

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE

Horizontal & Vertical Control Report

Type of Survey _____ Hydrographic Survey _____

Field No. _____ D00140, D00141, D00142, H11814, H11815 & H11816 _____

Registry No. _____ OPR-J977-TE-08 _____

LOCALITY

State _____ Louisiana _____

General Locality _____ Chandeleur and Breton Sounds _____

2008 - 2009

CHIEF OF PARTY

Joseph Talbott

LIBRARY & ARCHIVES

DATE _____ April 24, 2009 _____

NOAA FORM 77-28 (11-72) <div style="text-align: center;"> U.S. DEPARTMENT OF COMMERCE NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION </div> <div style="text-align: center; margin-top: 20px;"> HYDROGRAPHIC TITLE SHEET </div>	REGISTRY No <div style="text-align: center; margin-top: 10px;"> Horizontal & Vertical Control Report OPR-J977-TE-08 </div>
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. D00140, D00141, D00142, H11814, H11815 & H11816
<div style="margin-bottom: 10px;"> State <u>Louisiana</u> </div> <div style="margin-bottom: 10px;"> General Locality <u>Breton and Chandeleur Sounds</u> </div> <div style="margin-bottom: 10px;"> Sub-Locality <u>Various</u> </div> <div style="display: flex; justify-content: space-between; margin-bottom: 10px;"> Scale <u>1:20,000</u> Date of Survey <u>June 16, 2008 – January 31, 2009</u> </div> <div style="display: flex; justify-content: space-between; margin-bottom: 10px;"> Instructions dated <u>April 21, 2008</u> Project No. <u>OPR-J977-TE-08</u> </div> <div style="margin-bottom: 10px;"> Vessel <u>M/V Thomas R. Dowell and M/V Bella Marie</u> </div> <div style="margin-bottom: 10px;"> Chief of party <u>Joseph Talbott</u> </div> <div style="margin-bottom: 10px;"> Surveyed by <u>TerraSond Ltd.</u> </div> <div style="margin-bottom: 10px;"> Soundings by echo sounder, lead line, pole <u>Singlebeam and Multibeam Echosounder, Side Scan Sonar</u> </div> <div style="margin-bottom: 10px;"> Graphic record scaled by <u>N/A</u> </div> <div style="display: flex; justify-content: space-between; margin-bottom: 10px;"> Graphic record checked by <u>N/A</u> Automated Plot <u>N/A</u> </div> <div style="margin-bottom: 10px;"> Verification by <u>N/A</u> </div> <div style="margin-bottom: 10px;"> Soundings in fathoms feet at <u>MLW MLLW</u> Meters at <u>MLLW</u> </div>	
<div style="margin-bottom: 10px;"> REMARKS: <u>Contract No.: DG133C-05-CQ-1079</u> </div> <div style="display: flex; justify-content: space-between; margin-bottom: 10px;"> <u>Contractor: TerraSond Ltd.</u> <u>All times recorded in UTC</u> </div> <div style="margin-bottom: 10px;"> <u>1617 South Industrial Way, Suite 3</u> </div> <div style="margin-bottom: 10px;"> <u>Palmer, AK 99645</u> </div>	

Horizontal and Vertical Control Report
Shallow Water Multibeam Sonar, Singlebeam Sonar
and
Side Scan Sonar Survey Services
OPR-J977-TE-08
April 21, 2008



H11814	H11816	D00141
H11815	D00140	D00142

M/V Bella Marie

M/V Thomas R. Dowell

State: Louisiana

Locality: Chandeleur and Breton Sounds

Year: 2008 - 2009

Lead Hydrographer: Joseph C. Talbott

TerraSond Ltd.

TERRASOND
TERRESTRIAL AND SEA FLOOR MAPPING

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Overview

All work performed pursuant to this survey was completed, as specified in the Statement of Work: Side Scan Sonar Survey Services, OPR-J977-TE-08, Louisiana – Gulf of Mexico (SOW) dated April 21, 2008 and revised July 18, 2008.

A. Vertical Control

A.1. Time Zone

The central time meridian used for all data collected during OPR-J977-TE-08 was 000° longitude. All measurements were made in Universal Time, Coordinated (UTC).

The central time meridian for the project area was 090° west longitude (USA Central Standard Time (CST)) and the local time was offset from UTC by six hours (CST = UTC - 6 hours). No measurements were made using local time during the survey.

A.2. Datum

The tidal datums used for OPR-J977-TE-08 were Chart Datum, Mean Lower Low Water (MLLW) and Mean High Water (MHW). All soundings and depth measurements are referenced to MLLW and all heights are referenced to MHW.

A.3. Primary Tide Stations

The operating National Water Level Observation Network (NWLON) station at Pilot Station East, LA (8760922) was used as datum control for the survey area as well as control for datum determination at all subordinate stations.

Two additional NWLON stations were used to provide predicted tides during OPR-J977-TE-08. These stations, Bay Waveland Yacht Club, MS (8747437) and Gulfport Harbor, MS (8745557), were located north of the survey area, and supported the surveys in Chandeleur Sound and Eastern Breton Sound.

A.4. Subordinate Tide Stations

Two water level measurement systems (tide gauges) were installed at subordinate station locations, and operated continuously, during OPR-J977-TE-08 to provide information on tidal datums, water level reducers, refinement of final zoning and harmonic constituents for predictions. These stations included:

<u>Station Number</u>	<u>Station Name</u>	<u>Latitude (N)</u>	<u>Longitude (W)</u>
8760889	Olga Compressor Station, LA	29° 23.1'	89 22.8'
8760417	Devon Energy Facility, LA	29° 12.04'	89 02.7'

David Evans and Associates (DEA) installed an Aquatrak acoustic gauge and a Design Analysis Associates, Inc. (DAA) radar gauge at Devon Energy Facility, LA (8760417) pursuant to OPR-J977-KR-DEA-2008 (Table 1).

TerraSond, Ltd. installed a DAA bubbler tide gauge and a DAA radar gauge at the second site, Olga Compressor Station, LA (8760889) (Table 2). Refer to Appendix I:

TIDE STATION INSTALLATION REPORT (8760889) for detailed information concerning the tide station installation.

Table 1 - Devon Energy Facility Tide Station

Station Name	Devon Energy Facility, North Pass, LA
Station ID	8760417
Position (NAD83):	
Latitude	29° 12.0' N
Longitude	089° 02.6' W
Owner:	Devon Energy, Inc.
Established:	April 4, 2008
Removed:	February 12, 2009
Installed By:	David Evans & Associates, Portland, OR
Tides Consultant:	John Oswald & Associates, Anchorage, AK
Project Numbers:	OPR-J977-KR-DEA-2008
Primary Tide Gauge:	
Model:	Aquatrak Model 4100 Series
Type:	Acoustic water level monitor
Backup Tide Gauge:	
Model:	Design Analysis Associates (DAA) Model 3611 Series
Type:	Radar water level sensor

Table 2 – Olga Compressor Station Tide Station

Station Name	Olga Compressor Station, Grand bay, LA
Station ID	8760889
Position (NAD83):	
Latitude	29° 12.0' N
Longitude	089° 02.6' W
Owner:	Southern Natural Gas, Inc.
Established:	May 15, 2008
Removed:	February 1, 2009
Installed By:	TerraSond Ltd., Palmer, AK
Tides Consultant:	John Oswald & Associates, Anchorage, AK

Project Numbers:	OPR-J977-TE-08
Primary Tide Gauge:	
Model:	Design Analysis Associates H-355, H-350XL
Type:	Bubbler system / pressure sensor logger
Backup Tide Gauge:	
Model:	DAA Model 3611 Series / H-350XL
Type:	Radar water level sensor / data logger

A.5. Tide Correctors and Zoning

In accordance with the SOW, all vertical measurements referenced to tidal datum (MLLW) were corrected for tidal influence using zoning provided by NOAA/CO-OPS and verified tides from tidal gauges at Pilot Station East, LA (8760922). Verified data were downloaded from the Tides and Currents Data Retrieval website (<http://tidesandcurrents.noaa.gov>)

The two subordinate gauges were used to provide additional data on tidal datums and to refine the zoning scheme in the survey area (Table 3 and Table 4). Processing of the subordinate tide station data, the zone adjustments and the computation of the final tides was subcontracted to John Oswald and Associates (JOA).

Table 3 - Hydrographic Zones using data from Olga Compressor Station, LA (8760889)

CGM161	CGM162	CGM163	CGM164	CGM165	CGM166	CGM167	CGM168
CGM168	CGM170	CGM171	CGM172	CGM173	CGM174	CGM175	CGM176
CGM177	CGM178	CGM179	CGM180	CGM181	CGM188	CGM189	CGM190
CGM191	CGM192	CGM193	CGM194	CGM195	CGM196	CGM197	CGM198
CGM199	CGM200	CGM201	CGM202	CGM203	CGM203	CGM204	CGM205
CGM206	CGM207	CGM208	CGM209	CGM210	CGM211	CGM212	CGM213
CGM214	CGM215	CGM216	CGM217	CGM218	CGM219	CGM220	CGM261
CGM262	CGM263	CGM264	CGM261A	CGM262A	CGM263A	CGM264A	CGM265

Table 4 - Hydrographic Zones using data from Devon Energy Facility, LA (8760417)

CGM207	CGM207	CGM209	CGM210	CGM211	CGM212	CGM213	CGM214
CGM215	CGM216	CGM217	CGM218	CGM219	CGM220	CGM237	CGM238
CGM239	CGM240	CGM241	CGM242	CGM246	CGM247	CGM248	CGM249
CGM250	CGM250A	CGM251	CGM252	CGM252A	CGM253	CGM253A	CGM254
CGM254A	CGM255	CGM255A	CGM256	CGM256A	CGM257	CGM257A	CGM258

CGM258A CGM259 CGM259A CGM260 CGM260A CGM261 CGM261A CGM262
CGM262A CGM263 CGM263A CGM264 CGM264A CGM265

A.5.1. Preliminary Correctors and Zoning.

The water level stations at Pilot Station East, LA (8760922), Bay Waveland Yacht Club, MS (8747437) and Gulfport Harbor, MS (8745557) were used as reference stations for predicted tides during OPR-J977-TE-08. The time and height correctors which were applied to these reference stations are shown in Table 5.

Table 5 - Predicted tide height and time correctors, referenced to tide station, for tide zones used during OPR-J977-TE-08

Zone	Time Corrector (minutes)	Range Ratio	Reference Station
CGM68	-6	x1.01	8745557
CGM69	0	x1.01	8745557
CGM70	+6	x1.01	8745557
CGM70A	+12	x1.01	8745557
CGM71	+18	x1.01	8745557
CGM71A	+24	x1.01	8745557
CGM72	+24	x1.01	8745557
CGM72A	+30	x1.01	8745557
CGM73	-48	x0.95	8747437
CGM73A	-48	x0.95	8747437
CGM74	-42	x0.95	8747437
CGM99	+12	x0.90	8747437
CGM100	0	x0.90	8747437
CGM101	-6	x0.90	8747437
CGM102	-18	x0.90	8747437
CGM103	-30	x0.90	8747437
CGM104	-36	x0.90	8747437
CGM105	-42	x0.90	8747437
CGM106	-48	x0.90	8747437
CGM107	-48	x0.90	8747437
CGM108	+30	x0.95	8745557

Zone	Time Corrector (minutes)	Range Ratio	Reference Station
CGM109	+24	x0.95	8745557
CGM110	+18	x0.95	8745557
CGM111	+18	x0.95	8745557
CGM112	+12	x0.95	8745557
CGM113	+6	x0.95	8745557
CGM114	0	x0.95	8745557
CGM115	-6	x0.95	8745557
CGM116	-18	x0.95	8745557
CGM119	+84	x1.10	8760922
CGM124	-108	x0.84	8747437
CGM125	-102	x0.84	8747437
CGM126	-96	x0.84	8747437
CGM127	-90	x0.84	8747437
CGM128	-84	x0.84	8747437
CGM129	-78	x0.84	8747437
CGM130	-72	x0.84	8747437
CGM131	-66	x0.84	8747437
CGM132	-66	x0.84	8747437
CGM133	-60	x0.84	8747437
CGM134	-54	x0.84	8747437
CGM135	-48	x0.84	8747437
CGM136	-42	x0.84	8747437
CGM137	-42	x0.84	8747437
CGM138	-30	x0.84	8747437
CGM139	-24	x0.84	8747437
CGM140	-12	x0.84	8747437
CGM141	0	x0.84	8747437
CGM142	+12	x0.84	8747437
CGM143	+24	x0.84	8747437

Zone	Time Corrector (minutes)	Range Ratio	Reference Station
CGM151	+42	x0.84	8747437
CGM152	+30	x0.84	8747437
CGM159	+36	x0.84	8747437
CGM160	+30	x0.84	8747437
CGM161	+198	x1.10	8760922
CGM162	+186	x1.10	8760922
CGM163	+174	x1.10	8760922
CGM164	-6	x0.78	8760922
CGM165	-18	x0.78	8747437
CGM166	-24	x0.78	8747437
CGM167	-36	x0.78	8747437
CGM168	-42	x0.78	8747437
CGM169	-48	x0.78	8747437
CGM170	-54	x0.78	8747437
CGM171	-60	x0.78	8747437
CGM172	-66	x0.78	8747437
CGM173	-66	x0.78	8747437
CGM174	-72	x0.78	8747437
CGM175	-78	x0.78	8747437
CGM176	-78	x0.78	8747437
CGM177	-84	x0.78	8747437
CGM178	-90	x0.78	8747437
CGM179	-96	x0.78	8747437
CGM180	-102	x0.78	8747437
CGM181	-108	x0.78	8747437
CGM188	+72	x1.10	8760922
CGM189	+78	x1.10	8760922
CGM190	+84	x1.10	8760922
CGM192	+90	x1.10	8760922

Zone	Time Corrector (minutes)	Range Ratio	Reference Station
CGM193	+96	x1.10	8760922
CGM194	+96	x1.10	8760922
CGM195	+102	x1.10	8760922
CGM196	+108	x1.10	8760922
CGM197	+108	x1.10	8760922
CGM198	+114	x1.10	8760922
CGM199	+120	x1.10	8760922
CGM200	+126	x1.10	8760922
CGM201	+132	x1.10	8760922
CGM202	+138	x1.10	8760922
CGM203	+150	x1.10	8760922
CGM204	+162	x1.06	8760922
CGM205	+174	x1.06	8760922
CGM206	+150	x1.06	8760922
CGM207	+138	x1.06	8760922
CGM208	+126	x1.06	8760922
CGM209	+120	x1.06	8760922
CGM210	+114	x1.06	8760922
CGM211	+114	x1.06	8760922
CGM212	+108	x1.06	8760922
CGM213	+102	x1.06	8760922
CGM214	+96	x1.06	8760922
CGM215	+96	x1.06	8760922
CGM216	+90	x1.06	8760922
CGM217	+84	x1.06	8760922
CGM218	+84	x1.06	8760922
CGM219	+78	x1.06	8760922
CGM220	+72	x1.06	8760922
CGM237	+48	x1.06	8760922

Zone	Time Corrector (minutes)	Range Ratio	Reference Station
CGM238	+54	x1.06	8760922
CGM239	+60	x1.06	8760922
CGM240	+66	x1.06	8760922
CGM241	+72	x1.06	8760922
CGM242	+78	x1.06	8760922
CGM246	+36	x0.98	8760922
CGM247	+42	x0.98	8760922
CGM248	+48	x0.98	8760922
CGM249	+54	x0.98	8760922
CGM250	+54	x0.98	8760922
CGM250A	+48	x0.85	8760922
CGM251	+66	x0.98	8760922
CGM252	+66	x0.98	8760922
CGM252A	+60	x0.85	8760922
CGM253	+72	x0.98	8760922
CGM253A	+66	x0.85	8760922
CGM254	+78	x0.98	8760922
CGM254A	+72	x0.85	8760922
CGM255	+84	x0.98	8760922
CGM255A	+78	x0.85	8760922
CGM256	+90	x0.98	8760922
CGM256A	+84	x0.85	8760922
CGM257	+96	x0.98	8760922
CGM257A	+90	x0.85	8760922
CGM258	+96	x0.98	8760922
CGM258A	+96	x0.85	8760922
CGM259	+102	x0.98	8760922
CGM259A	+102	x0.85	8760922
CGM260	+108	x0.98	8760922

Zone	Time Corrector (minutes)	Range Ratio	Reference Station
CGM260A	+102	x0.85	8760922
CGM261	+114	x0.98	8760922
CGM261A	+108	x0.85	8760922
CGM262	+120	x0.98	8760922
CGM262A	+114	x0.85	8760922
CGM263	+126	x0.98	8760922
CGM263A	+120	x0.85	8760922
CGM264	+132	x0.98	8760922
CGM264A	+126	x0.85	8760922
CGM265	+144	x0.98	8760922

A.5.2. Final Correctors and Zoning

The water level stations at Gulfport Harbor, MS (8745557), Olga Compressor Station, Grand Bay, LA (8760889) and Devon Energy Facility, Main Pass, LA (8760417) were used as reference stations for corrected tides for final processing during OPR-J977-TE-08. The final zoning scheme is shown in Figure 1. The time and height correctors which were applied to these reference stations are shown in Table 6.

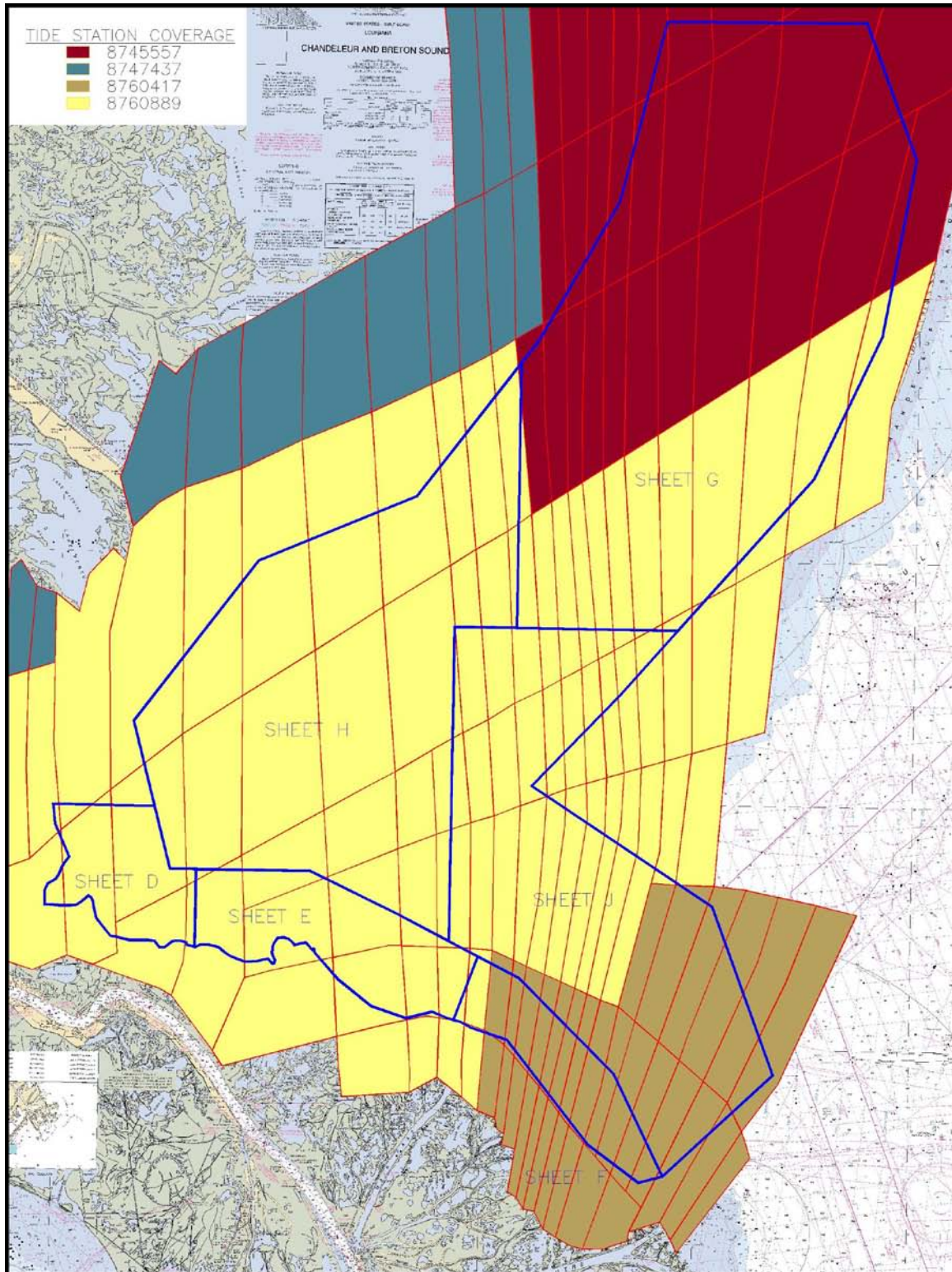


Figure 1 - Final tidal zoning scheme used for OPR-J977-TE-08. The color coded reference stations are Gulfport Harbor, MS (8745557), Devon Energy Facility, LA (8760417) and Olga Compressor Station, LA (8760889). The Bay Waveland Yacht Club Station (8747437) was not used.

Table 6 - Predicted tide height and time correctors, referenced to tide station, for tide zones used during OPR-J977-TE-08. Subordinate stations in bold print.

Zone	Time Corrector (minutes)	Range Ratio	Reference Station
CGM68	-6	1.01	8745557
CGM69	0	1.01	8745557
CGM70	6	1.01	8745557
CGM70A	12	1.01	8745557
CGM71	18	1.01	8745557
CGM71A	24	1.01	8745557
CGM72	24	1.01	8745557
CGM72A	30	1.01	8745557
CGM108	30	0.95	8745557
CGM109	24	0.95	8745557
CGM110	18	0.95	8745557
CGM111	18	0.95	8745557
CGM112	12	0.95	8745557
CGM113	6	0.95	8745557
CGM114	0	0.95	8745557
CGM115	-6	0.95	8745557
CGM116	-18	0.95	8745557
CGM124	-18	0.88	8745557
CGM191	-78	1.04	8760889
CGM125	-12	0.88	8745557
CGM126	-6	0.88	8745557
CGM127	0	0.88	8745557
CGM128	6	0.88	8745557
CGM129	12	0.88	8745557
CGM130	18	0.88	8745557
CGM131	18	0.88	8745557
CGM132	24	0.88	8745557
CGM133	30	0.88	8745557

Zone	Time Corrector (minutes)	Range Ratio	Reference Station
CGM134	36	0.88	8745557
CGM135	-48	1.16	8760889
CGM136	-42	1.16	8760889
CGM137	-42	1.16	8760889
CGM138	-30	1.16	8760889
CGM139	-24	1.16	8760889
CGM140	-12	1.16	8760889
CGM141	0	1.16	8760889
CGM142	12	1.16	8760889
CGM143	24	1.16	8760889
CGM159	36	1.16	8760889
CGM160	30	1.16	8760889
CGM161	36	1.04	8760889
CGM162	24	1.04	8760889
CGM163	12	1.04	8760889
CGM164	0	1.04	8760889
CGM165	-18	1.08	8760889
CGM166	-24	1.08	8760889
CGM167	-36	1.08	8760889
CGM168	-42	1.08	8760889
CGM169	-48	1.08	8760889
CGM170	-54	1.08	8760889
CGM171	-60	1.08	8760889
CGM172	-66	1.08	8760889
CGM173	-66	1.08	8760889
CGM174	-72	1.08	8760889
CGM175	-78	1.08	8760889
CGM176	-78	1.08	8760889
CGM177	-84	1.08	8760889
CGM178	-90	1.08	8760889

Zone	Time Corrector (minutes)	Range Ratio	Reference Station
CGM179	-96	1.08	8760889
CGM180	-102	1.04	8760889
CGM181	-108	1.04	8760889
CGM188	-90	1.04	8760889
CGM189	-84	1.04	8760889
CGM190	-78	1.04	8760889
CGM192	-72	1.04	8760889
CGM193	-66	1.04	8760889
CGM194	-66	1.04	8760889
CGM195	-60	1.04	8760889
CGM196	-54	1.04	8760889
CGM197	-54	1.04	8760889
CGM198	-48	1.04	8760889
CGM199	-42	1.04	8760889
CGM200	-36	1.04	8760889
CGM201	-30	1.04	8760889
CGM202	-24	1.04	8760889
CGM203	-12	1.04	8760889
CGM204	0	1.00	8760889
CGM205	+12	1.00	8760889
CGM206	-12	1.00	8760889
CGM207	-24	1.00	8760889
CGM208	-36	1.00	8760889
CGM209	-42	1.00	8760889
CGM210	-48	1.00	8760889
CGM211	-48	1.00	8760889
CGM212	-54	1.00	8760889
CGM213	-60	1.00	8760889
CGM214	-66	1.00	8760889
CGM215	-66	1.00	8760889

Zone	Time Corrector (minutes)	Range Ratio	Reference Station
CGM216	-72	1.00	8760889
CGM217	-78	1.00	8760889
CGM218	-78	1.00	8760889
CGM219	-84	1.00	8760889
CGM220	-90	1.00	8760889
CGM237	0	1.08	8760417
CGM238	+6	1.08	8760417
CGM239	+12	1.08	8760417
CGM240	+18	1.08	8760417
CGM241	+24	1.08	8760417
CGM242	30	1.08	8760417
CGM246	0	1.00	8760417
CGM247	0	1.00	8760417
CGM248	0	1.00	8760417
CGM249	+6	1.00	8760417
CGM250	+6	1.00	8760417
CMG250A	0	0.87	8760417
CGM251	+18	1.00	8760417
CGM252	+18	1.00	8760417
CGM252A	+12	0.87	8760417
CGM253	+24	1.00	8760417
CGM253A	18	0.87	8760417
CGM254	+30	1.00	8760417
CGM254A	+24	0.87	8760417
CGM255	+36	1.00	8760417
CGM255A	+30	0.87	8760417
CGM256	+42	1.00	8760417
CGM256A	+36	0.87	8760417
CGM257	+48	1.00	8760417
CGM257A	+42	0.87	8760417

Zone	Time Corrector (minutes)	Range Ratio	Reference Station
CGM258	+48	1.00	8760417
CGM258A	+48	0.87	8760417
CGM259	+54	1.00	8760417
CGM259A	+54	0.82	8760417
CGM260	+60	1.00	8760417
CGM260A	+54	0.82	8760417
CGM261	-48	0.92	8760889
CGM261A	-54	0.75	8760889
CGM262	-42	0.92	8760889
CGM262A	-48	0.75	8760889
CGM263	-36	0.92	8760889
CGM263A	-42	0.75	8760889
CGM264	-30	0.92	8760889
CGM264A	-36	0.75	8760889
CGM265	-18	0.92	8760889

A.6. Ellipsoidal Height Survey

A GPS survey on one tidal bench mark at Olga Compressor Station tide station (8760889) was performed in accordance with the "User's Guide for GPS Observations" updated March 2007, published by RDD/COOPS/NOS/NOAA¹. The GPS observation was performed on tidal bench mark 8760889 H starting at 18:46 on 11/11/2008 and ending at 20:55 on 11/12/2008.

The GPS data was submitted to OPUSDB and approved. The OPUSDB PID is BBBG69. The datasheet may be downloaded from the OPUSDB website at <http://beta.ngs.noaa.gov/OPUS/view.jsp>. Refer to Appendix IV: TIDE STATION REPORT for details of the Ellipsoidal Height Survey.

B. Horizontal Control

B.1. Datum

The horizontal datum used for OPR-J977-TE-08 was the North American Datum of 1983 (NAD 83). The projection used was Universal Transverse Mercator (UTM) Zone 16 North.

¹ United States. Dept. of Commerce, NOAA, NOS. User's Guide for GPS Observations. March 2007. 6 Mar. 2009 <http://tidesandcurrents.noaa.gov/publications/Users_Guide_for_GPS_Observations_updated_March_2007.pdf>.

Horizontal position control was determined using a Differential Global Positioning System (DGPS). The primary source of navigation correctors was the United States Coast Guard DGPS station at English Turn, LA, (StaID 814). Correctors from the USCG differential DGPS station at Mobile Point, AL, (StaID 813), were used when the English Turn station was unavailable. DGPS Site Operating Parameters from the USCG Navigation Center and National Geodetic Survey (NGS) data sheet information for each Continuously Operating Reference Station (CORS) is included in Appendix A to this report.

No additional horizontal control stations were established pursuant to OPR-J977-TE-08.

DGPS confidence checks were conducted weekly, when possible, on the *M/V Bella Marie* using a Trimble DSM 212 GPS receiver. Positions obtained with the Seapath 200 and DSM 212 receivers were simultaneously logged using Microsoft® HyperTerminal. Position differences were then analyzed using Microsoft Excel to ensure position quality. Position inverses, when compared with the fixed baseline length between the receiver antennas on each vessel, were well within the required 10-meter accuracy for this survey. The DGPS confidence checks performed for the *M/V Thomas R. Dowell* followed the same procedure as for the *M/V Bella Marie* except that the two DSM-232 receivers were compared with each other. Refer to the Descriptive Report, SEPARATE I: ACQUISITION AND PROCESSING LOGS included with each survey for a table of quality control checks to ensure positional accuracy.

LETTER OF APPROVAL

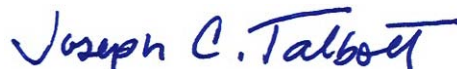
Horizontal and Vertical Control Report OPR-J977-TE-08

REGISTRY Numbers: H11814, H11815, H11816, D00140, D00141 and D00142

This report and the accompanying appendices are respectfully submitted.

Field operations contributing to the accomplishment of surveys H11814, H11815, H11816, D00140, D00141 and D00142 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 as per the Statement of Work. Other reports submitted with OPR-J977-TE-08 include the Descriptive Reports and the Data Acquisition and Processing Report.

I believe this survey is complete and adequate for its intended purpose.



Joseph C. Talbott, Lead Hydrographer
TerraSond Ltd.

Date April 24, 2009



APPENDIX I

Tide Station Installation Report



John Oswald & Associates LLC
SURVEYING GPS TIDES HYDROGRAPHY

2000 E. Dowling Road, Suite 10
Anchorage, AK 99507
(907) 561-0136 Phone
(907) 561-0143 Fax

June 9, 2008

Joseph Talbot
Terrasond, Ltd.
1617 South Industrial Way Suite #3
Palmer, Alaska 99645
(907) 745-7215
jtalbott@terrasond.com

Re: 8760889 Olga Compressor Tide Station Installation Report

The installation report for the Olga Compressor Tide Station has been completed and the digital copy is available in one zip file on the JOA FTP site. Please use FTP client software such as CuteFTP, Filezilla, FireFTP for Firefox, etc to download this reports. Internet Explorer may have problems connecting to this FTP site. The FTP login information follows:

Host: ftp.joasurveys.com
Username: terrasond
Password: 1617S

A digital copy of the reports should be forwarded to the following address:

Chief, Requirements and Development Division
NOAA/NOS/CO-OPS/RDD
SSMC 4, Station #6531
1305 East-West Highway
Silver Spring, MD 20910-3281
Tel: (301) 713-2897 x145

Please submit at the same time an original transmittal letter to the COTR, listing what was forwarded to CO-OPS. If you have any questions, please contact me.

Sincerely,

Mike Zieserl
mike@joasurveys.com

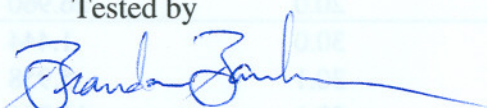
Certificate of Calibration

This certifies that your precision instrument met all of the specifications determined by tests performed on the date listed below. This instrument was subjected to extensive pre-qualifications. It was then calibrated using an automated test system over a period of approximately 20 hours followed by another 20 hour validation test.

WaterLOG calibration standards are traceable to the National Institute of Standards and Technology (NIST). The Model Number and Serial Number of the standard used are listed below.

The test data below is a sampling of the 150 actual data points taken during the pre-shipment validation test on this instrument.

Tested by



TEST REPORT

REPORT DATE: 01/02/2008
DATE TESTED: 12/31/2007
MODEL NUMBER: H350XL
SERIAL NUMBER: S#001037
NIST TRACEABLE REFERENCE: DH Instruments Model RPM1-G0030 SN40840

Reference Temp.	Measured Temp	Reference Press.	Measured Press.	Delta
-40.0	-40.0	0.000	-0.002	0.002
-39.9	-39.9	4.451	4.450	0.001
-40.0	-39.9	8.952	8.952	0.000
-40.0	-39.9	17.952	17.953	-0.001
-40.0	-39.9	26.938	26.939	-0.001
-30.0	-30.1	1.455	1.456	-0.001
-30.0	-30.1	5.947	5.948	-0.001
-30.0	-30.1	11.947	11.947	0.000
-30.0	-30.1	20.946	20.944	0.002
-30.0	-30.1	29.943	29.940	0.003
-19.9	-20.0	2.951	2.950	0.001
-20.0	-19.9	7.455	7.455	0.000
-20.0	-19.9	14.946	14.945	0.001
-20.0	-19.9	23.932	23.934	-0.002
-9.9	-9.9	-0.001	-0.002	0.001
-10.1	-9.9	4.461	4.460	0.001

S#001037

<i>Reference Temp.</i>	<i>Measured Temp</i>	<i>Reference Press.</i>	<i>Measured Press.</i>	<i>Delta</i>
-10.1	-9.9	8.959	8.958	0.001
-9.8	-9.9	17.946	17.947	-0.001
-10.1	-9.9	26.939	26.938	0.001
-0.1	0.0	1.450	1.450	0.000
-0.1	0.0	5.958	5.957	0.001
0.1	0.0	11.952	11.950	0.002
-0.1	0.0	20.954	20.955	-0.001
-0.1	0.0	29.937	29.936	0.001
10.1	9.9	2.957	2.958	-0.001
9.9	10.0	7.446	7.446	0.000
9.9	10.0	14.960	14.958	0.002
9.9	10.0	23.947	23.944	0.003
20.1	19.9	-0.001	-0.002	0.001
19.9	20.0	4.455	4.455	0.000
19.9	20.0	8.949	8.949	0.000
19.9	20.0	17.952	17.952	0.000
20.0	20.0	26.960	26.960	0.000
30.2	30.0	1.444	1.445	-0.001
30.3	30.1	5.958	5.956	0.002
30.2	30.1	11.961	11.961	0.000
29.9	30.1	20.940	20.940	0.000
29.8	30.1	29.940	29.940	0.000
39.8	40.0	2.963	2.962	0.001
40.1	40.1	7.457	7.457	0.000
40.2	40.1	14.961	14.957	0.004
39.8	40.1	23.943	23.941	0.002
50.2	49.9	0.000	-0.002	0.002
49.8	50.0	4.454	4.452	0.002
49.9	50.0	8.948	8.948	0.000
50.2	50.0	17.951	17.952	-0.001
49.9	50.0	26.957	26.954	0.003
60.0	60.0	1.447	1.447	0.000
60.0	60.1	5.954	5.952	0.002
60.0	60.1	11.958	11.956	0.002
60.0	60.1	20.939	20.939	0.000
60.0	60.1	29.921	29.920	0.001
Maximum Deviation From Standard:		0.004,	-0.002	

S#001037

Tide Gauge System Acceptance Test

Sensor Type: Radar

Model: DAA H3611

Serial No.: 1200

Date of test: 5/7/2008

Tested by: Terrasond, Ltd.

Time	Reference Stage (m)	Gauge Stage (m)	Difference (m)
11:02	0.9590	0.9600	0.0010
11:04	1.1425	1.1430	0.0005
11:06	1.4025	1.4020	0.0005
11:10	1.6145	1.6140	-0.0005
11:12	1.6145	1.6130	-0.0015
11:15	1.6150	1.6140	-0.0010
Average =			0.000

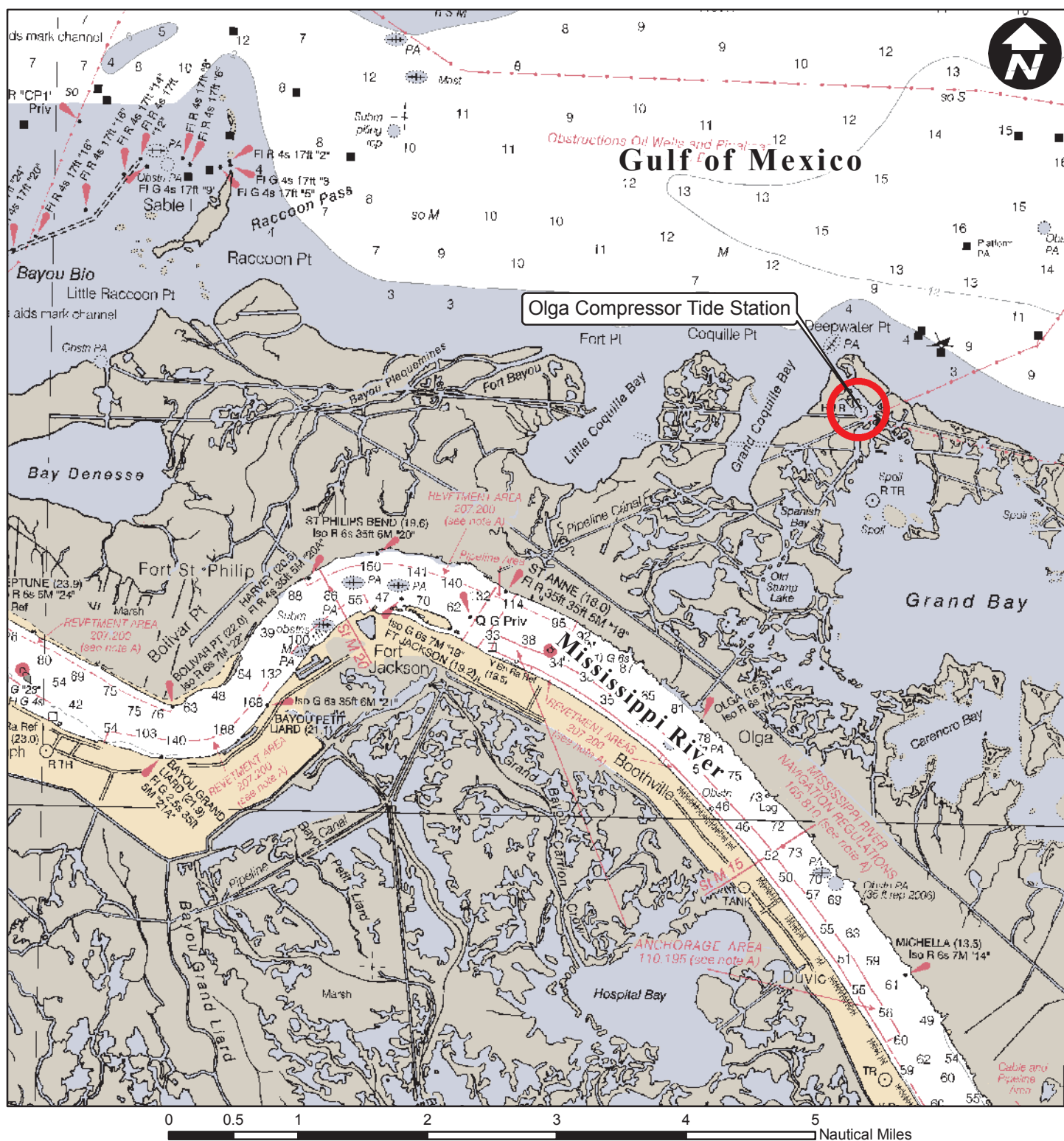
All measurements were from the bottom of the radar gauge base plate to the floor. The frame for the radar sensor was clamped to the forklift forks which were raised to obtain the offsets. The gauge was set as close to vertical as could be measured.

Site Report

876-0889 Olga Compressor Station, Grand Bay, LA

Site Visit	Purpose of Visit	Installation	Team Leader	Joe Talbot, Terrasond	Date of Visit	5/13-15/2008
Tertiary Station	Installation	May 15, 2008	Removal		Number of Days	
Project	OCS	S-J977-KR-TERRA-2008			JOA	115
Position (NAD83)	Latitude (N)	29° 23' 11.6"	Longitude (W)	89° 22' 48.5"	Time Meridian	0° (UTC)
Local Values	Gravity (milligals)	979312	GOES Angles	Elev 55°/ Az 181°	Magnetic Declination	13° W, +0° 0' W/year
Contractor	Prime			Tide Consultant		
	Terrasond 1617 South Industrial Way, Suite 3 Palmer, AK 99645 (907) 745-7215 ATTN: Joseph Talbot			John Oswald & Associates, LLC 2000 E. Dowling Rd, Suite 10 Anchorage, AK 99507 (907) 561-0136 phone ATTN: John Oswald		
Owner	El Paso Corporation- Southern Natural Gas (SNG) Toca Compressor Station 2400 Bayou Road St. Bernard, LA 70085 (504) 682-6212					
Location	To reach the tidal bench marks from Venice, proceed by boat upstream from The Jump on the Mississippi River to the Baptiste Collette Bayou outlet (first on the right), then proceed NE on the bayou and in Main Pass to a dredged east-west canal near the end of Main Pass, then turn left and proceed west for 2.9 km (1.6 nm) in the canal to an oil field, continue NW across Grand Bay for 6.4 km (3.5 nm) to Olga Compressor Station. The bench marks are located on the platforms throughout the station: the comm. tower, former compressor the reciving and the discharge platforms.The tide gage was located on the eastern most corner of the communication tower platform, the platform closest to and with stairs down to the crew boat dock. The tide staff was on a pile just NW of the tide gauge.					
Tide House	The tide gauge electronics are housed in individual Pelican cases mounted inside of a prefabricated plastic shed bolted down to the eastern most corner of the concrete communications tower platform. The orifice line for the bubbler gauge runs just outside of the shed then down to orifice below, wire for the radar gauge runs a short distance NW'ly from shed to radar mount. GPS antennas are mounted to shed itself, GOES antennas are mounted to chain link fence posts just SE of the shed and the solar panels are bolted to the platform just in front of shed					
Primary DCP	Installed	5/13/2008	Removed			
	Pressure Sensor	DAA H350XL	Serial No.	1037	Vent Value (m)	0.000
			Averaging Interval	180 seconds	Slope Constant in Gauge	0.70404
	Data Logger	combined in H350XL	Firmware	2.12h		
	Pump	DAA H355	Serial No.			
	GOES Radio	DAA H222	Serial No.		GPS timing	Yes
	GOES Address	E82021C6	Channel	143	Format	NGWLMS
			Interval	1 hour	Offset	0:25:50
	Power	One battery with a 70watt solar panel with solar controller.				
	Orifice	The bubbler orifice is at the bottom of a 3/4" diameter black steel pipe, 3.168 m (10.4 ft) long, which was hose clamped to 1"x2" spacers then 1/2"stainless banded to a free standing wood piling below platform.				
Comments						
Secondary DCP	Installed	5/13/2008	Removed			
	Radar Sensor	DAA H3611	Serial No.	1200	Level Point to Sensor "0"	0.000
			Averaging Interval	20 seconds	Slope Constant in Gauge	meters * 10
	Data Logger	DAA H350XL	Serial No.	1048	Firmware	2.12h
	GOES Radio	DAA H222			GPS timing	Yes
	GOES Address	E82032B0	Channel	143	Format	Binary (9 byte)
			Interval	1 hour	Offset	0:26:00
	Power	One battery with a 70watt solar panel with solar controller.				
	Radar Mount	The radar was mounted with a custom fabricated aluminum frame, concrete anchored to platform, that held the radar head over the short "curb" that runs along the outside edge of platform. Aluminum mount also extended down once past curb to allow radar cone to clear the bottom of the platform deck.				
	Comments	H350XL would not log unless screen was on. Disabled Auto-off function then logging/GOES Tx worked				
Tide Staff	Tide staff is composed of two 1-meter sections mounted on a treated 2x4. The top section extends above the top of the 2x4. It was bolted to the north side of a free standing piling NW of radar, tide house and orifice, most easily visible from crew boat dock walkway. Leveled directly to the top (2m mark) of the staff and tied into the bench mark network.					
Tidal Bench Marks	Primary	Recovered	Established	Designations		
	8760889 J	0	5	8760889 F, 8760889 G, 8760889 H, 8760889 J, 8760889 K		
Leveling	Date	Order	Type	Bench Marks Connected		
	5/15/2008	Third	Optical	8760889 F, 8760889 G, 8760889 H, 8760889 J, 8760889 K		
	NAVD88 Level Tie	No NAVD88 marks within 1.6km (1 mi).				
	Comments	Level run included Gauge 1 orifice "0", Gauge 2 radar Leveling Point, and staff stop (top of staff, 2m mark)				
GPS & OPUS	Bench Mark	Date	Session Length	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
	8760889 J					
	NAVD88 GPS Tie	Not required per OCS hydro specifications until OPUS Projects is operational.				
	Comments	No GPS performed during install. Terrasond will complete before station removal.				
Station History	5/13 - 15/2008 - Tide station installed. Cody Mayfield from JOA, 3 Terrasond personnel.					

Olga Compressor Station, Grand Bay, Louisiana (876-0889)



Station Number: 876-0889

Station Name: OLGA COMPRESSOR STATION,
GRAND BAY, LA

Latitude: 29-23-11.6 N

Longitude: 89-22-48.5 W

NOAA Chart: 11364, 42nd Ed., Sep. 15/07

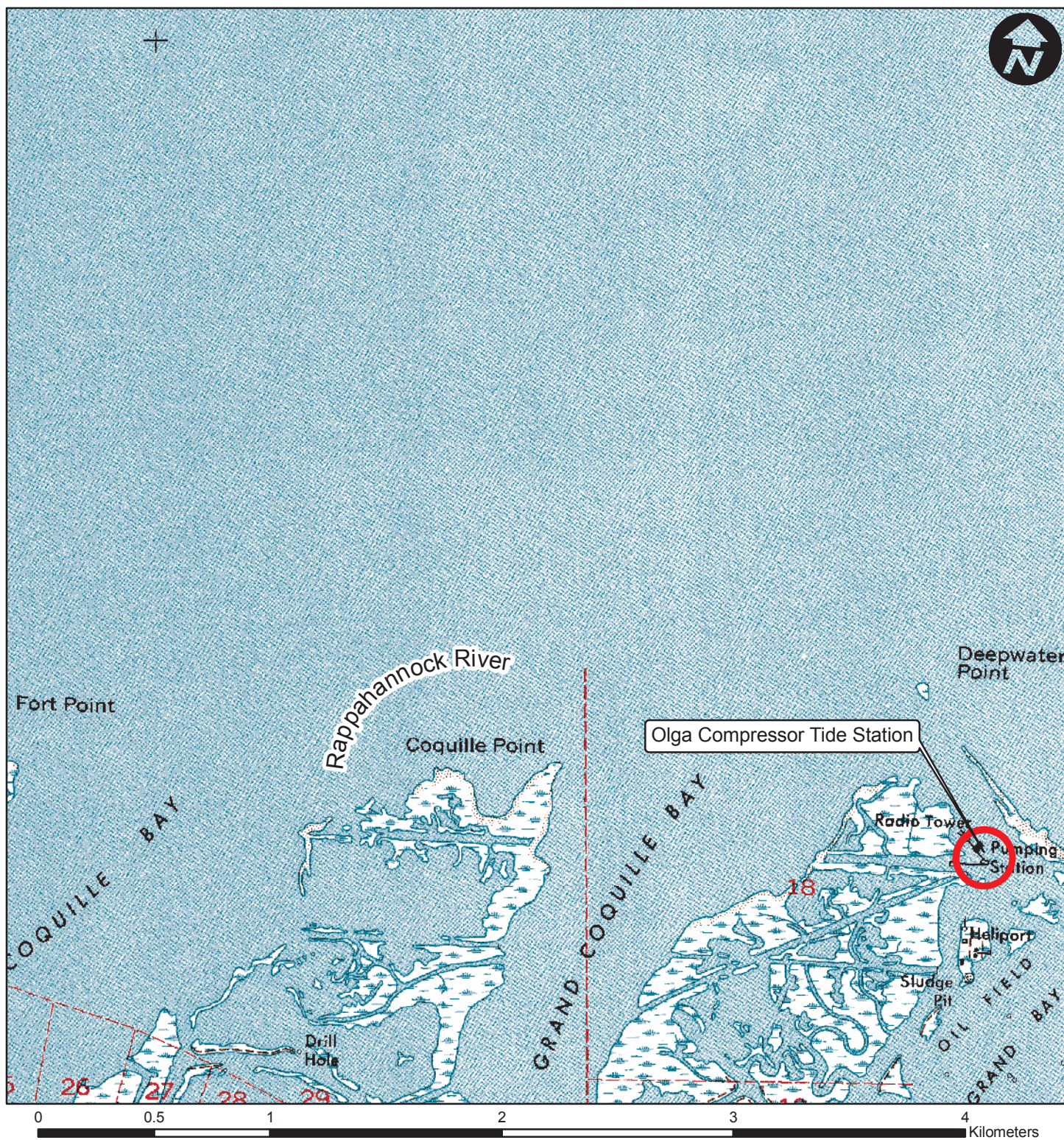
Display Scale: 1:80,000

Chart Scale = 1:80,000

USGS 7.5 Minute Quad: COQUILLE POINT

US Dept. of Commerce/NOAA/National Ocean Service/Center for Operational Oceanographic Products and Services

Olga Compressor Station, Grand Bay, Louisiana (876-0889)



Station Number: 876-0889

Station Name: OLGA COMPRESSOR STATION, GRAND BAY, LA

Latitude: 29-23-11.6 N

Longitude: 89-22-48.5 W

USGS Quad: COQUILLE POINT

Map Scale = 1:24,000

US Dept. of Commerce/NOAA/National Ocean Service/Center for Operational Oceanographic Products and Services

BENCHMARK SKETCH**JOA**

REVISED BY:

DATE:

STATION NAME **OLGA COMPRESSOR STATION,
GRAND BAY, LA**

STATION NO.

REVISED BY:

DATE:

876-0889

REVISED BY:

DATE:



FORM POS1

All elevations are in meters above Site Datum of Tabulation
1983-2001 Epoch

PBM

15.000

876-0889 J

PLANES

13.307

Highest Tide

10.856

MHW

10.463

MLLW

9.848

Lowest Tide

ORIFICES

14.94

Platform Deck

9.749

Primary Orifice "0"

15.276

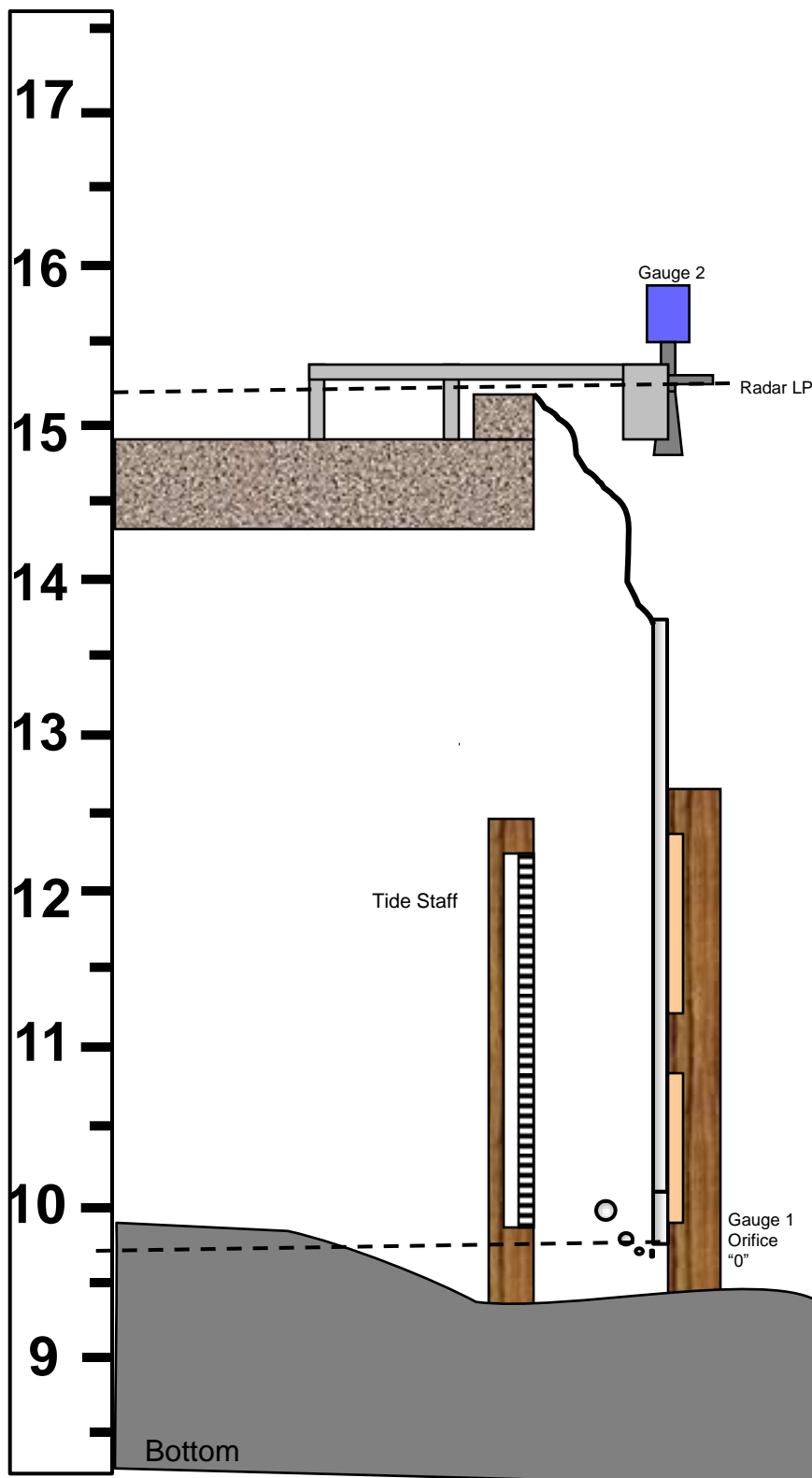
Secondary Gauge LP

9.897

Staff "0"

Elevations are based on an average of Installation, Check, 6 month and Closeout levels performed between May 2008 and February 2009.

Tidal datum planes were computed by JOA Surveys, based on 8 months of monthly mean comparisons.

**JOA SURVEYS**

2000 E. Dowling Rd #10
Anchorage, AK 99507
www.joasurveys.com

STATION

876-0889
Olga Compressor

Drawn by:

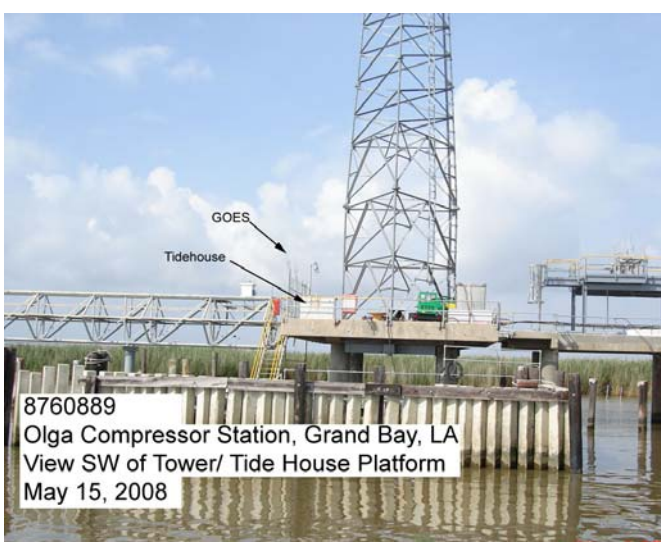
Cody Mayfield

Date:

5/23/2008

REVISED

Mike Zieserl, 3/17/2009



8760889 ComTowerPlatform.jpg



8760889 Discharge platform height .jpg



8760889 Discharge platform.jpg



8760889 F East.jpg



8760889 F Face.jpg



8760889 F North.jpg



8760889 F South.jpg



8760889 F Standing.jpg



8760889 F SW.jpg



8760889 G Face.jpg



8760889 G NE.jpg



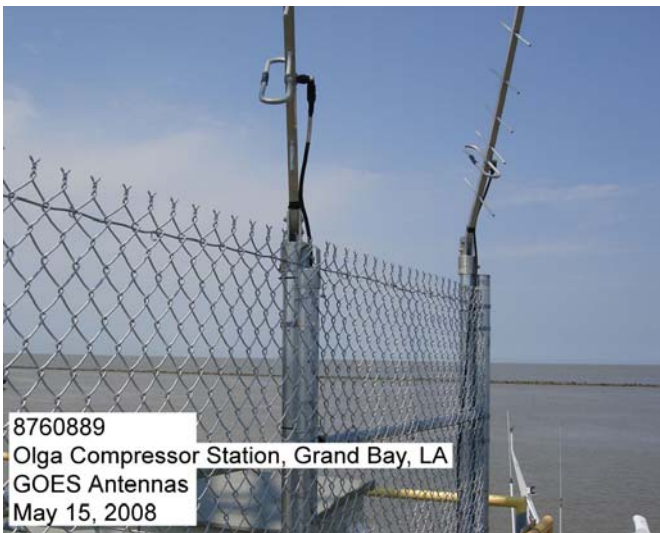
8760889 G North.jpg



8760889 G SE.jpg



8760889 G Standing.jpg



8760889 GOES.jpg



8760889 H Face.jpg



8760889 H NE.jpg



8760889 H SE.jpg



8760889 H Standing.jpg



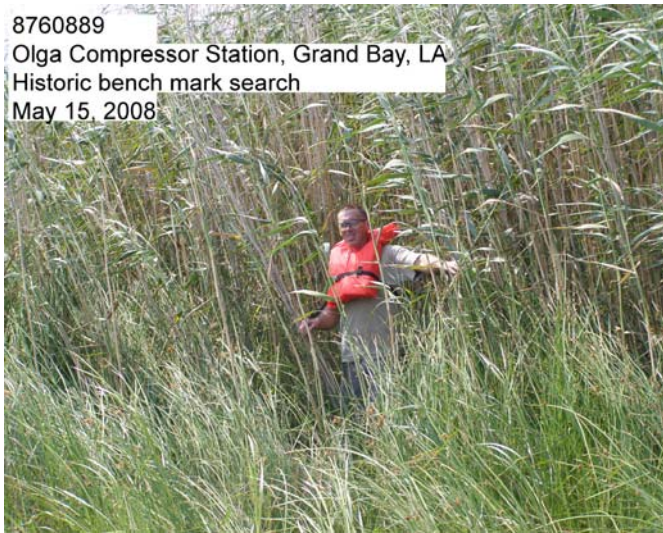
8760889 H SW.jpg



8760889 Historic mark search 1.jpg



8760889 Historic mark search 2.jpg



8760889 Historic mark search 3.jpg



8760889 Historic mark search 4.jpg



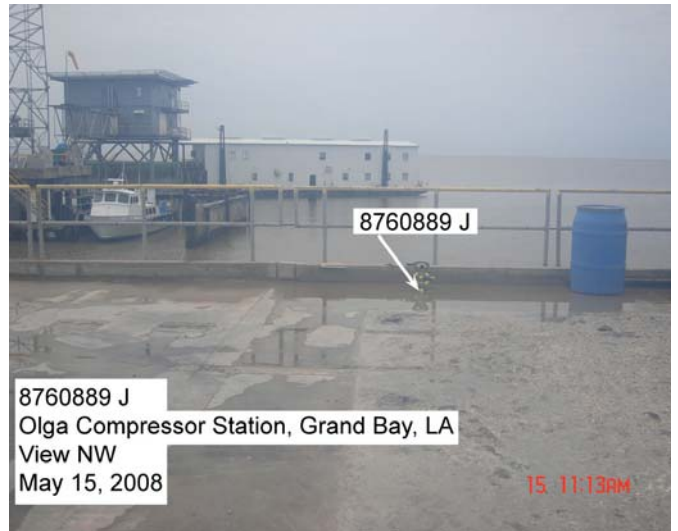
8760889 Historic mark search 5.jpg



8760889 J Face.jpg



8760889 J NE.jpg



8760889 J NW .jpg



8760889 J Standing.jpg



8760889 J SW.jpg



8760889 K East.jpg



8760889 K Face.jpg



8760889 K North.jpg



8760889 K SE 2.jpg



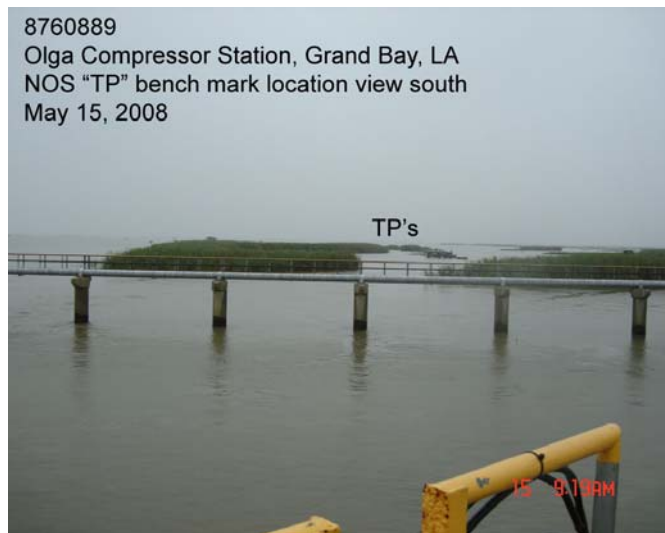
8760889 K Standing.jpg



8760889 NOS TP mark face.jpg



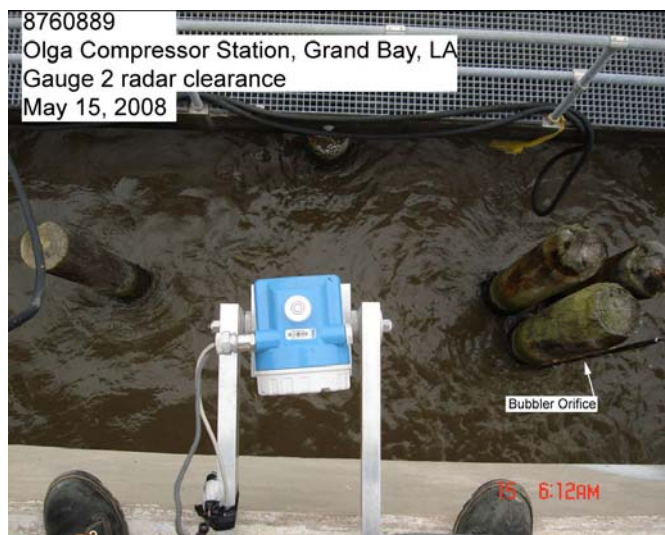
8760889 NOS TP mark NW.jpg



8760889 NOS TP mark south.jpg



8760889 Orifice.jpg



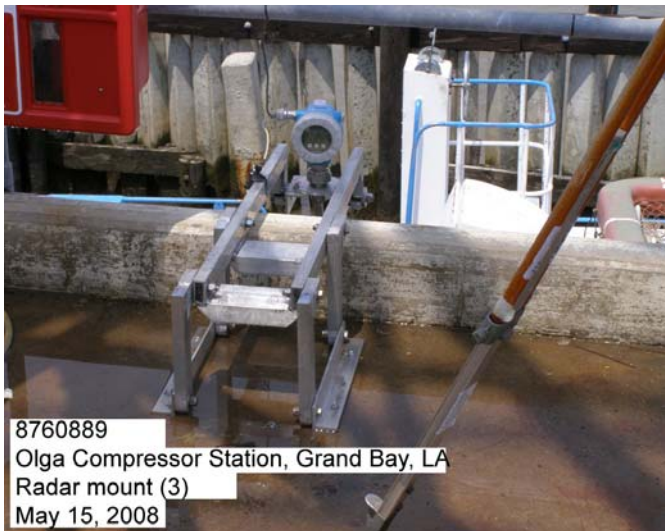
8760889 radar clearance.jpg



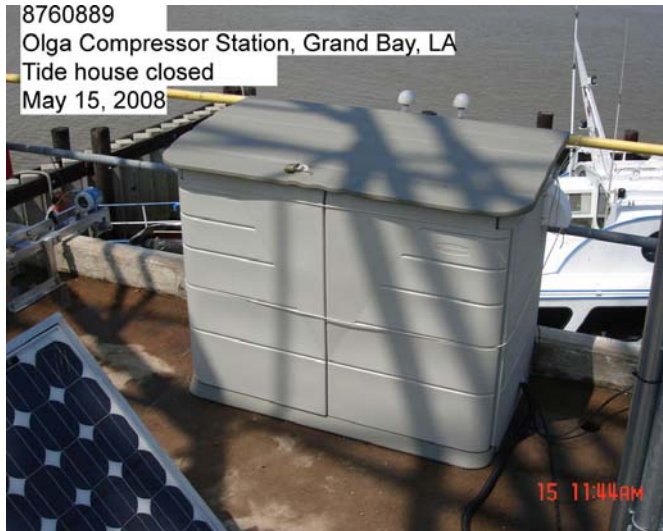
8760889 Radar Mount 1.jpg



8760889 Radar Mount 2.jpg



8760889 Radar mount 3.jpg



8760889 Tide house closed.jpg



8760889 Tide house.jpg



8760889 Tide Staff.jpg

TO REACH STATEMENT

876-0889 Olga Compressor, Grand Bay, LA

To reach the tidal bench marks from Venice, LA, proceed by boat from The Jump 1.9 km (1.0 nm) north upstream on the Mississippi River to the first channel on the right leading to Baptiste Collette Bayou, turn right and proceed 9.0 km (4.8 nm) NE through Baptiste Collette Bayou and Main Pass to a dredged east-west canal near the end of Main Pass, then turn left and proceed west for 2.9 km (1.6 nm) and exit the canal, and proceed NW across Grand Bay for 6.1 km (3.3 nm) to Olga Compressor Station. The bench marks are located on the platforms throughout the station. The tide gauges were located at the eastern most corner of the communication tower platform, the platform closest to and with stairs down to the crew boat dock. The tide staff was on a pile just NW of the tide gauges.

Datum Offset Computation Worksheet

Olga Compressor, Grand Bay, LA 876-0889

all values in meters

Current as of: May 15, 2008

Type of Visit: Installation of Tide Station

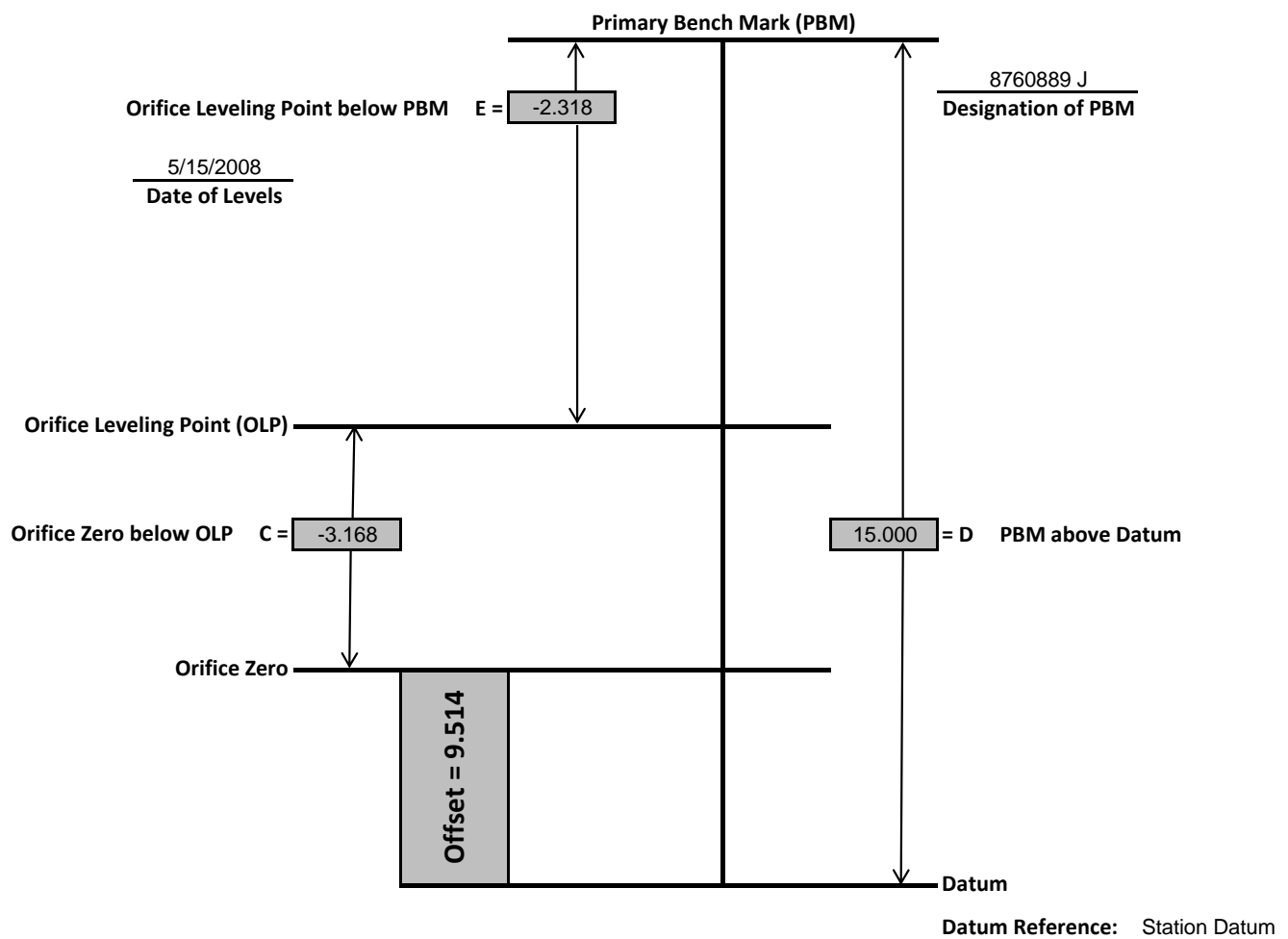
Sensor: The primary water level sensor is also referred to as Gauge #1, and is a digital "bubbler" gauge.

Offset = D (PBM above Datum) + E (Orifice Leveling Point below PBM) + C (Orifice Zero below Orifice Leveling Point)

Offset = 15.000 + -2.318 + -3.168

Offset = 9.514

The offset is the elevation of the Primary Water Level sensor zero or orifice zero above the datum of choice.



Peg Test							
Forward (balanced)							
1495				1461			
1400	1400.0	95		1367	1367.0	94	
1305		95	190	1273		94	188
4200	1400.0			4101	1367.0		190
4101	1367.0						378
99	33.0						
33.0							
Reverse (unbalanced)							
1408				1602			
1394	1394.0	14		1426	1426.0	176	
1380		14	28	1250		176	352
4182	1394.0			4278	1426.0		28
4278	1426.0						380
-96	-32.0						
-32.0							
				forward		33.0	
				reverse		-32.0	
				difference		1.0	
				distance		37.8	
				mm/m		0.026455	

F to G

Forward (balanced)

2439				1801			
2276	2276.3	163		1619	1618.3	182	
2114		162	325	1435		184	366
6829	2276.3			4855	1618.3		
1741				2150			
1605	1604.3	136		2002	2002.0	148	
1467		138	274	1854		148	296
11642	3880.7		599	10861	3620.3		662
10861	3620.3						599
781	260.3						1261
260.3							

Reverse (unbalanced)

2230				1821			
2083	2082.7	147		1685	1685.7	136	
1935		148	295	1551		134	270
6248	2082.7			5057	1685.7		
1755				2392			
1572	1572.0	183		2229	2229.3	163	
1389		183	366	2067		162	325
10964	3654.7		661	11745	3915.0		595
11745	3915.0						
-781	-260.3						
-260.3							

forward	260.3
reverse	-260.3
difference	0.0
distance	126.1

G to H

Forward

2373					829			
2254	2253.7	119			709	709.0	120	
2134		120	239		589		120	240
6761	2253.7				2127	709.0		239
2127	709.0							479
4634	1544.7							
1544.7								

Reverse

635					2181			
515	515.0	120			2061	2061.0	120	
395		120	240		1941		120	240
1545	515.0				6183	2061.0		240
6183	2061.0							480
-4638	-1546.0							
-1546.0								

forward	1544.7
reverse	-1546.0
difference	-1.3
distance	47.9

H to J

Forward

1381				1414			
1286	1286.0	95		1319	1319.0	95	
1191		95	190	1224		95	190
3858	1286.0			3957	1319.0		190
3957	1319.0						380
-99	-33.0						
-33.0							

Reverse

1395				1361			
1300	1300.0	95		1267	1266.7	94	
1205		95	190	1172		95	189
3900	1300.0			3800	1266.7		190
3800	1266.7						379
100	33.3						
33.3							

forward	-33.0
reverse	33.3
difference	0.3
distance	38

J to K

Forward

1915				1812			
1754	1753.3	161		1636	1636.0	176	
1591		163	324	1460		176	352
5260	1753.3			4908	1636.0		324
4908	1636.0						676
352	117.3						
117.3							

Reverse

1815				1919			
1639	1638.3	176		1756	1756.7	163	
1461		178	354	1595		161	324
4915	1638.3			5270	1756.7		354
5270	1756.7						678
-355	-118.3						
-118.3							

forward	117.3
reverse	-118.3
difference	-1.0
distance	67.6

Note 2/23/09: in the original level notes, the mean difference of elevation between 8760889 J and 8760889 K was -0.1178m. This was incorrect. It should be +0.1178m. The field forms for that leveling section were reversed when they were recopied from the original forms (original forms were nearly destroyed by heavy rain). The forward form was used as reverse, and the reverse form used as forward. This has been corrected here, and the abstract for the installation report has been resubmitted.

K to Staff

Forward

1368				4586			
1352	1352.0	16		4570	4570.0	16	
1336		16	32	4554		16	32
4056	1352.0			13710	4570.0		32
13710	4570.0						64
-9654	-3218.0						
-3218.0							

Reverse

4569				1351			
4553	4552.7	16		1335	1335.3	16	
4536		17	33	1320		15	31
13658	4552.7			4006	1335.3		33
4006	1335.3						64
9652	3217.3						
3217.3							

forward -3218.0
reverse 3217.3
difference -0.7
distance 6.4

1320 was written as 1340 in the rewritten level notes

K to Radar

Forward

1466				1315			
1455	1455.0	11		1299	1299.0	16	
1444		11	22	1283		16	32
4365	1455.0			3897	1299.0		22
3897	1299.0						54
468	156.0						
156.0							

Reverse

1301				1454			
1285	1285.0	16		1442	1442.3	12	
1269		16	32	1431		11	23
3855	1285.0			4327	1442.3		32
4327	1442.3						55
-472	-157.3						
-157.3							

forward	156.0
reverse	-157.3
difference	-1.3
distance	5.4

K to Orifice

Forward

1384				3589			
1373	1373.0	11		3573	3573.0	16	
1362		11	22	3557		16	32
4119	1373.0			10719	3573.0		22
10719	3573.0						54
-6600	-2200.0						
-2200.0							

Reverse

3567				1361			
3551	3551.0	16		1350	1350.0	11	
3535		16	32	1339		11	22
10653	3551.0			4050	1350.0		32
4050	1350.0						54
6603	2201.0						
2201.0							

forward	-2200.0
reverse	2201.0
difference	1.0
distance	5.4

Abstract of Conventional Leveling on Station Datum

Olga Compressor, Grand Bay, LA

876-0889

Connected bench marks: 5 8760889 F, 8760889 G, 8760889 H, 8760889 J, 8760889 K
Primary bench mark: 8760889 J

Initial leveling
Date 5/15/2008
Level/SN
Observer C. Mayfield
Rod person B. Bowen
C Factor (mm/m) 0.02646
NOAA Form 75-29 1 - 16

Installation Leveling								
(all values in meters)								
Bench Mark		Distance	Diff. of Elevation (DE)		Closure	Mean DE	Station Datum	
From	To		Forward	Reverse			Elevation	Bench Mark
							15.0000	8760889 J
8760889 J	8760889 K	68	0.1173	-0.1183	-0.0010	0.1178	15.1178	8760889 K
8760889 K	Top of Orifice #1	5.4	-2.2000	2.2010	0.0010	-2.2005	12.9173	Top of Orifice #1
Top of Orifice #1	Orifice #1 "0"		note 3	taped		-3.1680	9.7493	Orifice #1 "0"
Spur to Other Bench Marks								
8760889 J	8760889 H	38	0.0333	-0.0330	0.0003	0.0332	15.0332	8760889 H
8760889 H	8760889 G	48	-1.5460	1.5447	-0.0013	-1.5454	13.4878	8760889 G
8760889 G	8760889 F	126	-0.2603	0.2603	0.0000	-0.2603	13.2275	8760889 F
Spur to Radar								
8760889 K	Radar LP	5.5	0.1560	-0.1573	-0.0013	0.1566	15.2744	Radar LP
Radar LP	Radar Sensor "0"		note 4			0.000	15.2744	Radar Sensor "0"
Spur to Staff Stop								
8760889 K	Staff Stop	6.4	-3.2180	3.2173	-0.0007	-3.2176	11.9002	Staff Stop
Staff Stop	Staff "0"		-2.000	taped		-2.000	9.9002	Staff "0"

Note 2/23/09: in the original tide station installation report, the mean difference of elevation between 8760889 J and 8760889 K was listed as -0.1178m. This was incorrect. It should be +0.1178m. The field forms for that leveling section were reversed when they were recopied from the original forms (original forms were nearly destroyed by heavy rain). The forward form was used as reverse, and the reverse form used as forward. This has been corrected on this abstract, and the abstract for the installation report has been resubmitted.

- 1) LP = leveling point
- 2) The H350XL Bubbler is Gauge 1 and the Radar is Gauge 2
- 3) Black steel orifice pipe measured with steel tape before mounting on pile
- 4) Radar Sensor "0" offset from LP (SNS) is based upon predeployment calibration test. Radar LP is the bottom of the circular plate.

Installation Leveling		
Abstract by:	C. Mayfield	5/18/08
Verified by:	M. Zieserl	2/23/09
dates		

STATION SUMMARY FILE

JOA 3/18/2009

8760889 Olga Compressor Station, Grand Bay, LA

Lat (N): 29° 23' 11.6" Lon (W): 89° 22' 48.5"

DATUMS (Epoch 1983-2001)

HWL	13.307				
MHHW	10.867	DHQ	0.011		
MHW	10.856				
MTL	10.663			GT	0.404
DTL	10.665			MN	0.385
NAVD88	N/A				
MSL	10.676				
MLW	10.471	DLQ	0.007		
MLLW	10.463				
LWL	9.848				

meters

HWI	n/a
LWI	n/a

Balance	To be completed by COOPS				
DHQ	DLQ	MN	GT	MTL	DTL

Extreme	Date	Time
HWL	09-01-2008	11:06
LWL	08-24-2008	23:42

To be completed by COOPS

Stage	Date	ID
Complete		
Verified		
Accepted		

Source	Control Station
Monthly Means	8760922 PILOTS STATION EAST, SOUTHWEST PASS, LA

Staff	PBM	PBM STND Elevation
05-13-2008	8760889 J	15.000

Segments	
Begin	End
05-13-2008 20:12	02-01-2009 17:06



APPENDIX II

Abstract of Levels

Abstract of Conventional Leveling on Station Datum

Olga Compressor, Grand Bay, LA 876-0889

Connected bench marks: 5 8760889 F, 8760889 G, 8760889 H, 8760889 J, 8760889 K
Primary bench mark: 8760889 J

	<u>Installation Leveling</u>	<u>Check Leveling</u>	<u>6 month leveling</u>	<u>Closeout Leveling</u>
Date	5/15/2008	9/26/2008	11/11/2008	2/1/2009
Level/SN	Wild NA2 / 5046382	Wild NA2 / 5046382	Wild NA2 / 5046382	Wild NA2 / 1346
Observer	C. Mayfield	J. Talbot	W. Bowen	J. Talbot
Rod person	B. Bowen	S. Shaw	S. Shaw	J. Wahl
C Factor (mm/m)	0.02646	0.03482	-0.26316	0.02604
NOAA Form 75-29	1 - 16	1 - 8	1 - 14	1 - 16

Installation Leveling (05/15/08)								
(all values in meters)								
Bench Mark		Distance	Diff. of Elevation (DE)		Closure	Mean DE	Station Datum	
From	To		Forward	Reverse			Elevation	Bench Mark
8760889 J	8760889 K	68	0.1173	-0.1183	-0.0010	0.1178	15.1178	PBM 8760889 J
8760889 K	Top of Orifice #1	5.4	-2.2000	2.2010	0.0010	-2.2005	12.9173	8760889 K
Top of Orifice #1	Orifice #1 "0"		note 3	taped		-3.1680	9.7493	Top of Orifice #1
Spur to Other Bench Marks								
8760889 J	8760889 H	38	0.0333	-0.0330	0.0003	0.0332	15.0332	8760889 H
8760889 H	8760889 G	48	-1.5460	1.5447	-0.0013	-1.5454	13.4878	8760889 G
8760889 G	8760889 F	126	-0.2603	0.2603	0.0000	-0.2603	13.2275	8760889 F
Spur to Radar								
8760889 K	Radar LP	5.5	0.1560	-0.1573	-0.0013	0.1566	15.2744	Radar LP
Radar LP	Radar Sensor "0"		note 4			0.000	15.2744	Radar Sensor "0"
Spur to Staff Stop								
8760889 K	Staff Stop	6.4	-3.2180	3.2173	-0.0007	-3.2176	11.9002	Staff Stop
Staff Stop	Staff "0"		-2.000	taped		-2.000	9.9002	Staff "0"

Note 2/23/09: in the original tide station installation report, the mean difference of elevation between 8760889 J and 8760889 K was listed as -0.1178m. This was incorrect. It should be +0.1178m. The field forms for that leveling section were reversed when they were recopied from the original forms (original forms were nearly destroyed by heavy rain). The forward form was used as reverse, and the reverse form used as forward. This has been corrected on this abstract, and the abstract for the installation report has been resubmitted.

Installation Leveling (05/15/08)		
Abstract by:	C. Mayfield	5/18/08
Verified by:	M. Zieserl	2/23/09
dates		

Check Leveling (09/26/08)								
(all values in meters)								
Bench Mark		Distance	Diff. of Elevation (DE)		Closure	Mean DE	Station Datum	
From	To		Forward	Reverse			Elevation	Bench Mark
8760889 J	8760889 K		(J and K not connected, holding install elev. of K)				15.0000	PBM 8760889 J
8760889 K	Top of Orifice #1	11.6	-2.2027	2.2023	-0.0004	-2.2025	15.1178	8760889 K
Top of Orifice #1	Orifice #1 "0"		note 3	taped		-3.1680	12.9153	Top of Orifice #1
Spur to Other Bench Marks								
8760889 J	8760889 H	38	0.0353	-0.0340	0.0013	0.0346	15.0346	8760889 H
Spur to Radar								
8760889 K	Radar LP	10.7	0.1560	-0.1560	0.0000	0.1560	15.2738	Radar LP
Radar LP	Radar Sensor "0"		note 4			0.000	15.2738	Radar Sensor "0"
Spur to Staff Stop								
8760889 K	Staff Stop	10.9	-3.2220	3.2200	-0.0020	-3.2210	11.8968	Staff Stop
Staff Stop	Staff "0"		-2.000	taped		-2.000	9.8968	Staff "0"

Check Leveling (09/26/08)		
Level notes by:	J. Talbot	9/26/08
Abstract by:	M. Zieserl	9/29/08
dates		

6 month leveling (11/11/08)								
(all values in meters)								
Bench Mark		Distance	Diff. of Elevation (DE)		Closure	Mean DE	Station Datum	
From	To		Forward	Reverse			Elevation	Bench Mark
8760889 J	8760889 K	66.7	0.1213	-0.1200	0.0013	0.1206	15.0000	PBM 8760889 J
8760889 K	Top of Orifice #1	6.5	-2.2013	2.2013	0.0000	-2.2013	15.1206	8760889 K
Top of Orifice #1	Orifice #1 "0"		note 3	taped		-3.1680	12.9193	Top of Orifice #1
							9.7513	Orifice #1 "0"
Spur to Other Bench Marks								
8760889 J	8760889 H	38.2	0.0357	-0.0363	-0.0006	0.0360	15.0360	8760889 H
8760889 H	8760889 G	48.1	-1.5447	1.5450	0.0003	-1.5448	13.4912	8760889 G
8760889 G	8760889 F	125.5	-0.2600	0.2603	0.0003	-0.2602	13.2310	8760889 F
Spur to Radar								
8760889 K	Radar LP	6.2	0.1567	-0.1563	0.0004	0.1566	15.2772	Radar LP
Radar LP	Radar Sensor "0"		note 4			0.000	15.2772	Radar Sensor "0"
Spur to Staff Stop								
8760889 K	Staff Stop	<i>not leveled</i>						
Staff Stop	Staff "0"							

6 month leveling (11/11/08)		
Abstract by:	J. Talbot	11/11/08
Verified by:	M. Zieserl	2/12/09
		<i>dates</i>

Closeout Leveling (02/01/09)								
(all values in meters)								
Bench Mark		Distance	Diff. of Elevation (DE)		Closure	Mean DE	Station Datum	
From	To		Forward	Reverse			Elevation	Bench Mark
8760889 J	8760889 K	68.4	0.1200	-0.1193	0.0007	0.1196	15.0000	PBM 8760889 J
8760889 K	Top of Orifice #1	12.6	-2.2030	2.2027	-0.0003	-2.2028	15.1196	8760889 K
Top of Orifice #1	Orifice #1 "0"		note 3	taped		-3.1680	12.9168	Top of Orifice #1
							9.7488	Orifice #1 "0"
Spur to Other Bench Marks								
8760889 J	8760889 H	38.5	0.0360	-0.0373	-0.0013	0.0366	15.0366	8760889 H
8760889 H	8760889 G	48	-1.5470	1.5457	-0.0013	-1.5464	13.4902	8760889 G
8760889 G	8760889 F	125.8	-0.2607	0.2623	0.0016	-0.2615	13.2287	8760889 F
Spur to Radar								
8760889 K	Radar LP	12	0.1567	-0.1573	-0.0006	0.1570	15.2766	Radar LP
Radar LP	Radar Sensor "0"		note 4			0.000	15.2766	Radar Sensor "0"
Spur to Staff Stop								
8760889 K	Staff Stop	12.4	-3.2263	3.2233	-0.0030	-3.2248	11.8948	Staff Stop
Staff Stop	Staff "0"		-2.000	taped		-2.000	9.8948	Staff "0"

Closeout Leveling (02/01/09)		
Abstract by:	J. Talbot	2/1/09
Verified by:	M. Zieserl	2/12/09
		<i>dates</i>

Notes :

- 1) LP = leveling point
- 2) The H350XL Bubbler is Gauge 1 and the Radar is Gauge 2
- 3) Black steel orifice pipe measured with steel tape before mounting on pile at installation
- 4) Radar Sensor "0" offset from LP (SNS) is based upon pre and post deployment calibration test. Radar LP is the bottom of the circular plate.

Abstract of Conventional Leveling on Station Datum
Devon Energy Facility, North Pass, LA
876-0417

Connected bench marks: 5 8760417 A, 8760417 B, 8760417 C, 8760417 D, 8760417 E
 Primary bench mark: 8760417 A

	<u>Installation Leveling</u>	<u>DEA closeout leveling</u>	<u>Terrasond check leveling</u>	<u>Final closeout leveling</u>
Date	4/3-4/2008	8/26/2008	9/26/2008	2/10-11/2009
Level/SN	Wild NA2/387306			
Observer	T. Brennan		J. Talbot	T. Brennan
Rod person	C. Mayfield			G. Shier
C Factor (mm/m)	0.0000	0.03766	0.00621	0.02453
NOAA Form 75-29	1 - 18	1 - 16	1 - 8	1-12

Installation Leveling (4/3-4/2008)									
(all values in meters)									
Bench Mark		Distance	Diff. of Elevation (DE)		Closure	Mean DE	Station Datum		Bench Mark
From	To		Forward	Reverse			Elevation		
							15.0000	8760417 A (PBM)	
8760417 A	8760417 B	53	0.0920	-0.0920	0.0000	0.0920	15.0920	8760417 B	
8760417 B	8760417 C	64	-0.0610	0.0613	0.0003	-0.0612	15.0308	8760417 C	
8760417 C	8760417 D	63	-0.0220	0.0230	0.0010	-0.0225	15.0083	8760417 D	
8760417 D	8760417 E	52	-0.0573	0.0580	0.0007	-0.0576	14.9507	8760417 E	
Spur to Aquatrak									
8760417 A	Aquatrak LP	62	0.6260	-0.6263	-0.0003	0.6262	15.6262	Aquatrak LP	
Aquatrak LP	Aquatrak Sensor "0"		note 3			0.0950	15.7212	Aquatrak Sensor "0"	
Spur to Radar									
8760417 A	Radar LP	57	-0.5907	0.5910	0.0003	-0.5908	14.4092	Radar LP	
Radar LP	Radar Sensor "0"		note 4			-0.0100	14.3992	Radar Sensor "0"	
Spur to Staff Stop									
8760417 A	Staff Stop	52	-1.4843	1.4847	0.0004	-1.4845	13.5155	Staff Stop	
Staff Stop	Staff "0"		-1.8150	taped		-1.8150	11.7005	Staff "0"	

Installation Leveling (4/3-4/2008)		
Level notes by:	T Brennan	4/3/08
Abstract by:	M Zieserl	4/16/08
		dates

DEA closeout leveling (08/26/08)									
(all values in meters)									
Bench Mark		Distance	Diff. of Elevation (DE)		Closure	Mean DE	Station Datum		Bench Mark
From	To		Forward	Reverse			Elevation		
8760417 A	8760417 B	53	0.0933	-0.0920	0.0013	0.0926	15.0000	8760417 A (PBM)	
8760417 B	8760417 C	64	-0.0600	0.0610	0.0010	-0.0605	15.0926	8760417 B	
8760417 C	8760417 D	63	-0.0233	0.0233	0.0000	-0.0233	15.0321	8760417 C	
8760417 D	8760417 E	52	-0.0587	0.0580	-0.0007	-0.0584	15.0088	8760417 D	
14.9504 8760417 E									
Spur to Aquatrak									
8760417 A	Aquatrak Collar	31	0.5867	-0.5867	0.0000	0.5867	15.5867	Aquatrak Collar	
Aquatrak Collar	Aquatrak LP		note 5			0.0440	15.6307	Aquatrak LP	
Aquatrak LP	Aquatrak Sensor "0"		note 3			0.0950	15.7257	Aquatrak Sensor "0"	
Spur to Radar									
8760417 A	TP on Radar	40	-0.5250	0.5253	0.0003	-0.5252	14.4748	TP on Radar	
TP on Radar	Radar LP		note 5			-0.0650	14.4098	Radar LP	
Radar LP	Radar Sensor "0"		note 4			-0.0100	14.3998	Radar Sensor "0"	
Spur to Staff Stop									
8760417 A	Staff Stop	53	-1.4837	1.4827	-0.0010	-1.4832	13.5168	Staff Stop	
Staff Stop	Staff "0"		-1.8150	taped		-1.8150	11.7018	Staff "0"	

DEA closeout leveling (08/26/08)		
Level notes checked by:	SNA	8/26/08
Abstract by:	M Zieserl	9/17/08
		dates

Terrasond check leveling (09/26/08)								
(all values in meters)								
Bench Mark		Distance	Diff. of Elevation (DE)		Closure	Mean DE	Station Datum	
From	To		Forward	Reverse			Elevation	Bench Mark
8760417 A	8760417 B	53	0.0930	-0.0927	0.0003	0.0928	15.0000 15.0928	8760417 A (PBM) 8760417 B
Spur to Aquatrak								
8760417 A	Aquatrak Collar	40	0.5863	-0.5863	0.0000	0.5863	15.5863	Aquatrak Collar
Aquatrak LP	Aquatrak LP		note 5			0.0440	15.6303	Aquatrak LP
Aquatrak LP	Aquatrak Sensor "0"		note 3			0.0950	15.7253	Aquatrak Sensor "0"
Spur to Radar								
8760417 A	TP on Radar	40	-0.5257	0.5257	0.0000	-0.5257	14.4743	TP on Radar
TP on Radar	Radar LP		note 5			-0.0650	14.4093	Radar LP
Radar LP	Radar Sensor "0"		note 4			-0.0100	14.3993	Radar Sensor "0"
Spur to Staff Stop								
8760417 A	Staff Stop	53	-1.4833	1.4830	-0.0003	-1.4832	13.5168	Staff Stop
Staff Stop	Staff "0"		-1.8150	taped		-1.8150	11.7018	Staff "0"

Terrasond check leveling (09/26/08)		
Level notes by:	J. Talbot	9/26/08
Abstract by:	M Zieserl	9/29/08
		dates

JOA and DEA Closeout Leveling (02-10-09)									
(all values in meters)									
Bench Mark		Distance	Diff. of Elevation (DE)		Closure	Mean DE	Station Datum		Bench Mark
From	To		Forward	Reverse			Elevation		
							15.0000		8760417 A (PBM)
8760417 A	8760417 B	53	0.0920	-0.0900	0.0020	0.0910	15.0910		8760417 B
8760417 B	8760417 C	64	-0.0623	0.0633	0.0010	-0.0628	15.0282		8760417 C
8760417 C	8760417 D	63	-0.0230	0.0220	-0.0010	-0.0225	15.0057		8760417 D
8760417 D	8760417 E	52	-0.0583	0.0580	-0.0003	-0.0582	14.9475		8760417 E
Spur to Aquatrak									
8760417 B	Aquatrak LP	62	0.5337	-0.5333	0.0004	0.5335	15.6245		Aquatrak LP
AquaTrak LP	Aquatrak Sensor "0"		note 3			0.0950	15.7195		Aquatrak Sensor "0"
Spur to Radar									
8760417 B	Radar LP	61	-0.6847	0.6847	0.0000	-0.6847	14.4063		Radar LP
Radar LP	Radar Sensor "0"		note 4			-0.010	14.3965		Radar Sensor "0"
Spur to Staff Stop									
8760417 B	Staff Stop	30	-1.5763	1.5760	-0.0003	-1.5762	13.5148		Staff Stop
Staff Stop	Staff "0"		-1.815	taped		-1.815	11.7000		Staff "0"

JOA and DEA Closeout Leveling (02-10-09)		
Level notes by:	T. Brennan	2/18/09
Abstract by:	T. Brennan	2/18/09
Checked by:	G. Shier	2/18/09

Notes :

- 1) LP = leveling point
- 2) The Aquatrak is Gauge 1 and the Radar is Gauge 2
- 3) Aquatrak Sensor "0" offset from LP (SNS) is +0.095 based upon predeployment calibration. LP is top of gray collar.
- 4) Radar Sensor "0" offset from LP (SNS) is -0.010 based upon predeployment calibration test. LP is top of circular plate.
- 5) Tape measurement



APPENDIX III

Tide Staff Observations

Summary of Staff Observations on Station Datum

Olga Compressor, Grand Bay, LA

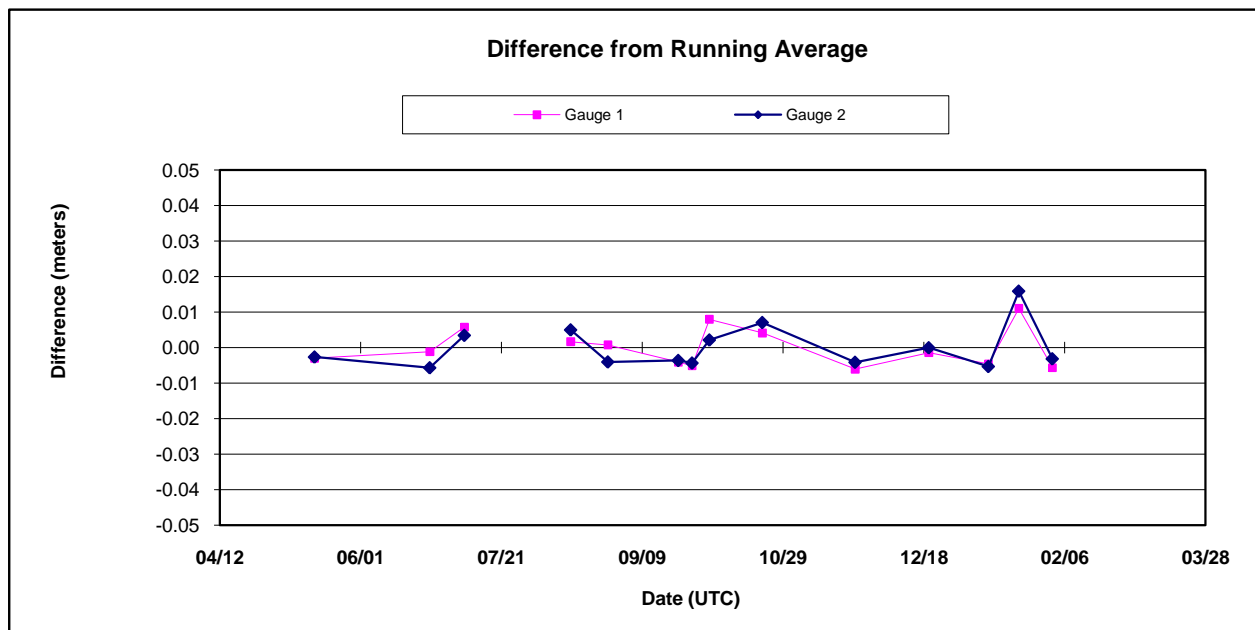
876-0889

all values in meters

Bold = rejected

	Gauge 1	Gauge 2
Average	9.749	15.270
St Dev	0.005	0.006
Count	14	14

Date (2008)	Gauge 1	Gauge 2	gauge 1 N	gauge 2 N
05/15	9.745	15.267	35	35
06/25	9.747	15.264	11	11
07/07	9.754	15.273	11	12
08/02	9.891	15.416	10	10
08/14	9.750	15.274	10	10
08/27	9.749	15.265	10	10
09/21	9.744	15.266	10	10
09/26	9.743	15.265	8	8
10/02	9.756	15.272	11	11
10/21	9.753	15.277	11	11
11/23	9.742	15.265	11	11
12/19	9.747	15.269	11	11
01/09	9.744	15.264	11	11
01/20	9.760	15.285	11	11
02/01	9.743	15.266	31	31



- Note 1: Gauge 1 is an H350XL Bubbler and Gauge 2 is a Radar sensor. Raw measurements from the Radar are distances down to the water surface.
- Note 2: Staff constants for Gauge 1 are corrected to the Orifice "0" of the tide gauge. Staff constants for Gauge 2 are corrected to the Leveling Point (which is the same as the Sensor "0") of the radar sensor. Staff readings are relative to station datum.
- Note 3: The average staff constants should be very close to the station datum elevations of the Orifice "0" of the bubbler gauge and Sensor "0" of the radar gauge.

Water Density Observations and Slope Constant

Olga Compressor, Grand Bay, LA

876-0889

Date	Time (local)	Density
05/13/08	03:15	1.000
05/13/08	03:30	1.000
05/13/08	03:30	1.000
05/15/08	09:50	1.000
05/15/08	11:00	1.000
05/15/08	11:54	1.000
05/15/08	15:21	1.000
06/25/08	multiple readings	1.000
07/07/08	multiple readings	1.000
08/02/08	multiple readings	1.000
08/14/08	multiple readings	1.000
08/27/08	multiple readings	1.000
09/21/08	multiple readings	1.000
09/26/08	multiple readings	1.000
10/02/08	multiple readings	1.000
10/21/08	multiple readings	1.000
11/23/08	multiple readings	1.004
12/19/09	multiple readings	1.002
01/09/09	multiple readings	1.001
01/20/09	multiple readings	1.001
02/01/09	multiple readings	1.004

Average Density =	1.0006
--------------------------	---------------

Final slope constant =	0.703639
-------------------------------	-----------------

 Density of surface water measured by calibrated hydrometer. Samples obtained during staff (water leveling) checks by Terrasond personnel. All times are GMT. Density units = gm/cm3.

The tide gauge pressure readings (PSI) are multiplied by the final slope constant to determine the corrected stage depth readings (meters).

$$\frac{\text{PSI to Pa Conversion Factor}}{\text{Gravity} * \text{Water Density} * 1000}$$

For N 29 23 06 and W 89 22 48 this equation is equivalent to:

$$\frac{6894.757}{9.7931 * 1.001 * 1000}$$

Gravity is calculated using the online NGS predicted gravity model for location and height:

http://www.ngs.noaa.gov/cgi-bin/grav_pdx.prl



APPENDIX IV

Tide Station Report

Site Report

876-0889 Olga Compressor Station, Grand Bay, LA

Site Visit	Purpose of Visit	Installation	Team Leader	Joe Talbot, Terrasond	Date of Visit	5/13-15/2008
Tertiary Station	Installation	May 15, 2008	Removal		Number of Days	
Project	OCS	S-J977-KR-TERRA-2008			JOA	115
Position (NAD83)	Latitude (N)	29° 23' 11.6"	Longitude (W)	89° 22' 48.5"	Time Meridian	0° (UTC)
Local Values	Gravity (milligals)	979312	GOES Angles	Elev 55°/ Az 181°	Magnetic Declination	13° W, +0° 0' W/year
Contractor	Prime			Tide Consultant		
	Terrasond 1617 South Industrial Way, Suite 3 Palmer, AK 99645 (907) 745-7215 ATTN: Joseph Talbot			John Oswald & Associates, LLC 2000 E. Dowling Rd, Suite 10 Anchorage, AK 99507 (907) 561-0136 phone ATTN: John Oswald		
Owner	El Paso Corporation- Southern Natural Gas (SNG) Toca Compressor Station 2400 Bayou Road St. Bernard, LA 70085 (504) 682-6212					
Location	To reach the tidal bench marks from Venice, proceed by boat upstream from The Jump on the Mississippi River to the Baptiste Collette Bayou outlet (first on the right), then proceed NE on the bayou and in Main Pass to a dredged east-west canal near the end of Main Pass, then turn left and proceed west for 2.9 km (1.6 nm) in the canal to an oil field, continue NW across Grand Bay for 6.4 km (3.5 nm) to Olga Compressor Station. The bench marks are located on the platforms throughout the station: the comm. tower, former compressor the reciving and the discharge platforms.The tide gage was located on the eastern most corner of the communication tower platform, the platform closest to and with stairs down to the crew boat dock. The tide staff was on a pile just NW of the tide gauge.					
Tide House	The tide gauge electronics are housed in individual Pelican cases mounted inside of a prefabricated plastic shed bolted down to the eastern most corner of the concrete communications tower platform. The orifice line for the bubbler gauge runs just outside of the shed then down to orifice below, wire for the radar gauge runs a short distance NW'ly from shed to radar mount. GPS antennas are mounted to shed itself, GOES antennas are mounted to chain link fence posts just SE of the shed and the solar panels are bolted to the platform just in front of shed					
Primary DCP	Installed	5/13/2008	Removed			
	Pressure Sensor	DAA H350XL	Serial No.	1037	Vent Value (m)	0.000
			Averaging Interval	180 seconds	Slope Constant in Gauge	0.70404
	Data Logger	combined in H350XL	Firmware	2.12h		
	Pump	DAA H355	Serial No.			
	GOES Radio	DAA H222	Serial No.		GPS timing	Yes
	GOES Address	E82021C6	Channel	143	Format	NGWLMS
			Interval	1 hour	Offset	0:25:50
	Power	One battery with a 70watt solar panel with solar controller.				
	Orifice	The bubbler orifice is at the bottom of a 3/4" diameter black steel pipe, 3.168 m (10.4 ft) long, which was hose clamped to 1"x2" spacers then 1/2"stainless banded to a free standing wood piling below platform.				
Comments						
Secondary DCP	Installed	5/13/2008	Removed			
	Radar Sensor	DAA H3611	Serial No.	1200	Level Point to Sensor "0"	0.000
			Averaging Interval	20 seconds	Slope Constant in Gauge	meters * 10
	Data Logger	DAA H350XL	Serial No.	1048	Firmware	2.12h
	GOES Radio	DAA H222			GPS timing	Yes
	GOES Address	E82032B0	Channel	143	Format	Binary (9 byte)
			Interval	1 hour	Offset	0:26:00
	Power	One battery with a 70watt solar panel with solar controller.				
	Radar Mount	The radar was mounted with a custom fabricated aluminum frame, concrete anchored to platform, that held the radar head over the short "curb" that runs along the outside edge of platform. Aluminum mount also extended down once past curb to allow radar cone to clear the bottom of the platform deck.				
	Comments	H350XL would not log unless screen was on. Disabled Auto-off function then logging/GOES Tx worked				
Tide Staff	Tide staff is composed of two 1-meter sections mounted on a treated 2x4. The top section extends above the top of the 2x4. It was bolted to the north side of a free standing piling NW of radar, tide house and orifice, most easily visible from crew boat dock walkway. Leveled directly to the top (2m mark) of the staff and tied into the bench mark network.					
Tidal Bench Marks	Primary	Recovered	Established	Designations		
	8760889 J	0	5	8760889 F, 8760889 G, 8760889 H, 8760889 J, 8760889 K		
Leveling	Date	Order	Type	Bench Marks Connected		
	5/15/2008	Third	Optical	8760889 F, 8760889 G, 8760889 H, 8760889 J, 8760889 K		
	NAVD88 Level Tie	No NAVD88 marks within 1.6km (1 mi).				
	Comments	Level run included Gauge 1 orifice "0", Gauge 2 radar Leveling Point, and staff stop (top of staff, 2m mark)				
GPS & OPUS	Bench Mark	Date	Session Length	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
	8760889 J					
	NAVD88 GPS Tie	Not required per OCS hydro specifications until OPUS Projects is operational.				
	Comments	No GPS performed during install. Terrasond will complete before station removal.				
Station History	5/13 - 15/2008 - Tide station installed. Cody Mayfield from JOA, 3 Terrasond personnel.					

Site Report

876-0889 Olga Compressor Station, Grand Bay, LA

Site Visit	Purpose of Visit	Closeout	Team Leader	Joe Talbot, Terrasond	Date of Visit	February 1, 2009
Tertiary Station	Installation	May 15, 2008	Removal	February 1, 2009	Number of Days	262
Project	OCS	S-J977-KR-TERRA-2008			JOA	115
Position (NAD83)	Latitude (N)	29° 23' 11.6"	Longitude (W)	89° 22' 48.5"	Time Meridian	0° (UTC)
Local Values	Gravity (milligals)	979312	GOES Angles	Elev 55°/ Az 181°	Magnetic Declination	13° W, +0° 0' W/year
Contractor	Prime			Tide Consultant		
	Terrasond 1617 South Industrial Way, Suite 3 Palmer, AK 99645 (907) 745-7215 ATTN: Joseph Talbot			JOA Surveys, LLC 2000 E. Dowling Rd, Suite 10 Anchorage, AK 99507 (907) 561-0136 phone ATTN: Mike Zieserl		
Owner	El Paso Corporation- Southern Natural Gas (SNG) Toca Compressor Station 2400 Bayou Road St. Bernard, LA 70085 (504) 682-6212					
Location	To reach the tidal bench marks from Venice, proceed by boat upstream from The Jump on the Mississippi River to the Baptiste Collette Bayou outlet (first on the right), then proceed NE on the bayou and in Main Pass to a dredged east-west canal near the end of Main Pass, then turn left and proceed west for 2.9 km (1.6 nm) in the canal to an oil field, continue NW across Grand Bay for 6.4 km (3.5 nm) to Olga Compressor Station. The bench marks are located on the platforms throughout the station: the communications tower, former compressor, the receiving, and the discharge platforms.The tide gauge was located on the eastern most corner of the communication tower platform, the platform closest to and with stairs down to the crew boat dock. The tide staff was on a pile just NW of the tide gauge.					
Tide House	The tide gauge electronics are housed in individual Pelican cases mounted inside of a prefabricated plastic shed bolted down to the eastern most corner of the concrete communications tower platform. The orifice line for the bubbler gauge runs just outside of the shed then down to the orifice below. Wire for the radar gauge runs a short distance NW'ly from the shed to the radar mount. GPS antennas are mounted to shed itself, GOES antennas are mounted to chain link fence posts just SE of the shed and the solar panels are bolted to the platform just in front of shed.					
Primary DCP	Installed	5/13/2008	Removed	2/1/2009		
	Pressure Sensor	DAA H350XL	Serial No.	1037	Vent Value (m)	0.000
			Averaging Interval	180 seconds	Slope Constant in Gauge	0.70404
	Data Logger	combined in H350XL	Firmware	2.12h		
	Pump	DAA H355	Serial No.			
	GOES Radio	DAA H222	Serial No.		GPS timing	Yes
	GOES Address	E82021C6	Channel	143	Format	NGWLMS
			Offset	0:25:50	Transmit Window	10 seconds
	Power	One battery with a 70watt solar panel with solar controller.				
Orifice	The bubbler orifice is at the bottom of a 3/4" diameter black steel pipe, 3.168 m (10.4 ft) long, which was hose clamped to 1"x 2" spacers then 1/2" stainless banded to a free standing wood piling below platform.					
Comments	H350XL frequently restarted itself. Many small data gaps.					
Secondary DCP	Installed	5/13/2008	Removed	2/1/2009		
	Radar Sensor	DAA H3611	Serial No.	1200	Level Point to Sensor "0"	0.000
			Averaging Interval	20 seconds	Slope Constant in Gauge	meters * 10
	Data Logger	DAA H350XL	Serial No.	1048	Firmware	2.12h
	GOES Radio	DAA H222			GPS timing	Yes
	GOES Address	E82032B0	Channel	143	Format	Binary (9 byte)
			Offset	0:26:00	Transmit Window	10 seconds
	Power	One battery with a 70watt solar panel with solar controller.				
	Radar Mount	The radar was mounted with a custom fabricated aluminum frame, concrete anchored to platform, that held the radar head over the short "curb" that runs along the outside edge of platform. Aluminum mount also extended down once past curb to allow radar cone to clear the bottom of the platform deck.				
	Comments	H350XL would not log unless screen was on. Disabled Auto-off function then logging/GOES Tx worked. Transmitted data through GOES, but did not log data consistently.				
Tide Staff	Tide staff is composed of two 1-meter sections mounted on a treated 2x4. The top section extends above the top of the 2x4. It was bolted to the north side of a free standing piling NW of radar, tide house and orifice, most easily visible from crew boat dock walkway. Leveled directly to the top (2m mark) of the staff and tied into the bench mark network.					
Tidal Bench Marks	Primary	Recovered	Established	Designations		
	8760889 J	0	5	8760889 F, 8760889 G, 8760889 H, 8760889 J, 8760889 K		
Leveling	Date	Order	Type	Bench Marks Connected		
	5/15/2008	Third	Optical	8760889 F, 8760889 G, 8760889 H, 8760889 J, 8760889 K		
	NAVD88 Level Tie	No NAVD88 marks within 1.6km (1 mi).				
	Comments	Level run included Gauge 1 orifice "0", Gauge 2 radar Leveling Point, and staff stop (top of staff, 2m mark)				
	9/26/2009	Third	Optical	8760889 H to 8760889 J, 8760889 K to sensors		
	Comments	Level run included Gauge 1 orifice "0", Gauge 2 radar Leveling Point, and staff stop (top of staff, 2m mark)				
	11/11/2008	Third	Optical	8760889 F, 8760889 G, 8760889 H, 8760889 J, 8760889 K		
	Comments	Level run included Gauge 1 orifice "0", Gauge 2 radar Leveling Point				
	2/1/2009	Third	Optical	8760889 F, 8760889 G, 8760889 H, 8760889 J, 8760889 K		
	Comments	Level run included Gauge 1 orifice "0", Gauge 2 radar Leveling Point, and staff stop (top of staff, 2m mark)				
GPS & OPUS	Bench Mark	Date	Session Length	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
	8760889 H	11/11/2008	26 hours	29 23 9.87410	89 22 46.86839	-19.674
	OPUS DB	http://beta.ngs.noaa.gov/CORS-Proxy/oraOpusDbWeb/getDatasheet.jsp?PID=BBBG69				
	NAVD88 GPS Tie	Not required per OCS hydro specifications until OPUS Projects is operational.				
Station History	Comments					
	5/13 - 15/2008 - Tide station installed. Cody Mayfield from JOA, 3 Terrasond personnel.					
	9/26/08 (Joe Talbot, Terrasond) - check leveling after two hurricanes.					
	11/11/08 W. Bowen (Terrasond) - 6 month leveling and GPS observation.					
	12/19/08 Joe Talbot (Terrasond) - set bubbler gauge to transmit 2 redundant data sets in GOES message. Had been set to 0. Radar gauge always requires a reset to download data.					
2/1/2009 Joe Talbot (Terrasond) - remove tide station, end of hydro project.						

Tide Station Report

8760417 Devon Energy Facility, North Pass, LA

Site Visit	Purpose of Visit	Closeout	Team Leader	Travis Brennan, DEA	Date of Visit	February 10, 2009
Tertiary Station	Established	April 4, 2008	Closeout	February 10, 2009	Number of Days	312
Project	NOS	S-J977-KR-TERRA-2008			JOA WO#:	115
Position (NAD83)	Latitude (N)	29° 12' 02.70"	Longitude (W)	89° 02' 40.08"	Time Meridian	0° (UTC)
Local Values			GOES Angles	Elev 56°/ Az 182°	Magnetic Declination 0° 19' W	
Contractor	Prime			Tide Consultant		
	Terrasond 1617 South Industrial Way, Suite 3 Palmer, AK 99645 (907) 745-7215 ATTN: Joseph Talbot			John Oswald & Associates, LLC 2000 E. Dowling Rd, Suite 10 Anchorage, AK 99507 (907) 561-0136 phone ATTN: Mike Zieserl		
Owner	Main Contact in LA			North Pass Facility Contact		
	John Sherer 337-269-4332 John.sherer@dvn.com (John provided authorization to use the site.)			Call prior to showing up: (337) 269-4307 Gary Mays or Tommy Lejeune Backup: EJ Russell or Eugene Obrien		
Location	TO REACH THE TIDE STATION: From the Venice, LA Boat Harbor, proceed 4.2 km (2.3 nm) NNE through a small channel to the Mississippi River, turn right and proceed 16.7 km (9.0 nm) SSE following the Mississippi River past Main Pass and Octave Pass to where the river splits into 3 channels, turn left and follow the east most channel into Pass A Loutre and continue 21.3 km (11.5 nm) east to the Devon Energy Facility on the north bank of North Pass. The tide gauges were located on the platform with the large metal tank. The bench marks are located along the main walkway that runs parallel to the channel.					
Tide House	Tide house is located at the SE corner of the platform. The electronics are mounted in individual pelican cases. The cases are housed inside a small wooden box that is mounted on the outside of the railing that runs around the perimeter of the platform. The solar panels, GOES antennas and GPS antennas are mounted to the tide house.					
Tide Gauges	Two tide gauge systems, each powered by separate 12v battery with 20W solar panel for recharging. Each system has a separate GOES antenna and GPS antenna (time sync for GOES radio).					
Primary DCP	Acoustic Sensor	Aquatrak	Serial No.	1654-3280	SNS	0.095
	Data Logger	Sutron 8210				
	GOES Radio	Satlink 2				
	GOES Address	907181AE	Channel	141	Format	NGWLMS (Aqua)
	Interval	1 hour	Offset	0:30:15	Transmit Window	10 seconds
Secondary DCP	Radar Sensor	DAA H3611i	Serial No.	1581	SNS	-0.010
	Data Logger	DAA H522+			Firmware	2.12h
	GOES Radio	combined in H522+				
	GOES Address	907192D8	Channel	141	Format	Binary (9byte)
	Interval	1 hour	Offset	0:30:25	Transmit Window	10 seconds
Tide Staff	A one meter graduated metal staff bolted to a 2x4 and strapped to a piling on a separate platform across the channel from the tide station. A clear plastic stilling well with a float is mounted next to the tide staff. The staff stop is a paint spot on the metal grating directly above the staff.					
Tidal Bench Marks	Primary	Recovered	Established	Designations		
	8760417 A	0	5	8760417 A, 8760417 B, 8760417 C, 8760417 D, 8760417 E		
Leveling	Date	Order	Type	Bench Marks		
	4/3/2008	Third	Optical	8760417 A, 8760417 B, 8760417 C, 8760417 D, 8760417 E		
	Comments	Leveled to Primary and Secondary DCP sensors and to staff.				
	NAVD88 Level Tie	No NAVD88 marks within 1.6km (1 mi).				
	8/26/2008	Third	Optical	8760417 A, 8760417 B, 8760417 C, 8760417 D, 8760417 E		
	Comments	Leveled to Primary and Secondary DCP sensors and to staff.				
	9/26/2008	Third	Optical	8760417 A		
	Comments	Leveled to Primary and Secondary DCP sensors and to staff.				
	2/10/2009	Third	Optical	8760417 A, 8760417 B, 8760417 C, 8760417 D, 8760417 E		
Comments	Leveled to Primary and Secondary DCP sensors and to staff.					
GPS & OPUS	Bench Mark	Date	Observation	Latitude (N)	Longitude (W)	Ellipsoid Height (m)
	8760417 A	4/2/2008	5.5 hours	29° 12' 3.36199"	89° 2' 41.00718"	-21.012
	NAVD88 GPS Tie	Not required per OCS hydro specifications until OPUS Projects is operational.				
	Comments	OPUSDB completed. PID: BBBD74				
Station History	4/2 - 4/4/2008: (DEA & JOA) Tide station installed					
	4/18/2008: (DEA) Staff observations and check levels from PBM to Aquatrak LP and Radar LP. Check levels matched install levels within 2mm.					
	5/31/2008: (DEA) Intermittent power problems with Primary DCP (Aquatrak) repaired.					
	8/26/2008: (DEA) Levels and 3 hours of staff observations completed because DEA has completed their hydrographic survey. The tide station remains installed to support the Terrasond hydrographic survey.					
	9/26/2008: (Terrasond) Check leveling after hurricanes					
	2/10-11/2009: (DEA & JOA) Tide station close-out. 3 hours of staff observations and leveling. Equipment removed.					



APPENDIX V

Final Tide Note

FINAL TIDE NOTE and FINAL TIDE ZONING CHART

DATE: February 1, 2009

HYDROGRAPHIC BRANCH: Atlantic

HYDROGRAPHIC PROJECT: OPR-J977-TE_08

HYDROGRAPHIC SHEET: D00140

LOCALITY: 7 NM West of Chandeleur Islands, LA

TIME PERIOD: July 2, 2008 – January 22, 2009

TIDE STATION USED:

Station No.	Station Name	Latitude	Longitude
8745557	Gulfport Harbor, MS	30° 21.6' N	089° 04.9' W
8760889	Olga Compressor Station, Grand Bay, LA	29° 23.1' N	089° 22.8' W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE:

Station No.	Station Name	MHW
8745557	Gulfport Harbor, MS	0.500 m
8760889	Olga Compressor Station, Grand Bay, LA	0.392 m

REMARKS: RECOMMENDED ZONING

Use zone(s) identified as: CGM108, CGM109, CGM110, CGM111, CGM112, CGM113, CGM114, CGM115, CGM116, CGM125, CGM126, CGM127, CGM128, CGM129, CGM130, CGM131, CGM132, CGM133, CGM134, CGM135, CGM170, CGM171, CGM172, CGM173, CGM174, CGM175, CGM176, CGM177, CGM178, CGM179, CGM180, and CGM181

Refer to Figure 1 for zoning information.

Note 1: Provided time series data are tabulated in metric units (Meters), relative to MLLW and on Universal Time, Coordinated (UTC).

Note 2: Pilot Station East, LA (8760922) served as datum control for subordinate tide stations but was not used to supply MLLW correctors for this hydrographic survey. The datum for this station was updated in February 2009.

TerraSond Ltd.

FINAL TIDE NOTE and FINAL TIDE ZONING CHART

DATE: February 1, 2009

HYDROGRAPHIC BRANCH: Atlantic

HYDROGRAPHIC PROJECT: OPR-J977-TE_08

HYDROGRAPHIC SHEET: D00141

LOCALITY: Southern Chandeleur, Western Breton Sounds, LA

TIME PERIOD: July 4, 2008 – January 24, 2009

TIDE STATION USED:

Station No.	Station Name	Latitude	Longitude
8745557	Gulfport Harbor, MS	30° 21.6' N	089° 04.9' W
8760889	Olga Compressor Station, Grand Bay, LA	29° 23.1' N	089° 22.8' W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE:

Station No.	Station Name	MHW
8745557	Gulfport Harbor, MS	0.500 m
8760889	Olga Compressor Station, Grand Bay, LA	0.392 m

REMARKS: RECOMMENDED ZONING

Use zone(s) identified as: CGM134, CGM135, CGM136, CGM137, CGM138, CGM139, CGM140, CGM141, CGM142, CGM163, CGM164, CGM165, CGM166, CGM167, CGM168, CGM169, CGM170, CGM200, CGM201, CGM202, CGM203, CGM204, CGM206, CGM207, CGM208, and CGM209

Refer to Figure 2 for zoning information.

Note 1: Provided time series data are tabulated in metric units (Meters), relative to MLLW and on Universal Time, Coordinated (UTC).

Note 2: Pilot Station East, LA (8760922) served as datum control for subordinate tide stations but was not used to supply MLLW correctors for this hydrographic survey. The datum for this station was updated in February 2009.

Final Tidal Zoning for OPR-J977-TE-08

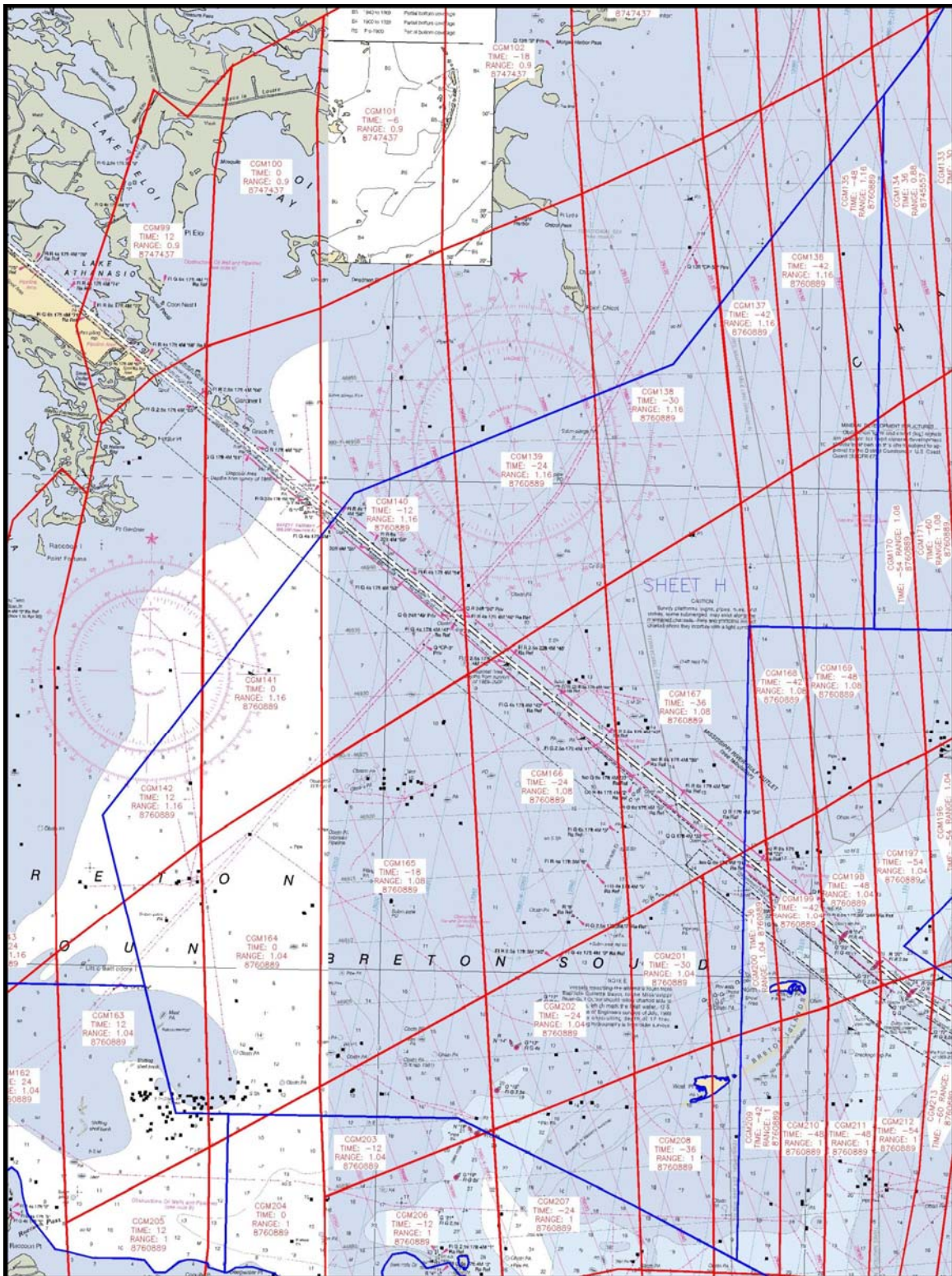


Figure 2 - Final Tidal Zoning Chart for OPR-J977-TE-08, Sheet D00141.

FINAL TIDE NOTE and FINAL TIDE ZONING CHART

DATE: February 1, 2009

HYDROGRAPHIC BRANCH: Atlantic

HYDROGRAPHIC PROJECT: OPR-J977-TE_08

HYDROGRAPHIC SHEET: D00142

LOCALITY: Southeast of Breton Islands, LA

TIME PERIOD: July 14, 2008 – January 27, 2009

TIDE STATION USED:

Station No.	Station Name	Latitude	Longitude
8740417	Devon Energy Facility, North Pass, LA	29° 12.0' N	089° 02.6' W
8760889	Olga Compressor Station, Grand Bay, LA	29° 23.1' N	089° 22.8' W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE:

Station No.	Station Name	MHW
8740417	Devon Energy Facility, North Pass, LA	0.363 m
8760889	Olga Compressor Station, Grand Bay, LA	0.392 m

REMARKS: RECOMMENDED ZONING

Use zone(s) identified as: CGM167, CGM168, CGM169, CGM170, CGM171, CGM172, CGM173, CGM174, CGM175, CGM176, CGM190, CGM191, CGM192, CGM193, CGM194, CGM195, CGM196, CGM197, CGM198, CGM199, CGM200, CGM209, CGM210, CGM211, CGM212, CGM213, CGM214, CGM215, CGM216, CGM217, CGM218, CGM219, CGM220, CGM238, CGM239, CGM240, CGM241, CGM242, CGM247, CGM248, CGM249, CGM250, CGM251, CGM252, CGM256, CGM254, CGM255, CGM256, CGM257, CGM258, CGM259, CGM260, CGM261, and CGM262

Refer to Figure 3 for zoning information.

Note 1: Provided time series data are tabulated in metric units (Meters), relative to MLLW and on Universal Time, Coordinated (UTC).

Note 2: Pilot Station East, LA (8760922) served as datum control for subordinate tide stations but was not used to supply MLLW correctors for this hydrographic survey. The datum for this station was updated in February 2009.

Final Tidal Zoning for OPR-J977-TE-08

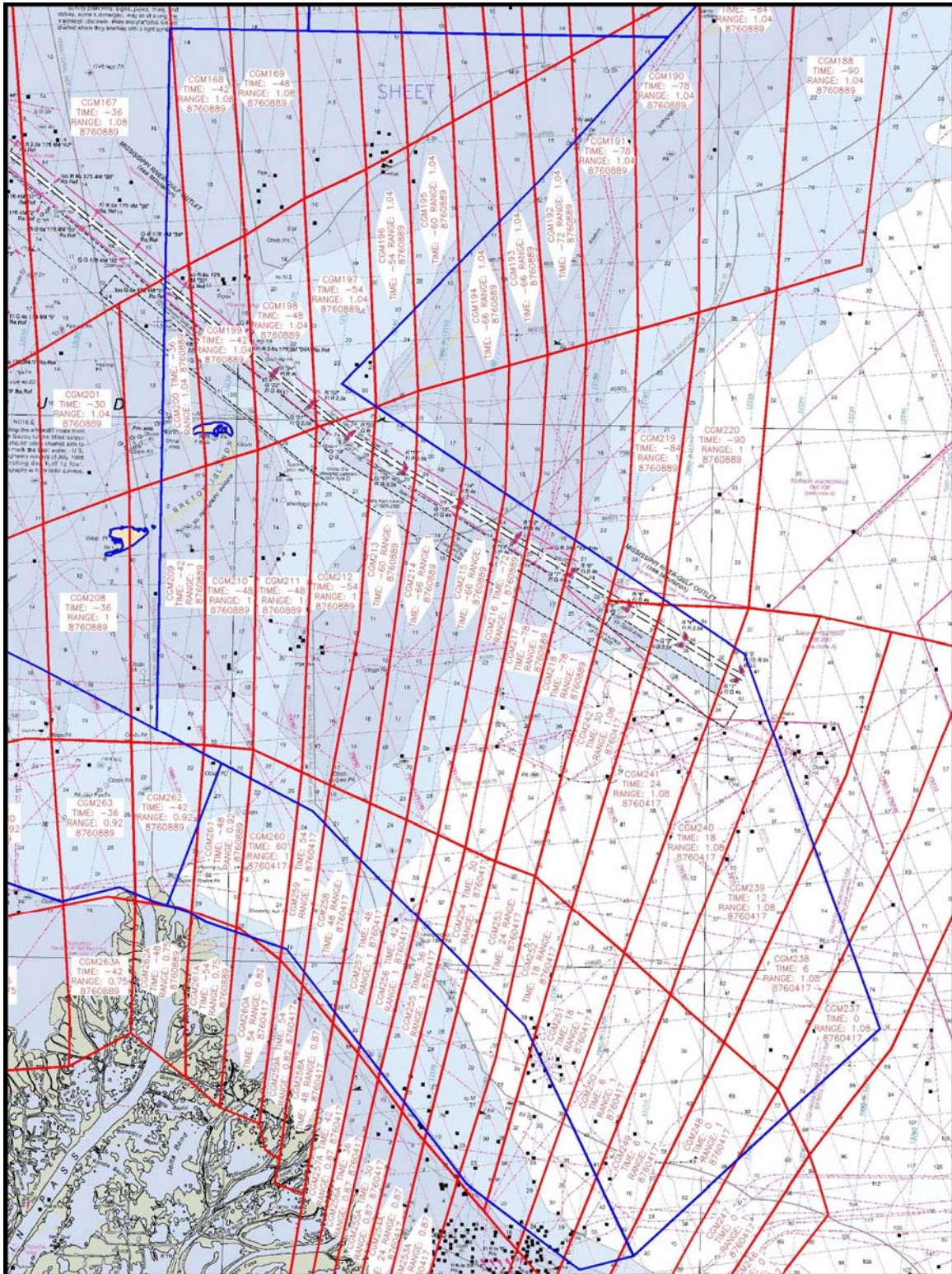


Figure 3 - Final Tidal Zoning Chart for OPR-J977-TE-08, Sheet D00142.

FINAL TIDE NOTE and FINAL TIDE ZONING CHART

DATE: February 1, 2009

HYDROGRAPHIC BRANCH: Atlantic

HYDROGRAPHIC PROJECT: OPR-J977-TE_08

HYDROGRAPHIC SHEET: H11814

LOCALITY: 3NM East of California Point, LA

TIME PERIOD: June 22, 2008 – January 27, 2009

TIDE STATION USED:

Station No.	Station Name	Latitude	Longitude
8760889	Olga Compressor Station, Grand Bay, LA	29° 23.1' N	089° 22.8' W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE:

Station No.	Station Name	MHW
8760889	Olga Compressor Station, Grand Bay, LA	0.392 m

REMARKS: RECOMMENDED ZONING

Use zone(s) identified as: CGM143, CGM160, CGM161, CGM162, CGM163, CGM164, CGM204, and CGM205

Refer to Figure 4 for zoning information.

Note 1: Provided time series data are tabulated in metric units (Meters), relative to MLLW and on Universal Time, Coordinated (UTC).

Note 2: Pilot Station East, LA (8760922) served as datum control for subordinate tide stations but was not used to supply MLLW correctors for this hydrographic survey. The datum for this station was updated in February 2009.

Final Tidal Zoning for OPR-J977-TE-08

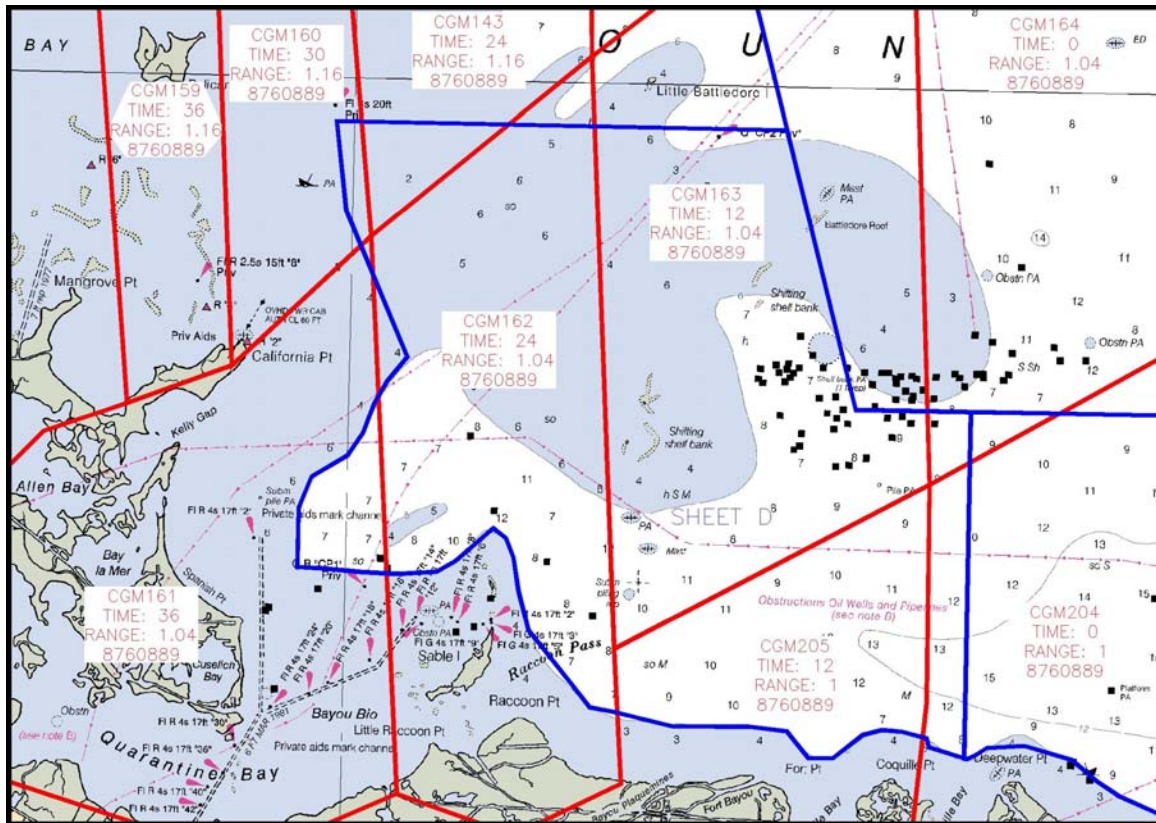


Figure 4 - Final Tidal Zoning Chart for OPR-J977-TE-08, Sheet H11814.

FINAL TIDE NOTE and FINAL TIDE ZONING CHART

DATE: February 1, 2009

HYDROGRAPHIC BRANCH: Atlantic

HYDROGRAPHIC PROJECT: OPR-J977-TE_08

HYDROGRAPHIC SHEET: H11815

LOCALITY: 2 NM North of Grand Bay, LA

TIME PERIOD: June 25, 2008 – January 31, 2009

TIDE STATION USED:

Station No.	Station Name	Latitude	Longitude
8760889	Olga Compressor Station, Grand Bay, LA	29° 23.1' N	089° 22.8' W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE:

Station No.	Station Name	MHW
8760889	Olga Compressor Station, Grand Bay, LA	0.392 m

REMARKS: RECOMMENDED ZONING

Use zone(s) identified as: CGM164, CGM203, CGM204, CGM206, CGM207, CGM208, CGM209, CGM261, CGM262, CGM263, CGM264, and CGM265

Refer to Figure 5 for zoning information.

Note 1: Provided time series data are tabulated in metric units (Meters), relative to MLLW and on Universal Time, Coordinated (UTC).

Note 2: Pilot Station East, LA (8760922) served as datum control for subordinate tide stations but was not used to supply MLLW correctors for this hydrographic survey. The datum for this station was updated in February 2009.

Final Tidal Zoning for OPR-J977-TE-08

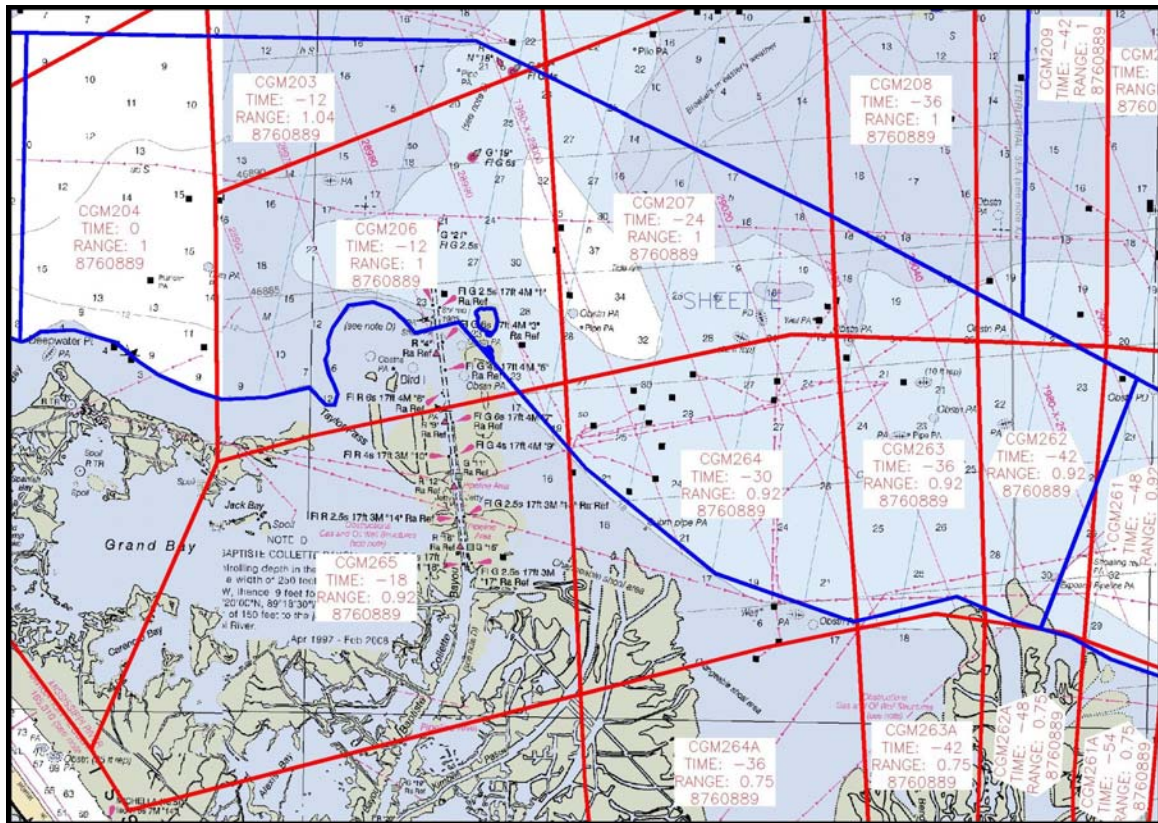


Figure 5 - Final Tidal Zoning Chart for OPR-J977-TE-08, Sheet H11815.

FINAL TIDE NOTE and FINAL TIDE ZONING CHART

DATE: February 1, 2009

HYDROGRAPHIC BRANCH: Atlantic

HYDROGRAPHIC PROJECT: OPR-J977-TE_08

HYDROGRAPHIC SHEET: H11816

LOCALITY: 7 NM Northwest of Pass A Loutre.

TIME PERIOD: June 22, 2008 – January 31, 2009

TIDE STATION USED:

Station No.	Station Name	Latitude	Longitude
8740417	Devon Energy Facility, North Pass, LA	29° 12.0' N	089° 02.6' W
8760889	Olga Compressor Station, Grand Bay, LA	29° 23.1' N	089° 22.8' W

PLANE OF REFERENCE (MEAN LOWER LOW WATER): 0.000 meters

HEIGHT OF HIGH WATER ABOVE PLANE OF REFERENCE:

Station No.	Station Name	MHW
8740417	Devon Energy Facility, North Pass, LA	0.363 m
8760889	Olga Compressor Station, Grand Bay, LA	0.392 m

REMARKS: RECOMMENDED ZONING

Use zone(s) identified as: CGM248, CGM249, CGM250, CGM251, CGM252, CGM253, CGM254, CGM255, CGM256, CGM257, CGM258, CGM259, CGM260, CGM260A, CGM261, CGM261A, CGM262, and CGM262A

Refer to Figure 6 for zoning information.

Note 1: Provided time series data are tabulated in metric units (Meters), relative to MLLW and on Universal Time, Coordinated (UTC).

Note 2: Pilot Station East, LA (8760922) served as datum control for subordinate tide stations but was not used to supply MLLW correctors for this hydrographic survey. The datum for this station was updated in February 2009.

TerraSond Ltd.



APPENDIX VI

Descriptive Report for Tidal Zoning



Descriptive Report for Tidal Zoning

OCS Project: S-J977-KR-TERRA-2008
Client: Terrasond, Ltd.
JOA Work Order: 115
Primary Tide Stations for Project: 8760922 Pilot Station East, LA (*datum control only*)
8747437 Bay Waveland Yacht Club, MS (*not used in final zoning*)
8745557 Gulfport Harbor, MS

Tertiary Tide Stations for Project: 8760417 Devon Energy Facility, LA
8760889 Olga Compressor Station, LA

Submitted by: Mike Zieserl
Email: mike@joasurveys.com

Preliminary Zoning

The preliminary zoning from CO-OPS generally shows the tide range increasing from about 0.3m to 0.5m from south to north, while the tide generally progresses from east to west taking nearly 3 hours to move through the survey area.

Preliminary tidal zoning from CO-OPS was based on the following NWLON stations:

- 8745557 Gulfport Harbor, MS
- 8747437 Bay Waveland, MS
- 9760922 Pilot Station East, LA

Final Zoning

The preliminary zoning was edited to make the zoning factors relative to the following tide stations:

- 8745557 Gulfport Harbor, MS (NWLON)
- 8760889 Olga Compressor Station (tertiary)
- 8760417 Devon Energy Facility (tertiary)

A comparison of the GT at the three tide stations showed that the preliminary zoning essentially had the range ratios modeled correctly. Looking at the difference in time of the tides between these three stations also showed that the time offsets were nearly correct as well.

GT for the 3 zones where the tide stations are located

	Gulfport Harbor	Olga Compressor	Devon Energy
Preliminary Zoning	0.53	0.39	0.36
Actual	0.53	0.40	0.37
Final Zoning	0.53	0.40	0.37

Time change in minutes between the tide stations

	Gulfport Harbor to Olga	Devon Energy to Olga Compressor
Preliminary Zoning	84	114
Actual	50 (1 sigma = 88min)	112 (1 sigma = 88min)
Final Zoning	84	114

The final zoning was not edited to reflect the measured time change between Olga and Gulfport Harbor (determined by comparing times of high and low tides) because the standard deviation of the measured time difference was so large. During the development of the final zoning, the measured time change between Gulfport and Olga was used to modify the time offsets as a test, and it did not improve the discrete shift at the zoning boundary between these two tide stations. Therefore, the preliminary zoning scheme was generally maintained, and the zoning factors were simply edited to reference these stations. The geometry of the zoning was not changed, with the exception of 15 zones that were deleted because they were not required for the survey area.

The deleted zones are listed below:

CGM151	CGM152	CGM99	CGM100	CGM101	CGM102
CGM103	CGM104	CGM105	CGM106	CGM107	CGM108
CGM74	CGM73A	CGM73			

The Bay Waveland NWLON was removed from the zoning because the tide station did not have verified data on several occasions during survey operations. Gulfport Harbor and Olga Compressor station were used to cover the zones that had been assigned to Bay Waveland.

Changed these zones to reference Gulfport instead of Bay Waveland:

CGM124	CGM125	CGM126	CGM127	CGM128	CGM129
CGM130	CGM131	CGM132	CGM133	CGM134	

Changed these zones to reference Olga instead of Bay Waveland:

CGM135	CGM136	CGM137	CGM138	CGM139	CGM140
CGM141	CGM142	CGM143	CGM159	CGM160	

Zoned tides covering the entire time period of the survey were compared at the boundary between Olga Compressor and Devon Energy at CGM260, and at the boundary of Olga Compressor and Gulfport Harbor at CGM134. The zoned tides from Devon and Olga compare passably. The average of the differenced zoned tides (excluding the 2 hurricanes) is about 1cm, with a standard deviation of 8cm.

The comparison of zoned tides between Olga and Gulfport at CGM134 do not match nearly as well. The water seems to behave much differently at Gulfport and Bay Waveland then it does at Olga or Devon. The average of the difference between the two zoned tides (excluding the 2 hurricanes) is 6cm. Starting in September, the Olga MLLW tide data seems to be consistently higher than the Gulfport MLLW data, possibly indicating a seasonal difference between these two areas, or a difference in the datum epoch. The standard deviation of the difference is 13cm.

Recommendations

For future hydrographic survey projects, COOPS should include the time and range contours, as well as any boundary conditions that are used to develop the preliminary zoning, with the SOW. This would make zoning revision much more straight forward. Currently, the time and range contours have to be recomputed from the preliminary zoning factors, and some guesswork is involved.

In addition, COOPS should include the historic station summary files they use to create the preliminary zoning. It can be difficult to understand, much less perform meaningful revision to the preliminary tidal zoning without the justifying data that went into creating it.

For future surveys in this area, it may be beneficial to install a tide station at the NE boundary of the project, near the Chandeleur Islands, to help bridge the difference between the water levels in the south (Olga and Devon) and north (Bay Waveland and Gulfport).

While the tide range is rather small, and fairly slow to change across the project area, the time of the tide changes much more, and is much more erratic depending on local weather conditions. Instead of discrete tide zones, averages of water levels from two or more tide stations, weighted for importance, may produce better results, and smoother transitions between zone boundaries.