

NOAA COASTAL MAPPING PROGRAM PROJECT COMPLETION REPORT

PROJECT MD1801-CM-N

Wicomico River, Green Hill Creek to Salisbury, Maryland

Introduction

Coastal Mapping Program (CMP) Project MD1801-CM-N provides highly accurate digital shoreline data for a portion of the Wicomico River, from Green Hill Creek upriver to Salisbury, in Maryland. 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 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 Procedure. The instructions discussed the project's purpose, geographic area of coverage, scope and priority; 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. RB created a Project Layout Diagram, flight maps and input files for the aircraft's flight management system.

Field Operations

The field operations for ME1801-CM-N consisted of the collection of static and kinematic GPS data and Inertial Measurement Unit (IMU) data, and the acquisition of digital aerial imagery. The photographic mission operations were conducted on May 2nd, 2018 (for the MHW) and March 10th, 2020 (for the MLLW) with the NOAA King Air (N68RF) aircraft. Project imagery included both natural color (RGB) and near-infrared (NIR) imagery acquired concurrently using an Applanix DSS-580 dual-head digital camera system (two 60 mm lenses) in coordination with both MLLW and MHW tide levels. Twelve strips of imagery in total were collected. Six strips of RGB and NIR were collected respectively, with three strips of each emulsion collected at MHW and MLLW, for a total of 204 images overall. All imagery was acquired at a nominal altitude of 10,500 feet, resulting in an approximate ground sample distance (GSD) of 0.36 meters for the NIR images and 0.32 meters for the color.

Direct Georeferencing Data Processing

GPS/IMU data for project MD1801-CM-N 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 station at Salisbury Regional Airport (KSBY), Salisbury, Maryland. The airborne kinematic data was

processed in May 2020 using POSPac MMS software (ver. 8.4). 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 an Exterior Orientation Total Propagated Uncertainty (EO-TPU) tool developed by NGS. Using this tool, the predicted horizontal uncertainty at the 95% confidence level was calculated to be 0.93 meters for the RGB color imagery, and 0.95 meters for the NIR imagery. Third order geodetic control points were used to test the horizontal integrity of the DG data, and all stereo-models were examined and found to have acceptable levels of parallax for mapping purposes.

Compilation

The data compilation phase of this project was completed by RSD personnel in July 2020. Digital mapping was performed using the SOCET SET Feature Extraction software module. Feature identification and attribution within the 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 MD1801-CM-N were determined according to standard Federal Geographic Data Committee (FGDC) practices. Cartographic features compiled from the DSS images have a horizontal accuracy of 1.9 meters for both the RGB color imagery and the NIR at the 95% confidence level. This predicted accuracy of compiled, well-defined points is derived by doubling the uncertainty calculated using the EO-TPU tool.

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

Date	Time (UTC)	Color Imagery		NIR Imagery		Tide Level*
		Roll	Images	Roll	Images	
05/02/2018	19:50 – 19:52	18VC26	06445 – 06453	18VR26	06445 – 06453	0.7 – 0.9
05/02/2018	20:10 – 20:14	18VC26	06475 – 06495	18VR26	06475 – 06495	0.7 – 1.0
05/02/2018	20:17 – 20:21	18VC26	06497 – 06516	18VR26	06497 – 06516	0.9 – 1.0
03/10/2020	14:01 – 14:05	20VC13	03091 – 03110	20VR12	02700 – 02719	-0.1 – 0.0
03/10/2020	14:09 – 14:11	20VC13	03112 – 03120	20VR12	02721 – 02729	-0.1 – 0.0
03/10/2020	14:18 – 14:22	20VC13	03121 – 03141	20VR12	02730 – 02750	-0.1 – 0.0

* 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 the NOS gauge at Bishop's Head, MD. The height of the MHW tidal datum in the project varies between 0.72 – 1.10 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 July 2020. The review process included analysis of the DG 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 (ver. 10.8) software. The entire suite of project products was evaluated for compliance to CMP requirements.

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

- 12261, Chesapeake Bay, Honga, Nanticoke, Wicomico Rivers, 31st 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

- Airborne Positioning and Orientation Reports (APOR)
- Project database
- GC11660 in shapefile format
- Project Completion Report (PCR)
- CEF in shapefile format

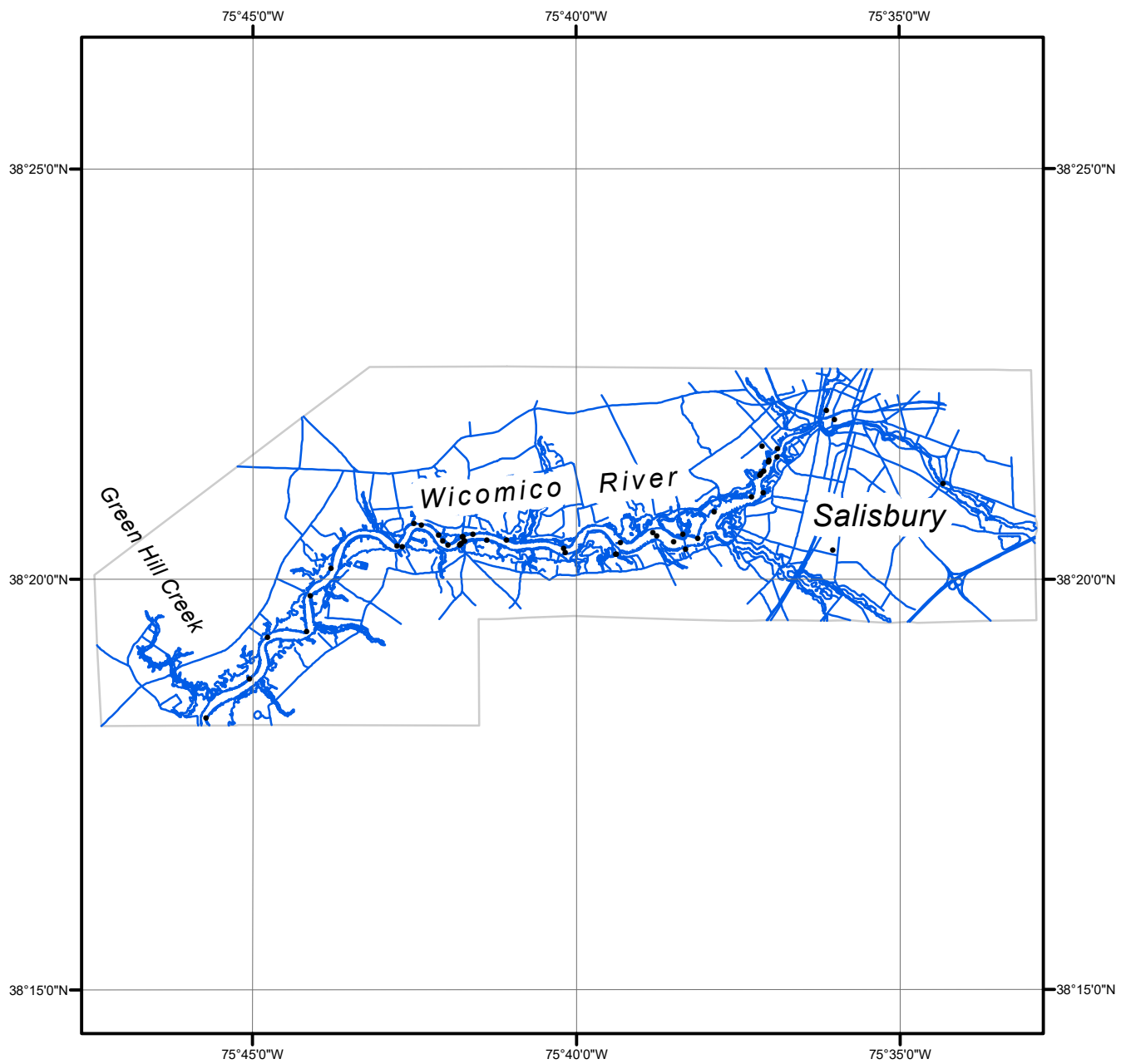
NOAA Shoreline Data Explorer

- GC11660 in shapefile format
- Metadata file for GC11660
- PCR in Adobe (PDF) format

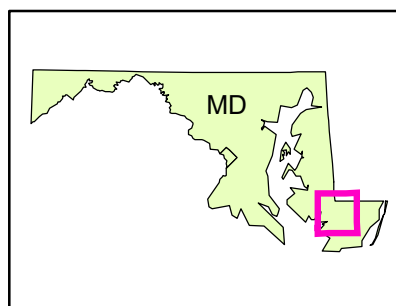
End of Report

WICOMICO RIVER, GREEN HILL CREEK TO SALISBURY

MARYLAND



Overview



MD1801-CM-N

GC11660