

U.S. DEPARTMENT OF COMMERCE

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
NATIONAL OCEAN SERVICE

**HORIZONTAL AND VERTICAL CONTROL  
REPORT**

Type of Survey Navigable Area  
Project No. OPR-R340-KR-21  
Time Frame June – November, 2021

**LOCALITY**

State Alaska  
General Locality Bristol Bay

\_\_\_\_\_  
**2021**  
\_\_\_\_\_

**CHIEF OF PARTY**  
ANDREW ORTHMANN

LIBRARY & ARCHIVES

**DATE**

# Horizontal and Vertical Control Report

OPR-R340-KR-21  
Approaches to Egegik Bay, AK  
**January 5<sup>th</sup>, 2022**



Project Name:	<i>Approaches to Egegik Bay, AK</i>
General Locality:	<i>Bristol Bay</i>
Sub Localities:	<i>H13438 – Egegik Bay</i> <i>H13439 – 12NM SW of Egegik</i> <i>H13440 – 16NM NM of Egegik</i> <i>H13441 – 17NM WNW of Egegik</i> <i>H13442 – 17NM WNW of Egegik Extension</i> <i>H13443 – Cape Greig to Cape Menshikof</i>
Vessel(s):	<i>R/V Qualifier 105 and Sealegs</i>
Field Unit:	<i>TerraSond</i>
Lead Hydrographer:	<i>Andrew Orthmann</i>

## ***A. Vertical Control***

Mean lower low water (MLLW) was the vertical control datum for this survey. All soundings are referenced to MLLW.

All time measurements were made in Universal Time Coordinated (UTC). The local time zone was offset from UTC by eight hours (Alaska Daylight Time = UTC – 8 hours). No measurements were made using local time.

### ***A.1. Tide Corrector Stations***

Two tertiary tide stations, at Egegik and Dago Creek Mouth (near Pilot Point), were installed under this project. The stations are summarized in the table below.

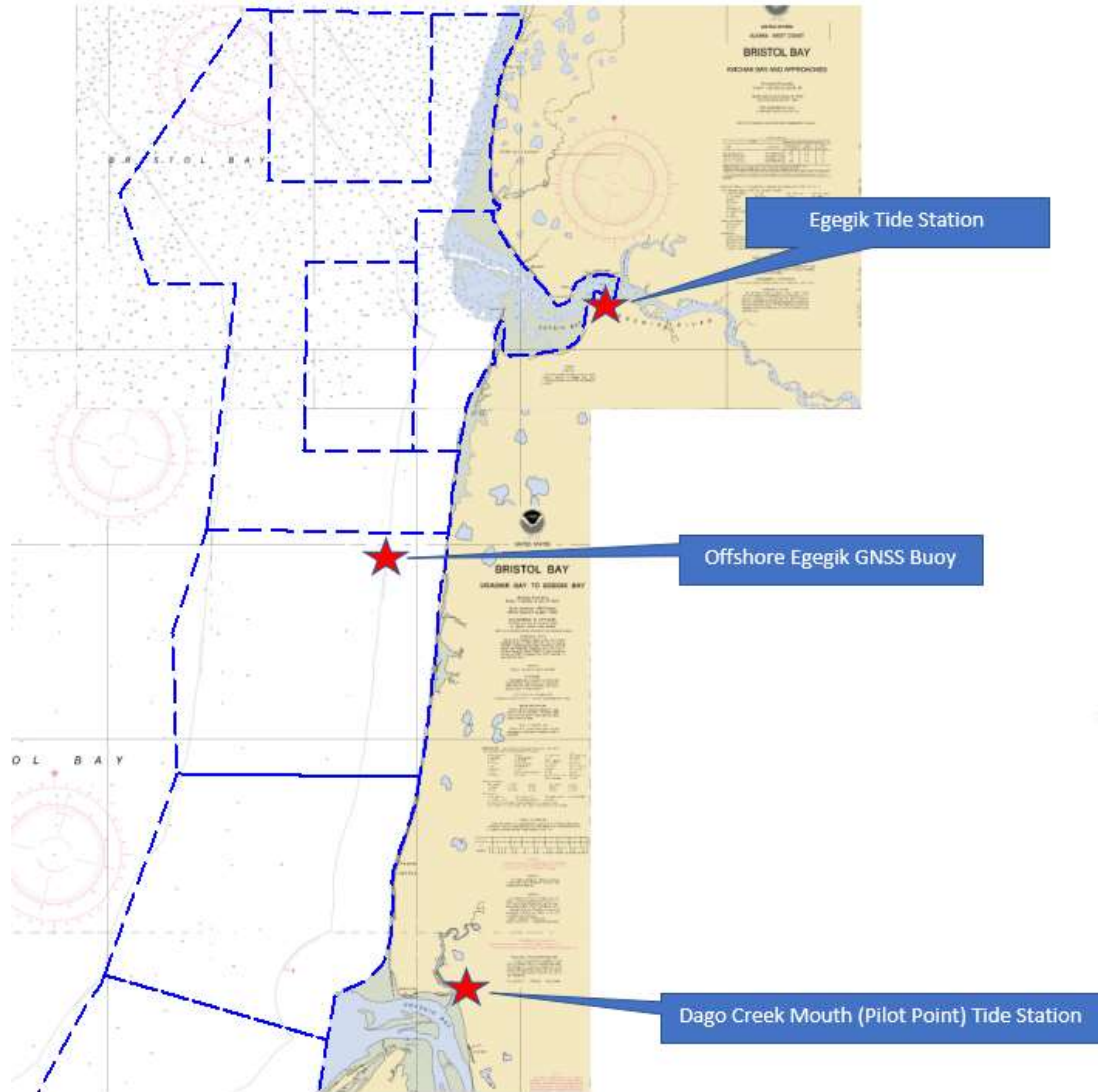
<b>Tide Station (AK)</b>	<b>Station No.</b>	<b>Latitude (NAD83)</b>	<b>Longitude (NAD83)</b>	<b>Julian Days of Operation (2021)</b>	<b>Configuration</b>
Egegik	9464874	58-12-52.1 N	157-22-49.1 W	221 – 309	1 Nile 502 radar, 1 WaterLOG H350XL, 1 RBR solo3D, 1 Seabird 37SMP CTD
Dago Creek Mouth	9464512	57-36-53.2 N	157-36-02.5 W	224 - 311	2 WaterLOG H350XLs, 1 RBR solo 3 D

***Table 1 – Tide Stations***

In addition, an ERTDM validation site was deployed in the survey area. It is summarized below.

<b>ERTDM Validation Site (AK)</b>	<b>Station No.</b>	<b>Latitude (NAD83)</b>	<b>Longitude (NAD83)</b>	<b>Julian Days of Operation (2020)</b>	<b>Configuration</b>
Offshore Egegik GNSS Buoy	9999778	57-59-44.1 N	157-43-05.3 W	212 - 243	1 JOA GNSS buoy

***Table 2 – ERTDM Validation Site***



*Figure 1 – Graphic showing tide stations relative to the survey extents.*

TerraSond contracted JOA Surveys, LLC (JOA) for tide support. JOA handled tasks associated with the on-shore gauges as well as processing of tide data, datum computations, tide analysis, and tide report compilation. JOA also supplied the GNSS buoy, which TerraSond deployed and recovered from the primary survey vessel.

### ***A.2. Tide Equipment***

A wide range of tide and supporting equipment were utilized on this project. An overview of equipment was provided in tables 1 and 2 above. Refer to the site reports in Appendix I for specific models as well as their configurations and calibrations.

### ***A.3. Tide Correctors***

Tidal corrections for hydrography was accomplished using ERS methodology. The NAD83 to MLLW grid file “OPR-R340-KR-21\_Egegik\_ERTDM21\_NAD83-MLLW\_.csar” provided by NOAA was used for all corrections. The grid file has an estimated uncertainty of 0.15 m (specified in the Project Instructions). Refer to the DRs for correspondence relating to this grid file.

### ***A.4. ERTDM Analysis***

During analysis of the GNSS Buoy data, which was installed as a check on the ERTDM model in an offshore portion of the project area, a discrepancy was observed. The NAD83 to MLLW separation was computed to be 11.790 m from the buoy data, while the ERTDM model had a separation value of 12.472 m at the buoy location, a difference of 0.682 m. Conversely, the NAD83 to MLLW separation values computed at the two project tide stations (Egegik and Dago Creek Mouth) agreed with the ERTDM model to 0.111 m and 0.079 m, respectively, which is within the uncertainty stated for the ERTDM model in the Work Instructions (0.15 m). This suggests the possibility of error in the tide model that exceeds specifications offshore. The discrepancy was brought to the COR's attention (see tides correspondence) but was unresolved at the time of this submittal. Further investigation is recommended.

Refer to Appendix II for more details on the ERTDM analysis.

## ***B. Horizontal Control***

The horizontal control datum used for this survey was NAD83 (2011). All final positions are NAD83 (2011).

Vessel positions were initially post-processed in the field in Applanix POSPac MMS (v8.5) software using the Trimble PP-RTX corrections service.

Following completion of field operations and availability of precise ephemeris data, some vessel positions were re-processed in POSPac (v8.7) using Applanix Smart Base (ASB) methodology to troubleshoot vertical busts associated with GPS error, and applied to final lines where improvement over PP-RTX was noted. ASB utilized publicly available precise ephemeris and GNSS data from CORS sites in the region to generate corrections within a network at each vessel position. Lines using ASB are noted in the applicable DR. CORS sites commonly utilized in the ASB network are listed below.

<b>HVCR Site ID</b>	<b>Base Station ID</b>
CHIGNIKLGNAK2006	AB13
DILLINGHAMAK2007	AB14
KINGSALMONAK2006	AC24
CAPE_GULL_AK2008	AC26
PORTHEIDENAK2007	AC40
PILOTPOINTAK2007	AC52

*Table 3 – CORS Stations commonly used in ASB network solutions.*

Real-time positions were provided by either Atlas H10 SBAS RTK correctors or FAA WAAS on ITRF2008. However, all real-time corrections were replaced in post-processing for final data with NAD83(2011) SBET solutions. Refer to the DAPR for details on positioning methodology.

Vessel position confidence checks were performed by comparing PPRTX and ASB methodology, with good results. These checks are available with each DR.

Correspondence relating to tides are also available with the project DRs.

Note that all tide data and associated detailed reports have been separately submitted to CO-OPS. The transmittal letters for the submissions are also included in the tides correspondence with the DRs, as well as in Appendix I of this report.

Post-processed positioning data and GNSS processing files are available with the survey deliverables.

# APPROVAL SHEET

For

## Horizontal and Vertical Control Report: H13438 through H13443

This report and the accompanying digital data are respectfully submitted.

Field operations contributing to the completion of this project were conducted under my direct supervision with frequent personal checks of progress and adequacy. This report, digital data, and accompanying records have been closely reviewed and are considered complete and adequate per the Statement of Work and Project Work Instructions. Other reports submitted with this survey include the Descriptive Report (DR) (one for each survey sheet) and the Data Acquisition and Processing Report (DAPR).

This survey is complete and adequate for its intended purpose.

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**Andrew Orthmann**

NSPS/THSOA Certified Hydrographer (2005), Certificate No. 225

Charting Program Manager

TerraSond