C. VERTICAL AND HORIZONTAL CONTROL

Refer to the Vertical and Horizontal Control Report for a detailed description of the vertical and horizontal control used during this survey. A summary of vertical and horizontal control for the survey follows.

C.1 VERTICAL CONTROL

Vertical control for the survey was based on the Mean Lower Low Water tidal datum (MLLW) from the NOAA station at Sitka (9451600).

Station details are as follows:

			WGS84	
Gauge	**Location**	**GS No.**	**Latitude**	**Longitude**
9451600	Sitka Sound Seafood Dock	TS8	57° 03.1' N	135° 20.5' W

Table 2 – Sitka Tide Gauge

C.2 ZONING

Tide zones that cover the extent of the survey were supplied by NOAA with time and range correctors relative to the Sitka tide station. These are as follows:

Tide Zone	GS Identifier	Time Corrector	Range Corrector	Reference Station
SA220	TA4	-6 minutes	x1.06	9451600
SA221	TA5	-12 minutes	x1.13	9451600
SA224	TA6	-12 minutes	x1.11	9451600
SA226	TA7	-12 minutes	x1.09	9451600
SA230	TA3	-6 minutes	x1.14	9451600
SA231	TA2	-6 minutes	x1.12	9451600
SA232	TA1	-6 minutes	x1.09	9451600
SEA200	TA8	0 minutes	x1.01	9451600

Table 3 – Tide Zones

Prior to the commencement of the survey, a tidal zoning analysis of the areas was conducted by surveying company 'John Oswald and Associates, LLC' in Anchorage, Alaska. The result of this analysis concluded that the zoning provided by NOAA should be adequate to meet the accuracy specifications for soundings and the datum jump between tide areas should be below 0.070 meters with the majority of the differences in the 2 – 3 centimeter range. A complete copy of this analysis can be found in the Vertical and Horizontal Report.

The verified tides supplied by NOAA were independently checked by John Oswald and Associates. Once the data was checked a fifth degree polynomial was applied to the tidal data and this data was then supplied to Tenix LADS Inc. for the application of tides.

For final processing, tidal correctors were applied to the tidal data delivered by John Oswald and Associates. The time and height correctors listed above were used for processing the data for tides.

C.3 HORIZONTAL CONTROL

Data collection and processing were conducted on the Airborne and Ground Systems in World Geodetic System (WGS 84) on Universal Transverse Mercator (Northern Hemisphere) projection UTM(N) in Zone 8, Central Meridian 135° West. All units are in meters. This data was post-processed and all soundings are relative to the North American Datum 1983 (NAD 83).

C.3.1 LADS Local GPS Base Station – Sitka

Real-time positions were determined using an Ashtech GG24 GPS receiver. A local GPS base station was coordinated by John Oswald and Associates on the roof of the Butler building at Sitka Airport, Sitka, Alaska on May 11, 2003.

The derived NAD83 coordinates for the local GPS base station, are:

NAD 83		UTM (N)		
Latitude (N)	Longitude (W)	Easting (m)	Northing (m)	Ellipsoidal Height (m)
57°02’45.02153”	135°21’20.53002”	478 418.443	6 322 544.771	13.209

Table 4 – GPS Base Station

GPS positions were determined off-line using data logged at the local GPS base station and on the aircraft. This data was processed through Ashtech PNAV software to calculate both a DGPS and Coarse Acquisition (C/A) code + carrier phase smoothed position solution. The C/A code + carrier phase smoothed positions were then imported into the GS and were applied to all soundings. This provided increased sounding position accuracy and horizontal redundancy.

Abstract of Times of Hydrography

Start and End times refer to tidal applications requirement.

Time on Task indicates actual time of task in the survey area. All times and dates are in UTC.

04_4mitro1

Date Flown	JD	Sortie No	Start time	End Time	Time On Task
May-26-04	147	1	23:00	04:00	01:42
Jun-27-04	179	2	23:00	02:30	00:05
Jul-04-04	186	3	23:00	06:00	03:22
Jul-06-04	188	4	17:30	00:30	03:04
Jul-07-04	189	5	17:00	03:00	05:28
Jul-08-04	190	6	23:00	07:30	04:23
#Jul-18-04	200	8	23:30	08:00	05:30
Aug-02-04	215	9	23:30	06:00	02:43
Aug-04-04	217	11	18:00	01:00	03:20
Aug-06-04	219	12	17:30	24:00	04:48
Aug-07-04	220	13	18:00	01:00	03:30
Aug-15-04	228	14	20:00	04:30	03:05
*Aug-20-04	233	15	19:30	00:30	01:07
Sep-2-04	246	17	18:00	22:00	01:17

04_4mitro2

Date Flown	JD	Sortie No	Start time	End Time	Time On Task
May-29-04	150	1	22:30	04:30	03:31
May-30-04	151	2	21:00	05:30	05:45
Jun-04-04	156	3	23:30	05:30	2:29
Jun-05-04	157	4	16:00	18:30	00:16
Jun-12-04	164	5	23:00	05:30	03:19
Jun-13-04	165	6	23:00	04:30	03:29
Jun-26-04	178	8	20:30	05:30	04:53
Jul-04-04	186	10	23:00	06:00	03:22
Jul-05-04	187	11	18:00	02:30	04:30
Jul-06-04	188	12	17:30	05:00	03:04
Jul-10-04	192	14	20:30	05:30	04:33
#Jul-18-04	200	16	23:30	08:00	05:30
Jul-20-04	202	17	23:30	07:00	03:58

Date Flown	JD	Sortie No	Start time	End Time	Time On Task
Jul-23-04	205	18	20:00	05:30	03:23
Jul-28-04	210	19	22:30	03:30	00:19
Jul-29-04	211	20	22:00	07:00	04:52
Aug-07-04	220	21	23:00	05:00	01:40
Aug-15-04	228	22	21:00	04:30	03:05
*Aug-20-04	233	23	19:30	00:30	01:07
*Aug-31-04	244	25	21:45	02:27	00:10

04_4mitro3

Date Flown	JD	Sortie No	Start time	End Time	Time On Task
#Jul-18-04	200	8	23:30	08:00	05:30
Aug-19-04	232	12	18:00	22:00	00:57

Note:

* denotes that 04_4mitro1 and 04_4mitro2 were both flown in the same sortie.

\# denotes that 04_4mitro1, 04_4mitro2 and 04_4mitro3 were all flown in the same sortie.

04_4mitro3 was a database created for reconnaissance only.

Tide Station Report
Mitrofania Island
945-9016

Position:	*Latitude (NAD 83)* 55° 53' 22"	*Longitude (NAD83)* 158° 49' 11"	*Time Meridian* 0° (UTC)
Owner:	*Tidelands* State of Alaska		*Uplands* USFWS Alaska National Maritime Refuge
Type of Station:	Tertiary		
Density Observations:	Yes		
Project Type:	Hydrographic		
Established:	4/20/04		
Removed:	9/804		
Tide Observer:	John Oswald & Associates, LLC (JOA) 2000 East Dowling Rd., Suite 10 Anchorage, Alaska 99507 Phone: (907) 561-0136 Fax: (907) 561-0143		
Project Manager:	John Oswald, PLS, CHS		
Prime Contractor:	Tenix LADS Inc. (ATTN: Darren Stephenson)		
NOS Project No:	OPR-P182-KRL-04		
NOS Contract No:	DG 133C-03-CQ-0011		
JOA WO No:	24		
Tide House and Platform:	Tide gauges were housed in a 4' X 4' X 8' plywood box covered with a camouflage tarp located approximately 15 m above the beach in grass. The orifices for gauge 1 and 2 are attached to separate sheet pile anchors, weighing about 250 lbs each, in 7.5 m of water. The orifice for tide gauge 3 has an approximately 400 lb I-beam as an anchor and is located in approximately 9.5 m of water. The anchors were set offshore using the F/V Captain "G". The tubing from each orifice to the respective tide gauge is approximately 110 m in length.		
Tide staff:	None. Spirit leveling was observed between a nearby tidal bench mark and the water. The survey rod was outfitted with a stilling well to dampen wave action.		
Tide Gauge:	Three tide gauges were installed at this site. Each gauge is a Design Analysis Associates H350XL/H355 digital bubbler. Each system is powered by a 12vdc battery and solar cells for recharging. Data was transmitted via GOES telemetry for each gauge using Signal Engineering radios and Yagi antennas.		

Tide Gauge	Date	Tide Gauge S/N
1	4/20/04	1043
2	4/20/04	1042
3	4/20/04	1038

Primary Benchmark:	9016 E 2004	
Initial leveling:	4/22/04	9016 A 2004, 9016 B 2004, 9016 C 2004, 9016 D 2004, 9016 E 2004
Close-out leveling:	9/8/04	
Existing tidal bench marks:	0	
New tidal bench marks:	5	
JOA Field Book:	2004.02	

Tide Station Location
Mitrofania Island
945-9016

Position:	*Latitude (NAD 83)* 55° 53' 22"	*Longitude (NAD83)* 158° 49' 11"	*Time Meridian* 0° (UTC)
Owner:	*Tidelands* State of Alaska	*Uplands* USFWS Alaska National Maritime Refuge	
Established:	4/20/04		
Removed:	9/804		
Tide Observer:	John Oswald & Associates, LLC (JOA) 2000 East Dowling Rd., Suite 10 Anchorage, Alaska 99507 Phone: (907) 561-0136 Fax: (907) 561-0143		
Project Manager:	John Oswald, PLS, CHS		
Prime Contractor:	Tenix LADS Inc. (ATTN: Darren Stephenson)		
NGS Project No:	OPR-P182-KRL-04		
NGS Contract No:	DG 133C-03-CQ-0011		
JOA WO No:	24		
Location:	To reach the bench marks from the harbor in Sand Point, AK, proceed NE 20.5 km (11 nm) to the north point of Korovin Island, then proceed ENE 46 km (25 nm) to the SE point of Kupreanof Point, then proceed NE 60 km (32 nm) to a west facing cove on the north side of Mitrofania Island. The benchmarks are located in the NE corner of the cove. The tide gauge orifices are located approximately 110 m offshore.		
GPS Tie:	Primary benchmark 9016 E 2004 was observed multiple times at a minimum of six hours each. Observations were processed and adjusted using NGS Pages NT and NGS Adjust. Methodology and results were documented in a comprehensive report (Fall 2004).		
Existing tidal bench marks:	0		
New tidal bench marks:	5		
Primary Bench Mark:	9016 E 2004		