

C. Horizontal and Vertical Control

Refer to the OPR-Q191-KR-12 Horizontal and Vertical Control Report for a detailed description of the horizontal and vertical control used on this survey. No deviations from the report occurred. A summary of the project's horizontal and vertical control follows.

Horizontal Control

The horizontal control datum for this survey was the North American Datum of 1983 (NAD83).

For real-time DGPS corrections, a CSI MBX-3 unit was tuned to the Cold Bay, Alaska USCG DGPS site. The unit output differentially corrected positions at 1 Hz to the (POS MV) 320 V4 where it was integrated with inertial data, and a position for the top-center of the IMU was generated. This position was logged concurrently with the bathymetry from WinFrog and the POS file with Fugro Pelagos PosMvLogger. It was later corrected for offsets to the multibeam echosounder (MBES) by CARIS HIPS in post processing.

Final positioning was done using post-processed kinematic (PPK) methods. Applanix POSPac MMS v5.4 software was used in conjunction with the POS files and local 1Hz base station data to generate a higher accuracy position which was applied in processing, replacing the real-time position records.

See OPR-Q191-KR-12 Horizontal and Vertical Control Report for a more detailed description of PPK positioning methods used.

Vertical Control

All sounding data were initially reduced to MLLW based on Preliminary Zoning provided by CO-OPS and modified by John Oswald and Associates (JOA) to use gauges located in Trident Bay, Rootok Island, and Tigalda Bay. Tidal data for a twenty-four hour period UTC, (Alaska Daylight Time to UTC was +8 hours) was assembled by JOA and uploaded to their ftp site at the end of every Julian Day. A cumulative file for the gauges was updated each day by appending

the new data. It should be noted that these unverified tides were used in the field for preliminary processing only.

Between June and August, Sea-Bird pressure data was collected at two locations around Derbin Strait. The Sea-Bird data, along with PPK derived vessel altitude data, was used in developing final tide zones. The tidal zoning was modified by JOA, providing a more elaborate zoning scheme from the preliminary NOAA CO-OPS zones issued in the Statement of Work.

On October 13, 2012, JOA issued verified tidal data and final zoning for OPR-Q191-KRL-12. All sounding data was then re-merged using CARIS HIPS and SIPS tide routine. Verified tidal data were used for all final Navigation BASE surfaces and S-57 Feature files.

For additional information, refer to the OPR-Q191-KR-12 Horizontal and Vertical Control Report.

Table 2 Tide Gauges

| Gauge | Model | Gauge Type | Location | Latitude | Longitude | Operational |
|--------------|--------------|-------------------|-------------------|-----------------|------------------|--------------------|
| 946-2721 | H350XL/355 | Digital Bubbler | Trident Bay, AK | 54° 08'20"N | 165°31'34" W | June - Aug |
| 946-2723 | H350XL/355 | Digital Bubbler | Rootok Island, AK | 54° 03'07"N | 165°30'50" W | June - Aug |
| 946-2782 | H350XL/355 | Digital Bubbler | Tigalda Bay, AK | 54°07'05"N | 164°58'35" W | June – Aug |