NOAA FORM 76-35A

U.S. DEPARTMENT of COMMERCE
NATIONAL OCEANIC and ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE

Horizontal and Vertical Control Report

Type of Survey. *Side Scan Sonar, Single Beam Sonar, and Interferometric Sonar*

Project No. S-J977-KR-SAIC

Time Frame: *9 January 2007 – 2 June 2007*

LOCALITY

State: *Louisiana*

General Locality: *Lake Borgne*

2007

CHIEF of PARTY

Gary R. Davis

Science Applications International Corporation

LIBRARY & ARCHIVES

DATE:

NOAA FORM 77-28 (11-72)	U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	REGISTRY NO.
	HYDROGRAPHIC TITLE SHEET	**H11612 H11613 H11614 H11615**
INSTRUCTIONS - The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.		FIELD NO. **A, B, C, D**

State: Louisiana

General Locality: Lake Borgne

Locality: *North (H11612); East (H11613); South (H11614); West (H11615)*

Scale: 1:20,000 Date of Survey: 09 January 2007 – 02 June 2007

Instructions Dated: October 18, 2006 Project No. S-J977-KR-SAIC

Vessel: *F/V Lacey Marie LA6708FC, M/V Thomas R. Dowell AL1534AH*

Chief of Party: Paul L. Donaldson & Gary R. Davis

Surveyed by: *Brian Biggert, Louie Cust, Gary Davis, Kevin Davis, Rick Davis, Travis Daniel, Paul Donaldson, Sean Halpin, Karen Hart, Chuck Holloway, Jason Infantino, Fred Jordon, John Kiernan, Meme Lobecker, Rick Nadeau, Chris Pinero, Gary Parker, Evan Robertson, Jeremy Shambaugh, Deb Smith, Mike Tappia, Justin West*

Soundings taken by **echo sounder**, hand lead, pole ODOM Echotrac CV, GeoAcoustics GeoSwath Plus

Graphic record scaled by:

Graphic record checked by:

Protracted by: Automated plot by:

Verification by:

Soundings in fathoms, feet, **meters** at MLW, **MLLW**

REMARKS: **Contract #** DG133C-05-CQ-1088
Contractor: Science Applications International Corp., 221 Third Street; Newport, RI 02840 USA
Subcontractors: Williamson & Associates, 1124 NW 53rd Street, Seattle WA 98107; Rotator Staffing Services, PO Box 366, 557 Cranbury Rd., E. Brunswick, NJ 08116 Lowe Engineers 2000 RiverEdge Parkway, Suite 400, Atlanta, GA 30328; John Oswald & Associates, LLC. 2000 E. Dowling Rd, Suite 10, Anchorage, AK 99507
Times: All times are recorded in UTC.
UTM Zone: Zone 16
Purpose: To provide NOAA with accurate hydrographic survey data suitable for item detection and debris mapping in the assigned areas: Sheet A (H11612), Sheet B (H11613), Sheet C (H11614), and Sheet D (H11615) in Lake Borgne, Louisiana.

NOAA FORM 77-28 SUPERSEDES FORM C&GS-537. ☆ U.S. GOVERNMENT PRINTING OFFICE: 1976—665-661/1222 REGION NO. 6

Science Applications International Corporation (SAIC) warrants only that the survey data acquired by SAIC and delivered to NOAA under Contract DG133C-05-CQ-1088 reflects the state of the sea floor in existence on the day and at the time the survey was conducted.

Table of Contents Page

List of Tables Page

List of Figures Page

A. VERTICAL CONTROL

For H11612, H11613, H11614, and H11615, the SAIC tide station in Martello Castle, LA (8761529) was the source for verified water level heights for the Lake Borgne surveys. Water level data were downloaded from the gauges and processed by sub-contractor John Oswald and Associates. The MLLW datum accepted for verified observed tides was based on a four month comparison to the NOAA station in Bay Waveland Yacht Club, MS (8747437). All tide data were in meters and annotated with Coordinated Universal Time (UTC).

Final water level files for each tide zone were created from verified tide data using the **SABER Create Water Level Files** tool. Water level files contained water level heights that were algebraically subtracted from depths to correct the sounding for tides and water levels. These water level files were applied to the bathymetry data using the **SABER Apply Tides** program within the **SABER** software.

When it was necessary to apply updated tide correctors to the GSF files, the program removed the previous tide corrector and applied the new corrector. Each time a routine was run on the GSF data file, a history record was appended to the end of the GSF file. For quality assurance, the **Check Tides** program was run on all GSF files to confirm that the appropriate water level corrector had been applied to the GSF file.

After confirmation that verified water levels were applied to all bathymetry data, grids were created and analyzed using various color change intervals. The color intervals provided a means to check for significant, unnatural changes in depth across zone boundaries due to water level correction errors, unusual currents, storm surges, etc.

The primary means for analyzing the adequacy of zoning was observing zone boundary crossings in the navigated swath editor, SAIC's **MVE**. In addition, crossline analysis using SAIC's **Analyze Crossings** software was used to identify possible depth discrepancies resulting from the applied water level corrector. Discrepancies were further analyzed to determine if they were the result of incorrect zoning parameters or weather (wind) conditions between the tide station and the survey area. The water level zones provided by NOS were adopted spatially, but zoning parameters based on Martello Castle, LA (8761529),

Table A-1, were computed by SAIC for application of the observed verified water levels. Table A-2 shows a summary of water level differences across zone boundaries in meters using verified water levels from Martello Castle (8761529).

Table A-1. Tide Zone Parameters Applied on Sheets H11612, H11613, H11614, H11615

Zone	Time Corrector (hours: minutes)	Range Ratio	Reference Station
CGM82	-2:18	1.118	8761529
CGM83	-2:06	1.105	8761529
CGM84	-1:54	1.092	8761529
CGM85	-1:35	1.079	8761529
CGM86	-1:18	1.065	8761529
CGM87	-1:06	1.052	8761529
CGM88	-0:48	1.039	8761529
CGM89	-0:30	1.026	8761529
CGM90	-0:12	1.013	8761529
CGM91	-0:00	1.000	8761529

Table A-2. Water Level Differences across Zone Boundaries, Verified

Zones	82-83	83-84	84-85	85-86	86-87	87-88	88-89	89-90	90-91
Min	-0.039	-0.038	-0.060	-0.059	-0.037	-0.058	-0.057	-0.056	-0.034
Max	0.050	0.050	0.069	0.069	0.048	0.067	0.066	0.065	0.046
Average	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003

B. HORIZONTAL CONTROL

The survey data for sheets H11612, H11613, H11614, and H11615 were collected in horizontal datum NAD-83, using geodetic coordinates, while data display and products used the UTM Zone 16 projection. The equipment used for positioning on the *F/V Lacey Marie* and the *M/V Thomas R. Dowell* are listed in Table B-1.

Table B-1. Positioning Equipment used for Sheet H11613

	POS/MV Serial No.	Hardware Firmware	Software Firmware	GPS Receivers
F/V Lacey Marie	2575	2.9-7	03.26	Trimble BD950
M/V Thomas R. Dowell	2579	2.9-7	03.26	Trimble BD950

All antenna and transducer offsets were measured relative to the Position Orientation System/Marine Vessel (POS/MV) Inertial Measurement Unit (IMU). The *F/V Lacey Marie* 2007 survey season vessel offsets are tabulated in Table B-2 and depicted in Figure B-1. The *M/V Thomas R. Dowell* 2007 sensor configuration are tabulated in Table B-3 and depicted in Figure B-2.

Table B-2. *F/V Lacey Marie* Antenna and Transducer Offsets (Meters) Relative to the POS/IMU Reference Point

Sensor	Offset in ISS-2000		Offset in POS/MV		Offset in GS+	
Center of V plate to Transducers					X	0.000
					Y	0.090
					Z	0.000
Center of V plate to Singlebeam Transducer					X	0.310
					Y	0.040
					Z	0.000
Center of V plate to MRU					X	-0.170
					Y	0.000
					Z	0.330
Vessel Center of Rotation			X	0.000		
			Y	0.000		
			Z	0.000		
POS/MV GPS Master Antenna			X	-9.914		
			Y	-1.000		
			Z	-4.842		
Trimble GPS Antenna	X	-9.914				
	Y	0.000				
	Z	-4.843				

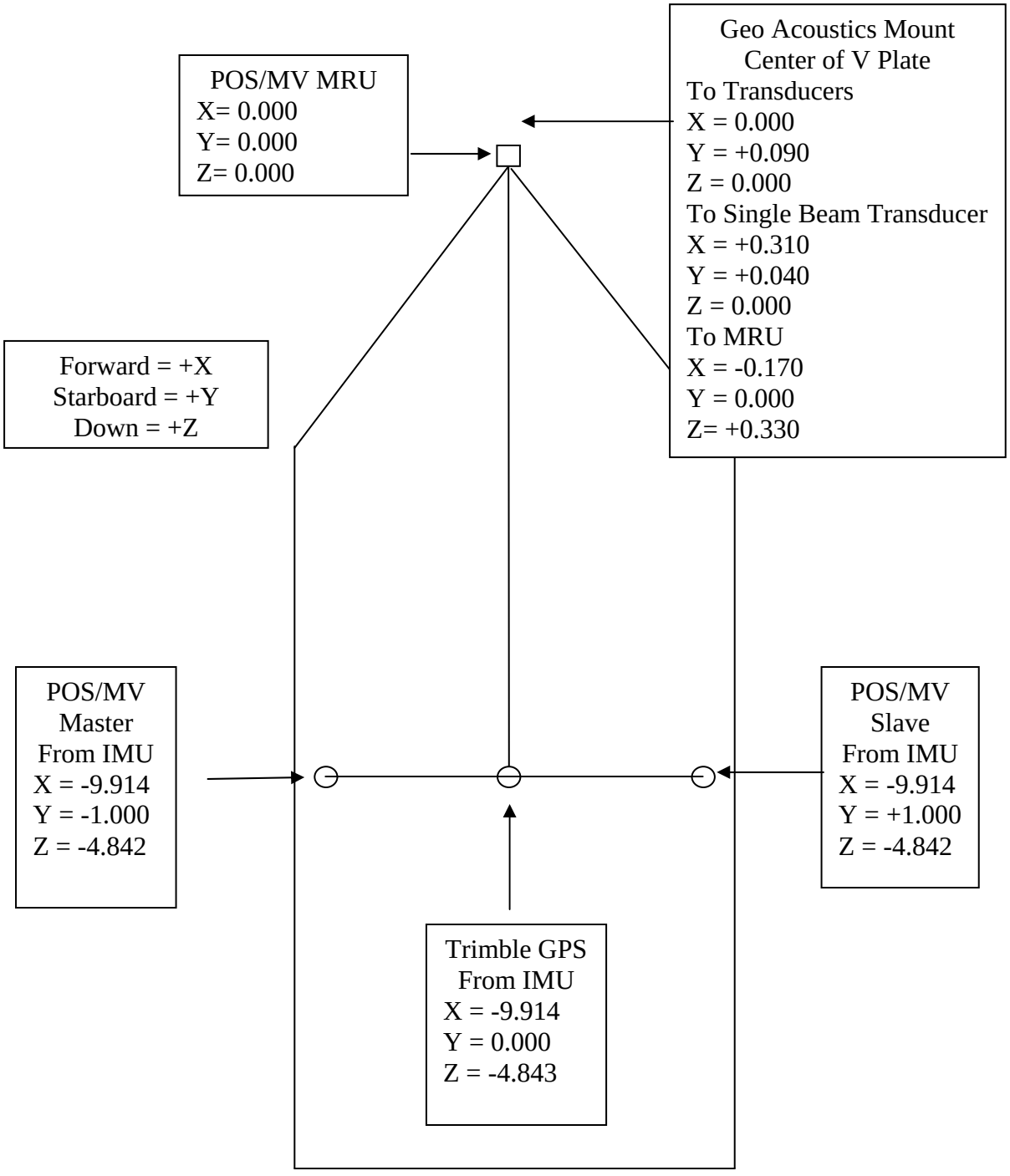

Figure B-1. Configuration and Offsets of the *F/V Lacey Marie* Sensors (measurements in meters)

Table B-3. *M/V Thomas R. Dowell* Antenna and Transducer Offsets (Meters) Relative to the POS/IMU Reference Point

Sensor	Offset in ISS-2000		Offset in POS/MV	
Odom Transducer Hull Mount			X	-2.080
			Y	-0.290
			Z	+0.905
Vessel Center of Rotation			X	-2.031
			Y	0.000
			Z	0.000
POS/MV Master GPS Antenna			X	-2.381
			Y	-1.266
			Z	-1.830
Trimble GPS Antenna	X	-2.031		
	Y	-0.266		
	Z	-1.804		
Sidescan Bow Mount	X	+4.522		
	Y	-0.126		
	Z	+1.698		

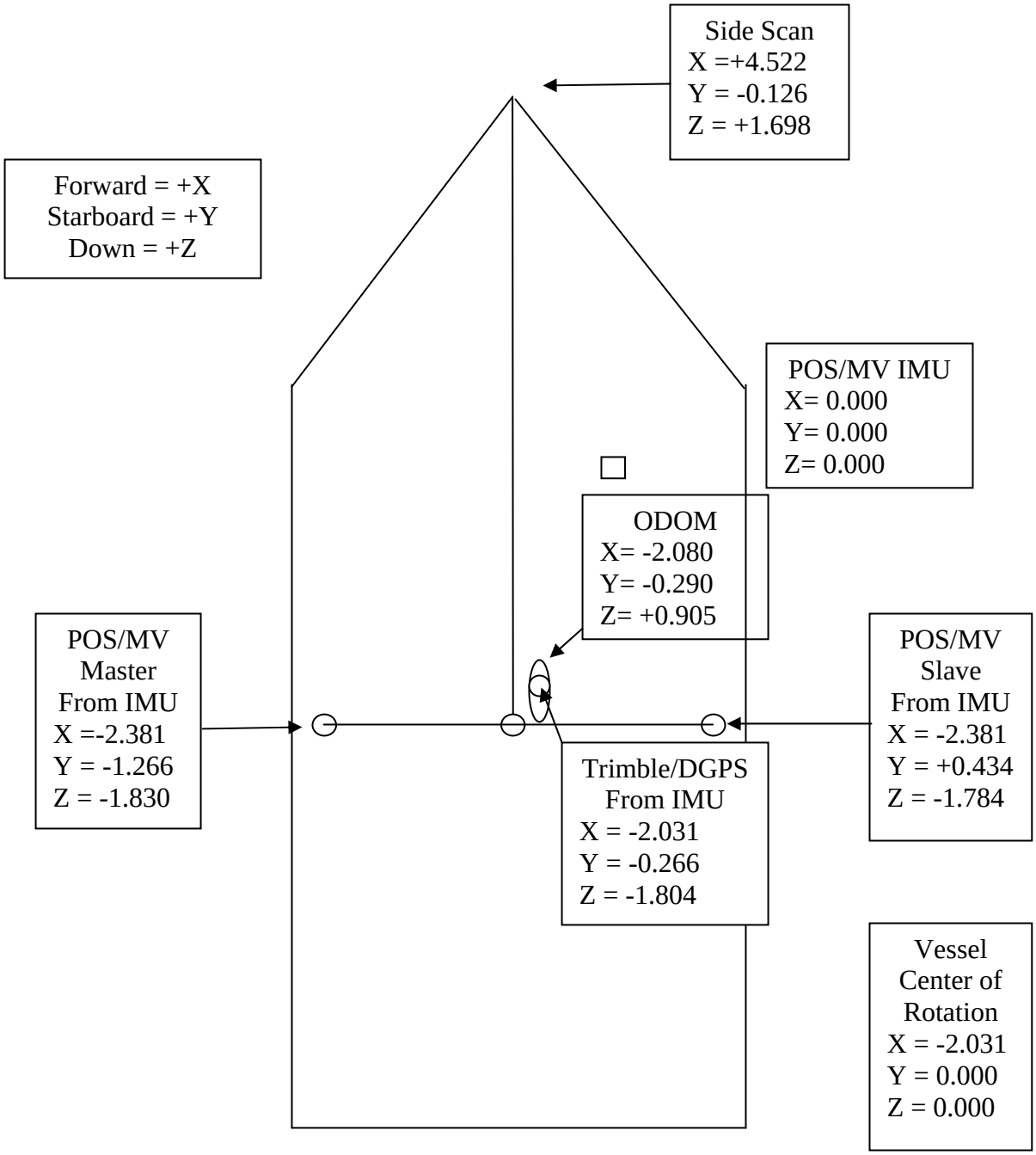

Figure B-2. Configuration and Offsets of the *M/V Thomas R. Dowell* Sensors (measurements in meters)

Daily position confidence checks were made by comparing the DGPS position from the POS/MV with the Trimble DGPS position. A real-time monitor automatically issued an alarm when the two DGPS positions differed by more than 10 meters horizontally. Positioning confidence checks were well within an inverse distance of 5 meters.

Differential correctors used for online data were from the U.S. Coast Guard Stations at English Turn, LA and Mobile Point, AL. The differential receiver was set to only receive data from these two corrector stations. There was one occasion where differential correctors were lost for 3 minutes 49 seconds while on line, however in general any loss observed in differential correctors was less than 15 seconds in duration. There were no positional issues noted for times where the differential correctors were lost. This is consistent with what is expected from a POS/MV inertial system which has the ability to maintain accurate positions for several minutes after loss of differential correctors.

Table B-4. Positional Difference between the POS/MV and Trimble 7400 on the *M/V Thomas R. Dowell*

Julian Day	Sheet ID	Time of Day (UTC)	Positional Difference (m)
009	C	1930	0.41
011	C	1840	0.08
012	C	1845	0.35
013	A	2048	0.81
014	A	1944	0.50
015	A	1924	1.60
018	A	1944	2.01
019	A	N/A	2.08
022	A	1925	1.94
023	A	1624	2.03
024	A	1923	2.05
025	A	1720	1.89
026	A	1918	1.59
027	A	1445	2.12
029	A	2000	1.63
030	A	1704	1.75
032	A	1620	2.02
033	A	1819	2.15
034	A	1826	1.62
035	A	1930	1.93
036	A	1327	2.17
037	A	1350	0.91
038	A	1803	1.39
039	A	1742	1.64
040	A	2000	1.71
043	A, D	2007	1.58

Julian Day	Sheet ID	Time of Day (UTC)	Positional Difference (m)
044	D	1700	1.81
046	D	1900	1.73
048	D	1321	2.95
050	A	1420	1.7
051	A, B	1630	1.8
052	A	1916	1.65
053	A	1830	1.64
054	A, B	1600	1.46
055	A	1424	1.93
056	A, D	2155/1347	1.89/1.86
057	A	1750	2.5
058	A	1600	1.98
059	A, D	1512/1334	1.8/1.71
060	D	1700	1.65
061	D	1607	1.67
062	D	1931	1.38
064	A, B	2042	1.7
065	D	2011	0.91
066	A, C	N/A	N/A
067	C	1600	1.75
068	A	1315	N/A
069	A	2006	1.7
070	A	1436	1.99
071	C	1843	1.58
072	A, B	1852	1.5
073	B, D	1233	1.6
074	D	1344	1.7
075	D	1852	1.54
077	A, D	1841	1.8
079	D	1846	1.96
080	D	1721	1.84
081	B	2144	1.75
082	B	1945	1.65
083	A	1620	1.99
084	A	1813	1.78
085	A	2110	1.57
086	B	2052	1.31
087	A	1632	1.93
088	A,B	1637	1.92
089	B	1313	1.78
091	A	1630	1.7

Julian Day	Sheet ID	Time of Day (UTC)	Positional Difference (m)
092	A	1830	1.18
093	A	1911	1.68
098	D	1404	1.56
099	C, D	1920	1.7
100	C	1520	2.0
101	D	1652	1.6
102	B	1206	1.8
103	B	1130	1.8
106	C,D	1528	1.69
107	A	1944	0.64
108	C	1522	1.8
109	D	1225	2.02
110	C, D	1856	2.28
111	C	1626	1.88
112	B	2130	1.72
113	B	1533	1.97
114	D	1634	1.89
116	A, D	1837/1213	2.17/2.13
117	A, C, D	1220/2128	1.78/1.76
118	A, B, C	1232	1.68
119	A	1813	1.73
120	A	1936	1.51
121	A	1855	1.55
122	A	1538	1.39
123	A	1949	1.71
124	A	1608	1.29
126	A	1909	1.81
128	A	1613	1.94
129	D	1746	1.49
130	D	1317	1.88
132	A, B	2037	1.66
133	D	1902	1.32
134	D	1635	1.95
136	C	N/A	1.5
139	B, C, D	1807	1.8
140	A	1150	1.85
141	A	1214	1.71
142	A	1155	1.2
146	A	1504	1.95
147	B	1707	1.99
148	C, D	1908	1.75

Julian Day	Sheet ID	Time of Day (UTC)	Positional Difference (m)
151	A	1849	2.08
152	A,B	1846	1.7
153	A	1136	2.06

Table B-5. Positional Difference between the POS/MV and Trimble 7400 on the *F/V Lacey Marie*

Julian Day	Sheet ID	Time of Day (UTC)	Positional Difference (m)
009	C	2300	0.78
011	C	2008	1.04
012	C	1540	0.80
013	C	1850	0.55
014	C	1854	0.96
015	C	1354	0.65
018	C	1736	0.41
019	C	1724	2.02
021	C	2108	0.61
022	C	1853	0.75
023	C	1952	0.64
024	C	1832	0.47
025	C	2100	0.33
026	C	1832	0.65
027	C	1820	0.23
029	C	2136	0.24
030	C	1813	0.48
031	C	1403	0.80
032	C	1810	0.52
033	C	1515	0.57
034	C	2012	0.75
035	C	2109	0.42
036	C	1950	1.46
037	C	1810	0.26
038	C	1942	0.58
039	C	2120	0.58
040	C	1403	0.80
042	C, D	1227	0.64
043	C, D	2223	0.5
044	C, D	1934	0.58
046	D	1830	0.58
048	C, D	1949	0.46
049	D	1821	0.52

Julian Day	Sheet ID	Time of Day (UTC)	Positional Difference (m)
050	D	1544	0.61
051	D	1720	0.76
052	D	1600	0.37
053	D	1217	0.62
054	A, D	1423	0.87
055	D	1654	0.33
056	D	1908	0.68
057	D	1830	0.67
058	C,D	1944	0.53
059	D	1953	0.40
060	D	1235	0.77
061	D	1726	0.58
062	D	1635	0.41
064	D	1737	0.63
065	D	1722	0.47
066	D	1220	0.73
067	C, D	1723	0.41
068	D	1711	0.94
069	D	1639	0.82
070	D	2035	0.60
071	D	1518	0.61
072	D	1744	0.33
073	D	1600	1.48
074	D	1500	0.52
075	D	1530	0.56
077	D	1300	0.48
078	D	1736	0.34
079	D	1820	0.25
080	D	1735	0.52
081	D	1447	0.28
082	D	1207	0.81
083	D	1535	0.49
084	D	1805	0.31
085	D	1800	0.54
086	D	1416	0.83
087	D	1818	0.43
088	D	1630	0.37
089	D	1600	0.53
090	D	1843	0.63
091	D	1630	0.6
092	D	1630	0.54

Julian Day	Sheet ID	Time of Day (UTC)	Positional Difference (m)
093	D	1645	0.54
094	D	1735	0.6
098	D	1615	0.53
099	D	1610	0.73
100	D	1314	1.27
101	D	1745	2.27
102	D	2032	0.64
103	D	1150	<5
106	D	1940	0.90
107	D	1743	0.47
108	D	1145	0.48
109	D	1533	0.49
110	B	1248	0.47
111	B	1721	0.63
112	B	1638	0.48
113	B	1634	0.44
114	B	1525	0.52
116	D	1731	0.45
117	B	1621	0.34
118	B	1550	0.63
119	B	1445	0.42
120	B	1524	0.56
121	B	1809	0.72
123	B	2130	0.66
124	B	1705	0.36
125	B	1903	0.5
126	B	1628	0.5
128	B	1634	0.39
129	B	1700	0.28
130	B	1933	0.43
131	B	1850	0.73
132	A, B	1343	0.59
133	A	1736	0.32
134	A,B	1832	0.53
135	A, D	1230	84.9
136	C, D	1609	0.53
139	A, B	1946	1.5
140	A	1828	0.53
141	A	1820	0.72
142	A	1827	0.62
145	A	1245	0.8

Julian Day	Sheet ID	Time of Day (UTC)	Positional Difference (m)
146	A	1211	0.7
147	A	1432	0.5
148	A	1230	0.53
149	A	1521	0.54
151	B	1740	0.8
152	A, C,D	1157	0.4
153	A, B,D	1216	0.48

C. APPROVAL SHEET

14 March 2008

LETTER OF APPROVAL

REGISTRY NUMBERS: H11612, H11613, H11614, and H11615

This Horizontal and Vertical Control Report for project S-J977-KR-SAIC is respectfully submitted.

Field operations and data processing contributing to the accomplishment of this survey, H11612, H11613, H11614, and H116115 were conducted under my supervision and that of lead hydrographer Paul L. Donaldson with frequent personal checks of progress and adequacy. This report has been closely reviewed and is considered complete and adequate as per the Statement of Work.

Reports previously submitted to NOAA for this project include:

Report	Submission Date
Descriptive Report H11613, SAIC Doc 07-TR-002	09 November 2007
Descriptive Report H11612, SAIC Doc 07-TR-001	18 January 2008
Descriptive Report H11614, SAIC Doc 07-TR-003	15 February 2008
Data Acquisition and Processing Report 07-TR-005 (Original Submission)	09 November 2007
Data Acquisition and Processing Report 07-TR-005 (*This report replaces the Data Acquisition and Processing Report submitted on 09 November 2007)*	18 January 2008

Reports concurrently submitted to NOAA for this project include:

Report	Submission Date
Descriptive Report H11615, SAIC Doc 07-TR-004	14 March 2008

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Gary R. Davis

Digitally signed by Gary R. Davis
DN: cn=Gary R. Davis, o=SAIC, ou=MSTD, email=gary.r.davis@saic.com, c=US
Date: 2008.03.12 14:05:30 -04'00'

Gary R. Davis
Lead Hydrographer
Science Applications International Corporation
14 March 2008