C. Vertical and Horizontal Control

The vertical control datum of this project is mean lower low water (MLLW). The horizontal control datum is the North American Datum of 1983 (NAD83). All soundings are therefore

corrected to MLLW, and all positions are on NAD83. Fieldsheets were projected into UTM Zone 3 North.

All sounding data was tide corrected using ellipsoid-referenced surveying techniques (ERS) to MLLW using a model of MLLW to NAD83 ellipsoid separation values. This method was successfully employed previously in this region for the 2010 surveys completed by TerraSond under project OPR-R341-KR-10. The use of ERS on those surveys resulted in a large improvement in data quality over discrete tide zone methods.

The separation model was developed by JOA and utilized the ellipsoid to MLLW datum separations computed at installed tide stations at Quinhagak, AK (946-5831), Popokamute, AK (946-6057) and Carter Bay (946-5601). Short duration tide gauges were installed at several sites throughout the project area and their separation values computed and utilized in the model as well. The separation model, which is included with the project CARIS and ERS deliverables, was applied using CARIS HIPS' "Compute GPSTide" routine to all lines. The separation model's filename is "Kuskokwim 2011 SEP Model 20111118.txt." MLLW to NAD83 ellipsoid separations in this sheet ranged from 11.241 m to 11.552 m.

Tide zones were not provided by NOAA for this project. JOA computed tide zones and provided verified, smoothed tides for the project but these were not used on the final data. Note: A "tidal" copy of the CARIS data corrected to MLLW using the conventional, discrete tide zones is supplied with the data deliverables in the "Reference_Only" subdirectory but it must be emphasized here that the tidal data set is for comparison purposes only.

Preliminary positions were determined using Real Time Kinematic (RTK) GPS. NAD83-based position corrections were broadcast from project base stations. The base stations also logged dual frequency GPS data at a 1 Hz interval which was periodically downloaded and used to post-process the positions.

Final positions were post-processed in Applanix POSPac, which utilized inertial and dual frequency GPS data logged continuously on the survey vessels along with the base station data to produce a post-processed kinematic (PPK) smoothed best estimate of trajectory (SBET) file. PPK SBETs were loaded into all survey lines without exception. This replaced all RTK navigation and GPS heights with the PPK solution.

Refer to the project DAPR for more information regarding PPK processing methods. Refer to the project HVCR for details regarding specific base stations, base station confidence checks, and derivation of the MLLW separation model.