 1.1 meters from RGB imagery and 1.2 meters from the NIR

imagery, all at the 95% confidence level. The predicted accuracy of compiled, well defined points is derived by doubling the circular errors derived from aerotriangulation statistics.

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

Date	Time (UTC)	Flight Line	Color Imagery		Infrared Imagery		Tide Level*
			Roll	Images	Roll	Images	
02/19/2014	20:17 – 20:20	50-005	14NC21	05482 – 05495	14NR16	02641 – 02654	0.9 – 1.0 m
02/19/2014	20:28 – 20:29	50-006	14NC21	05521 – 05530	14NR16	02680 – 02689	0.9 – 1.0 m
02/19/2014	20:34 – 20:36	50-007	14NC21	05531 – 05543	14NR16	02690 – 02702	0.9 – 1.0 m
02/19/2014	20:53 – 20:55	50-008	14NC21	05587 – 05600	14NR16	02746 – 02759	0.7 – 1.0 m
05/17/2014	19:49 – 19:50	50-020	14NC46	10505 – 10511	14NR39	07586 – 07592	0.9 – 1.0 m
05/17/2014	19:55 – 19:56	50-021	14NC46	10517 – 10524	14NR39	07598 – 07605	0.9 m
05/17/2014	20:11 – 20:12	50-022	14NC46	10606 – 10613	14NR39	07686 – 07694	0.9 m
05/17/2014	20:17 – 20:17	50-023	14NC46	10614 – 10620	14NR39	07695 – 07701	0.9 – 1.0 m
05/17/2014	20:33 – 20:34	50-024	14NC46	10699 – 10702	14NR39	07778 – 07783	0.8 – 1.0 m
10/18/2014	13:55 – 13:58	50-011	14NC95	21675 – 21692	14NR85	18205 – 18222	0.2 – 0.7 m
10/18/2014	14:03 – 14:05	50-012	14NC95	21693 – 21708	14NR85	18223 – 18238	0.2 – 0.6 m
10/18/2014	14:26 – 14:28	50-013	14NC95	21822 – 21838	14NR85	18352 – 18368	0.2 – 0.7 m
10/18/2014	14:32 – 14:34	50-010	14NC95	21839 – 21857	14NR85	18369 – 18387	0.3 – 0.9 m
10/18/2014	14:49 – 14:52	50-009	14NC95	21927 – 21945	14NR85	18547 – 18475	0.8 – 0.9 m
10/18/2014	14:55 – 14:57	50-014	14NC95	21946 – 21959	14NR85	18476 – 18489	0.2 – 0.6 m
10/24/2014	13:52 – 13:53	50-006	14NC100	22984 – 22992	14NR90	19514 – 19522	0.0 – 0.1 m
10/24/2014	13:58 – 14:00	50-007	14NC100	22993 – 23005	14NR90	19523 – 19535	0.1 m
10/24/2014	14:09 – 14:11	50-005	14NC100	23038 – 23051	14NR90	19569 – 19581	0.1 m
10/24/2014	14:16 – 14:19	50-009	14NC100	23053 – 23070	14NR90	19583 – 19600	0.1 m
10/24/2014	14:33 – 14:34	50-008	14NC100	23130 – 23140	14NR90	19660 – 19670	0.1 m
01/24/2016	16:04 – 16:05	50-020	16VC10	03364 – 03371	16VR10	03365 – 03370	-0.1 m
01/25/2016	14:57 – 14:58	50-024	16VC11	03388 – 03391	16VR11	03387 – 03390	-0.1 – 0.0 m
01/25/2016	15:13 – 15:14	50-021	16VC11	03472 – 03478	16VR11	03471 – 03477	-0.1 m
01/25/2016	15:19 – 15:19	50-023	16VC11	03479 – 03483	16VR11	03478 – 03483	-0.1 – 0.0 m
01/25/2016	15:35 – 15:36	50-022	16VC11	03567 – 03573	16VR11	03566 – 03572	-0.1 – 0.0 m
01/25/2016	16:34 – 16:36	50-014	16VC11	03598 – 03610	16VR11	03596 – 03609	-0.1 – 0.1 m
01/29/2016	16:35 – 16:37	50-012	16VC12	03670 – 03685	16VR12	03669 – 03684	0.1 m
01/29/2016	16:42 – 16:44	50-011	16VC12	03686 – 03703	16VR12	03685 – 03702	0.0 – 0.1 m
01/29/2016	17:04 – 17:07	50-013	16VC12	03807 – 03822	16VR12	03805 – 03821	0.0 – 0.1 m
01/29/2016	17:11 – 17:13	50-010	16VC12	03823 – 03840	16VR12	03822 – 03839	0.0 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 varies between 0.2 – 1.0 meter above MLLW.

## **Quality Control / Final Review**

Quality Control tasks were conducted during all phases of project completion by a senior member of the Fugro compilation team. The final QC review was completed in July 2018. The review process 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 10.6.1 software. All project data was evaluated for compliance to CMP requirements.

Comparisons of the largest scale NOAA nautical charts with natural color photographs and compiled project data resulted in creation of the Chart Evaluation File (CEF). The following nautical charts were used in the comparison process for FL1305D-CM-N:

- 11408, Crystal River to Horseshoe Point, FL, 31<sup>st</sup> Ed., Jun. 2018
- 11409, Anclote Keys to Crystal River, FL, 31<sup>st</sup> Ed., Jan. 2017

## **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**

- Ground Control Report
- Airborne Positioning and Orientation Reports (APOR)
- Aerotriangulation Report
- Project database
- GC11330 in shapefile format
- Project Completion Report (PCR)
- CEF in shapefile format

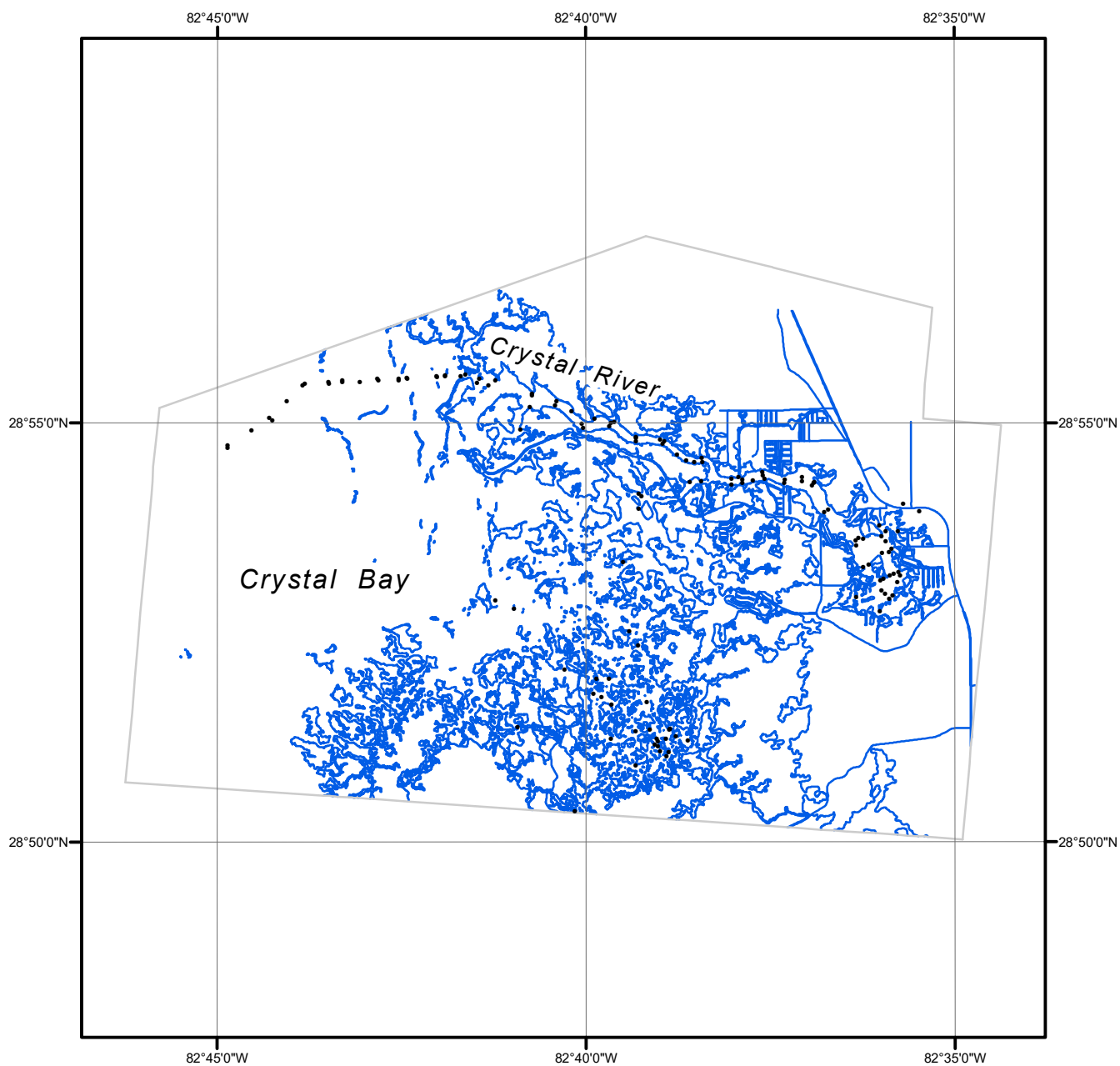
### **NOAA Shoreline Data Explorer**

- GC11330 in shapefile format
- Metadata file for GC11330
- PCR in Adobe PDF format

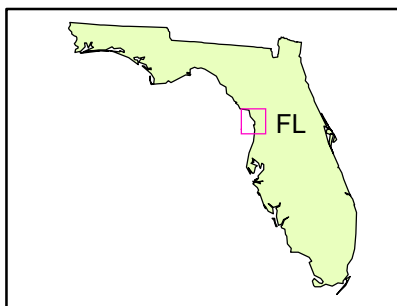
## **End of Report**

# CRYSTAL BAY AND RIVER

## FLORIDA



Overview



FL1305D-CM-N

GC11330