SCAN UPDATE
SEGMENT 18177
ROW OCS-G29042

In Reply Refer To: GE 1035A

April 13, 2012

Ms. Vanessa Villagran
Noble Energy, Inc.
100 Glenborough Dr., Suite 100
Houston, Texas 77067-3299

Dear Ms. Villagran:

This office has reviewed your completion report for the following pipeline:

Application Type: New Right-of-Way Pipeline
Letter Date: November 10, 2011

Segment Number	ROW Number	Size (inches)	Length (feet)	Service	From	To
18177	G29042	04-05	145035	Bulk Oil	West Plet Mississippi Canyon Block 292	Platform A Viosca Knoll Block 900

The total length of the "as-built" right-of-way is 27.47 miles.

The report is submitted in accordance with 30 CFR 250.1008 (b).

The data provided in the report establishes the assigned maximum allowable operating pressure (MAOP) for the pipeline:

MAOP (psig)	MAOP Determination
8399	Hydrostatic Test Pressure

The high and low-pressure sensors shall be set no higher than 15 percent above and below the normal operating range, respectively. The high pilot, however, shall not be set higher than the MAOP of the pipeline. The pressure range shall be established by the use of pressure recorders.

The right-of-way No. OCS-G29042 is described as follows:

A 200-foot wide right-of-way to operate and maintain a 4-1/2-inch bidirectional pipeline, 27.47 miles in length, to transport bulk oil from a West Pipeline End Terminal (West PLET) in Block 292 through Blocks 248, 204, 203, 159, 115, 71, 27, and 26 located in Mississippi Canyon Area and through Blocks 988 and 944 to Platform A in Block 900 located in Viosca Knoll Area.

Sincerely,

BIMAL SHRESTHA

Michael J. Saucier
Regional Supervisor

bcc:1502-01 Segment No. 18177, ROW OCS-G G29042 (MS5232)
1502-01 ROW OCS-G G29042 (Scanning) (MS 5033)
BShrestha:02/01/2012:Noble Energy, Inc.:18177

Scan

BS

100 Glenborough Drive
Suite 100
Houston, TX 77067-3299
Tel: 281 872-3100
Fax: 281 872-3111

noble energy

November 10, 2011

Bureau of Ocean Energy Management
1201 Elmwood Park. Blvd - MS5210
New Orleans. LA 70123-2394

Attn: Alex Alvarado

Re: Pipeline As-Built Drawings
Raton South Field Development Project
Mississippi Canyon 292
OCS Federal Waters, Gulf of Mexico, Offshore, Louisiana

Dear Mr. Alvarado:

Per the approved letters for segments 18176, 18177, 18178, 18179, 18182, Noble Energy Inc. is submitting the as-built pipeline plats for the Mississippi Canyon 292, OCS Federal Waters, Gulf of Mexico, Offshore Louisiana. Also enclosed are the pipelines hydrostatic test forms, charts and calibrations certificates.

If you should need anything further, please advise.

Sincerely,

Noble Energy Inc.

Vanessa Villagran
Regulatory Analyst

Enclosures
Mailed Via: UPS

HELIX SUBSEA CONSTRUCTION	noble energy

DOCUMENT TITLE:	*WEATHERFORD FLOODING OF DUAL 4.5" FLOWLINES OPERATIONAL PROCEDURE*		
DOCUMENT NO.:	*11268-HT-PR-N7001*		
CUSTOMER:	*NOBLE ENERGY*	PROJECT:	*RATON SOUTH*
CLIENT JOB NO.:	*N/A*	HELIX JOB NO:	*11268*

THIRD PARTY:	*WEATHERFORD*	REFERENCE NO.:	*WPSS-014550-WP-01*	REV NO: *03*
		NUMBER OF PAGES TO FOLLOW:		*69*

SIGNATURE LEGEND:

ID:	NAME:	TITLE:
HB	Harry Barker	Project Manager
NO	Nicholas Okubo	Field Engineer
BS	Bill Schmidt	Weatherford

HELIX SUBSEA CONSTRUCTION					
0	Issued for Construction	BS	HB	HB	09/08/11
C	Issued for Client Review	BS	HB	HB	08/03/11
B	Issued for Client Review	BS	HB	HB	07/22/11
REV.	DESCRIPTION	ORIGIN	CHECK	APPROVAL	DATE

NOBLE ENERGY INC	
APPROVAL STATUS DESCRIPTION	☑
APPROVED. WORK MAY PROCEED.	✓
REVISE AS NOTED AND RE-SUBMIT FINAL. WORK MAY PROCEED.	
REVISE AS NOTED AND RE-SUBMIT. WORK MAY NOT PROCEED.	
FOR INFORMATION ONLY. RE-SUBMISSION NOT REQUIRED.	
NAME	DATE 9/6/11

CLIENT

HELIX ENERGY SOLUTIONS

LOCATION

VK 900

Weatherford®

PIPELINE AND SPECIALTY SERVICES

RATON SOUTH FIELD DEVELOMPENT

OPERATIONAL PROCEDURE

FLOODING OF DUAL 4.5" FLOWLINES

DOCUMENT TYPE: WORK PROCEDURE

DOCUMENT TITLE: OPERATIONAL PROCEDURES

4.5" Dual Flowline Flooding

WPSS DOCUMENT NUMBER: WPSS-014550-WP-01

CLIENT DOCUMENT NUMBER:

03	3 JUNE 2011	Approved for Construction	T. Williams	T. Strahl		
02	22 JUNE 2011	Re-Issued for Review	T. Williams	T. Strahl		
01	7 JUNE 2011	Re-Issued for Review	B. Schmidt	T. Strahl	R. White	
00	31 May 2011	Issued for Review	B. Schmidt	T. Strahl		H. Barker
0A	16 MAY 2011	Internal Review	B. Schmidt	T. Strahl		
REV	DATE	DESCRIPTION	PREPARED BY	CHECKED BY.	REVIEWED BY	HESG
REVISIONS			SIGNATURES			

TABLE OF CONTENTS

1.0 GENERAL

Weatherford Pipeline and Specialty Services, hereinafter referred to as "WPSS", has been requested by Helix Energy Solutions Group, hereinafter referred to as "Helix", to perform pre-commissioning flooding of the crude oil field tieback to the existing Chevron production facility. The tie back consists of twin 4.5-inch O.D, 27.5 mile long flowlines terminating by means of Pipeline End Termination structures (PLETs) near the Raton South wellhead. The tie-in at the Raton South well will be achieved by installing a diverless vertically installed connection jumper. WPSS will flood each flowline individually prior to welding on the PLETs and overboarding. This scope of work will take place on the deck of the Helix Express Vessel.

WPSS will flood from a port on the pull in head. The flooding medium will be filtered seawater, treated with 600ppm of XC102 and 110pmm of OSW490. The Helix Express will supply the seawater from their saltwater lift pumps on board the Helix Express. Following the Flooding the WPSS equipment will be demobilized and the WPSS personnel will transfer to the Chevron platform VK-900 for the Hydrotest Operations.

SYSTEM	LENGTH [FT]	OD [IN]	WT [IN]	ID [IN]	WD (MAX.) [FT]	VOLUME [GALS]
EAST FLOWLINE	145,309	4.500"	0.531	3.438	3,400	70,075
WEST FLOWLINE	145,378	4.500"	0.531	3.438	3,400	70,108
NOTE:	Flowline Pipe Specification		API 5L x70 SMLS Line Pipe. w/ 14 – 16 MILS FBE Coating			

1.1 OBJECTIVE

The objective of this document is to provide all personnel a clear understanding of the work scope to ensure the work is completed in a safe, efficient and timely manner. Furthermore it is designed to be an inclusive source of information regarding the activities associated with the flooding operation to be performed on Noble Raton South Development Project, from the Helix Express.

1.2 ABBREVIATIONS

ASME	American Society of Mechanical Engineers
ANSI	American National Standards Institute
API	American Petroleum Institute
ID	Inside Diameter
ITP	Inspection Test Plan
JSA	Job Safety Analysis
MAOP	Maximum Allowable Operating Pressure
MSL	Mean Sea Level
OD	Outside Diameter
PPE	Personal Protective Equipment
PTW	Permit to Work
SOW	Scope of Work
SDV	Shut Down Valve
WFT	Weatherford
WPSS	Weatherford Pipeline & Specialty Services
WT	Wall Thickness
cfm	Cubic Feet per minute
ft	Feet
ft^3	Cubic Feet
gal	Gallons
gpm	Gallons Per Minute
hrs	*Hours*
in	Inches
mm	Millimeters
psi	*Pounds Per Square Inch*
psia	Pounds Per Square Inch (Absolute Pressure)
psig	Pounds Per Square Inch (Gauge Pressure)
scf	*Standard Cubic Feet*
scfm	Standard Cubic Feet Per Minute

Each Operational Procedure has an ITP. In the ITP involvement codes and definitions are used as follows:

"P" - Performance

The Organization involved is responsible for the physical performance of the Inspection Check or Task and for issuing the relevant Quality Record (definition of Record as per ISO 9000:2000 Quality Management Systems – Fundamentals and Vocabulary, para 3.7.6).

"W" - Witness

The Organization involved elects to attend to the Inspection or Check performed by the Performing Organization. The Performing Organization shall notify the Witnessing Organization of the Inspection or Check performance within 24 hours of activity being preformed. Non-attendance of the Witnessing Organization at the notified time shall under no circumstances delay the Inspection or Check being carried out by the Performing Organization.

"H" - Validation (Hold Point)

The Organization involved attends the Inspection or Check performed by the Performing Organization to record the Inspection or Check results. The Performing Organization shall notify the Validation Organization of the Inspection or Check performance within 24 hours of activity being preformed and shall carry out the Inspection or Check only if the Validation Organization is attending. A written waiver from the Validation Organization is required before execution of the Inspection or Check can take place in their absence.

"R" - Review

The Organization involved is responsible for the performance of a review of relevant documentation and/or Quality Records.

"M" - Monitor

The Organization indicated may monitor the works during routine surveillance.

1.3 REFERENCES

1.3.1 CODE REFERENCES

NUMBER	TITLE
30 CFR 250(J)	*Pipeline and Pipeline Rights of Way*
API Spec 5L	Specifications for Line Pipe
API RP 1110	Pressure Testing of Liquid Petroleum Pipelines
API RP 1111	Design, Construction, Operation and Maintenance of Offshore Hydrocarbon Pipelines
ASME B31.4.2002	Pipeline Transportation Systems for Liquid Hydrocarbons and other Liquids
ASME B31.8.2003	Gas Transmissions and Distribution Piping Systems
DNVS-OS-F101	Submarine Pipeline Systems

1.3.2 WPSS REFERENCES

NUMBER	TITLE
WPSS-Q-014550-01	Weatherford Commercial Proposal

1.3.3 HELIX ISSUED REFERENCES

NUMBER	TITLE
16172A100 REV01	RATON SOUTH SCOPE OF SUPPLY SCHEMATIC

1.3.4 Baker Hughes References

NUMBER	TITLE
	Raton South Hydrotest Recommendation

1.4 RESOURCES

Helix shall provide the following services to support the activities as outlined herein:

- Marine transportation for WPSS equipment and personnel
- Helicopter Transportation (if applicable)
- Meals and lodging for four (4) WPSS personnel onboard the Helix Express
- Crane services at dock and offshore facilities to transfer WPSS equipment and personnel
- Utility air supply for WPSS equipment onboard the Helix Express (185cfm @ 100psi)
- Water supply for WPSS equipment onboard the Helix Express (min 120gpm @ 30psi)
- Electrical supply for WPSS equipment onboard the Helix Express (110v, 15amp)
- Offshore Rigging support as needed

2.0 SAFETY

2.1 SUMMARY

WPSS is fully committed to providing a quality H.S.E. performance in all facets of its operations, at all locations and on all projects in which WPSS is involved. It is a requirement for all work procedures that pre-job safety analysis or JSAs be performed and that all pertinent information be distributed and discussed with all personnel involved prior to start of work. Furthermore, safety meetings shall be held prior to every shift to distribute current information and discuss hazards and safe procedures of the job at hand. WPSS personnel must wear proper PPE on the job; hard hat, safety shoes and safety glasses and other PPE as stipulated by the offshore vessel/platform.

2.2 SAFETY MEETINGS & JOB SAFETY ANALYSIS

Upon arrival at the work location, a site specific safety meeting will be held to review all aspects of safety relating to the work and location. All relevant personnel will be required to attend. This meeting will be recorded by WPSS.

A Job Safety Analysis (JSA) will be conducted before commencing each new operation and at the beginning of each work shift. The JSAs shall outline tasks to be performed and identify the associated risks for each task along with mitigating procedures to minimize the anticipated risk exposure. All work crewmembers shall participate in the JSA process to ensure everyone understands the risk and mitigating procedures. The JSAs shall also review the means of egress at the specific location.

The JSAs shall include all hazards, control measures, emergency response, fire prevention, safe areas, escape routes, muster points, use of signs and barriers, PPE, handling of hazardous material, awareness of high pressure, noise, First Aid facilities and accident and incident reporting.

Any accidents or incidents, including near misses, will require a total **"ALL STOP"** with a post review of the situation before any activity can resume. With regards to an unsafe act or situation, any personnel involved in operations can give an **"ALL STOP"** but only the WPSS Superintendent in conjunction with the Company Representative and Operations can give an **"ALL START"**.

NOTE:

At any point in time during the WPSS operations, an individual has the right to **"STOP THE JOB"** if there are "unsafe" activities or situations occurring.

2.3 PERMIT TO WORK

WPSS personnel are to ensure that a permit to work is issued by Offshore Vessel / Client on all offshore facilities / vessels thus ensuring that all parties under WPSS control are in full compliance with the facilities operating practices.

2.4 High Pressure Systems Precautions (Air, chemical or Water)

When operating in the vicinity of hoses, equipment, or piping under pressure, all personnel must adhere to the following precautions:

- During pressurization and hold period, a **minimum 15 foot** stand-off distance shall be maintained from test flange/head and a **minimum 10 foot** stand-off distance from pressurized piping. In the case of limited space due to SIMOPS, the client will assist WPSS crew in allocating stand-off distances during the Flooding operations.
- Placement of the test flange/head should take into consideration the ballistic flight path if failures were to occur on the autoclave port fitting and separation from the blind flanges was to occur.
- No work is to be conducted on the pressurized system. In the event that a leak is found, the system must be de-pressurized to ambient pressure or "double-block" isolation must be used before any work can be conducted on the system.
- A suitable area around test spread shall be taped off (red danger tape) to prevent unauthorized entry to area's near the test head.
- Prior to pressurization, the location and test activity shall be announced over the intercom/loud-speaker system.
- A suitable means shall be put in place to provide visual leak detection without having to approach the test flange/head during pressurization or hold period to accomplish the visual verification.
- Whip checks will be utilized to secure all hoses no matter the level of pressure; this will include all "standard" whip checks and/or rope for larger hoses when no "standard" whip checks exist.
- Before beginning work on any operation, the WPSS Crew on site will conduct a walk-through to check each piece of equipment and ensure it is correctly installed and secured with whip checks.

2.5 Equipment Transfer

Prior to mobilization the following will be confirmed for each item of WPSS equipment to be lifted:

- All equipment will be designed to adhere to standards for offshore transit/transfer and operations.
- All equipment will be clearly marked on the lifting frame with its weight.
- Equipment slings, shackles, stingers, etc. will be certified within the last 6 months and certification shall accompany the equipment.

WPSS personnel will adhere to the following precautions when operating in the vicinity of items being lifted overhead:

- Proper PPE will be worn by all individuals.
- Only one individual will provide hand-signals to the crane/forklift operator.
- WPSS personnel will clearly define a plan prior to beginning the lift, and will execute the plan as it was designed.

2.6 Environmental Safety

The following project specific precautions will be put in place to avoid any undue damage to the environment:

- To prevent spillage of fuel during pump to tank transfers, these operations will be performed over drip-pans or pads at all times.
- Water Disposal methods will be in place to remove the water brought onto the facilities and will be disposed of in a manner in accordance with regulations

2.7 Equipment Certification

All WPSS stand alone equipment (containers, pumps, compressors, tanks and hose baskets) shall be supplied with suitable rigging for offshore lifting and designed in accordance with Weatherford installation basis of design and shall include valid certification (certified lifting points and lifting gear). All mechanical instrumentation and electrical gear shall be calibrated by authorized Third party no sooner than 1 month of mobilization of the spread with 6 months validity certificates from time of delivery or testing.

3.0 Equipment, Personnel & Materials Required

3.1 WPSS Flooding Equipment

Item	Description	Qty	Dimensions (L x W x H) [ft]	Weight [lbs]
1.	Diesel driven positive displacement pump	2	4 x 4 x 5	2,200
2.	Chemical Injection pump	2	3 x 5 x 4	1,200
3.	50 micron Filter Skid	1	2 x 2 x 4	200
4.	Job Box	1	5 x 4 x 4	1,500
5.	50 bbl Tank	3	4 x 4 x 6	1,500
6.	Storage Container	1	10 x 8 x 8	9,800
7.	1" Diaphragm Pump	1	Stored Inside: Hose Basket *Job Box* Storage Container	
8.	2" Fill Hose	Set		
9.	1" Air Hose	250'		
10.	¼" Injection Hose	Set		
11.	2" Flow Meter	2		
12.	Pressure Relief Valve set to 1500psi	2		
13.	Keller Digital Gauge (pressure & temperature) 300bar	2		
14.	Hand Tools / Valves / Fittings	1 set each		
15.	Handheld Radio	1 set		
16.	Computer and printer package	1		

3.2 WPSS Personnel

Item	Description	Qty
1.	Supervisor	1
2.	Foreman	1
3.	Technician	2

3.3 WPSS Chemical Requirements

Item	Description	Qty
1.	Baker Hughes Biocide XC102 (600ppm) + 20% contingency	100 gallons total
2.	Baker Hughes Oxygen Scavenger (110ppm) + 20% contingency	19 gallons total

3.4 WPSS Offshore Requirements

Item	Description	Qty
1.	Seawater Supply	140,590 gals
2.	Utility Air	185cfm / 100psi
3.	Diesel Fuel	As needed
4.	Crane Access	As needed

3.5 Helix Provisions

Item	Description	Qty
1.	Tie in port on pull in head for flooding spread	1

4.0 Operational Procedures

4.1 Equipment and Personnel Mobilization

Once confirmation to mobilize has been received from Helix, WPSS equipment and personnel will be transferred to the Client Specified Dockyard Location from transit to the offshore location. Lift transfers for equipment and personnel will be conducted by the Helix personnel. Staging of the equipment will be carried out by Helix personnel with the assistance of WPSS personnel. All personnel working under WPSS will undergo the vessel orientation before any work can commence.

Item	Description	Reference	WPSS Initial/ Date	Helix Initial/ Date
1.	Prior to mobilization of equipment and personnel, the WPSS crew will stage equipment and review the following: • Pre-Test of manifolds/hoses per workshop procedure • Start-up and run of pumps • Check certification of hoses, lifting slings, shackles, lifting point, etc. • Check Keller Gauge for operating pressure: 300bar (4350psi)	WPSS-14550-MAN-01	P	W
2.	Prior to performing any work, WPSS Supervisor will conduct JSA Ensure all relevant parties have read and signed JSA	3-4-GL-GL-PSS-00004	P	W
3.	Load out equipment for Helix Noble Raton South Flooding operations on board the Helix Express.		P	W
4.	Mobilize equipment and personnel to: Company Dockyard Address (TBD)	5-4-GL-GL-PSS-00006	P	W

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE
5.	Upon arrival at the COMPANY DOCKYARD ADDRESS, WPSS personnel to supervise the offloading of WPSS equipment from *transportation*	5-4-GL-GL-PSS-00006	P	P
6.	*Confirm all items are properly secured for transit to site*		P	P
7.	*Upon arrival WPSS employees will immediately check-in with* Vessel Safety Officer and receive safety orientation prior to commencing any work activities	5-4-GL-GL-PSS-00006	P	W
8.	The WPSS Supervisor shall conduct a Site Safety Meeting, JSA and job brief with crew and all relevant personnel before any operation has commenced to review all aspects of safety relating to the location with relevant personnel. Helix, Company, and/or vessel representatives shall attend and provide site safety information. *The meeting will be recorded by WPSS on a Site Safety Form.*	3-4-GL-GL-PSS-00004 7-4-GL-GL-PSS-00003	P	W
9.	Vessel personnel to lift equipment to Vessel and spot into the planned position according to predetermined lifting plan. WPSS to review and oversee placement of equipment.	5-4-GL-GL-PSS-00006	W	P
10.	Await Helix representative's instructions to proceed with rig-up activities. Changes to be authorized by WPSS Supervisor and reviewed by Helix representative.	5-4-GL-GL-PSS-00006	P	W

4.2 Flooding Equipment Rig-up

Item	Description	Reference	WPSS Initial/ Date	Helix Initial/ Date	Client Initial/ Date
1.	Confirm all equipment is functional and complete daily maintenance and fuel checks.	5-4-GL-GL-PSS-00006	P	W	W
2.	Obtain Permit to Work for rig up and function testing and commence positioning of the equipment as per General Arrangement drawings. Conduct JSA/Tool Box Talk.	3-4-GL-GL-PSS-00004	P	P	W
3.	Lift the Flooding pumps and equipment to stage in the planned position if not already done during mobilization of equipment.	5-4-GL-GL-PSS-00006	P	P	W
4.	Connect the supply hose from the water source to the inlet of the 50 micron filter and tank manifold. Note: The Express confirm Fire water system can supply minimum 120gpm.	5-4-GL-GL-PSS-00006	P	W	W
5.	Connect the 2" flooding hose from the flooding pump to the flow meter / double block and bleed assembly. Install the heavy-duty whip checks to all connections and fully tighten.	5-4-GL-GL-PSS-00006	P	W	W
6.	Connect Supply hose from Chemical Storage tanks to Chemical Injection Pumps. Install the heavy-duty whip checks to all connections and fully tighten.	5-4-GL-GL-PSS-00006	P	W	W
7.	Prior to proceeding it will be necessary calibrate the chemical injection pumps to determine volume per stroke for chemical injection purposes.	5-4-GL-GL-PSS-00006	P	W	W

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
8.	*To perform confirmation on the output per stroke on each pump, conduct the following calibration test:* 1. *Ensure stroke counter on pump is "zeroed"* 2. *Flow water through system until a steady stream of water is flowing from the discharge hose* 3. *Place discharge hose in 5gal bucket and engage pump* 4. *Record the number of strokes required to fill 5gal bucket* 5. *Repeat 3 times to ensure accuracy* $Volume\ per\ stroke = {}^{5gal}/_{Number\ of\ strokes}$ Average volume per stroke				
9.	Calculate strokes per minute using volume per stroke above. $Strokes/Min = \frac{Flowrate\ x\ ppm}{1{,}000{,}000\ x\ volume\ per\ stroke}$ Strokes / Minute	5-4-GL-GL-PSS-00006	P	W	W
10.	After calibration connect the Chemical injection hose from the Chemical injection pump to the double block and bleed assembly. Install the heavy-duty whip checks to all connections and fully tighten.	5-4-GL-GL-PSS-00006	P	W	W
11.	Upon completion of previous steps WPSS will wait until first pipeline end is recovered to surface for PLET installation and given instruction to proceed.	5-4-GL-GL-PSS-00006	M	M	M
12.	Upon confirmation to proceed; The Helix representative shall review and sign the Commencement Report prior to the start of any operations associated with the tying in to pull in head and flooding operations. Note: Helix will provide a 2" Female NPT tap for tie in	5-4-GL-GL-PSS-00006 5-4-GL-GL-PSS-00011	P	P	W

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
13.	WPSS will then Install tie in manifold to pull in head. Note: Helix may need to provide rigger support and/or scaffolding to support tie in manifold on PLET porch.	5-4-GL-GL-PSS-00006	P	W	W
14.	Install 1" "bleed" hose from the tie in manifold and route to the 50 bbl Tanks for discharge. Note: Bleed water may contain chemical for disposal by Helix.	5-4-GL-GL-PSS-00006	P	W	W
15.	Connect the 2" flooding hose from the double block and bleed assembly to the tie in manifold on pull in head. Install the heavy-duty whip checks to all connections and fully tighten.	5-4-GL-GL-PSS-00006	P	W	W
16.	With all equipment in place the Subcontractor Project Engineer, and relevant personnel and walk through the flooding spread and will carry out a Safety walk-through of rig-up.	5-4-GL-GL-PSS-00006	P	H	H
17.	Upon confirmation of safety walk-through, WSPP will erect safety barriers and place safety warning signs and check functionality of WPSS flooding spread	5-4-GL-GL-PSS-00006	P	W	W
18.	Platform personnel will ensure that top of riser flange is properly vented to allow displaced air to escape. Note: If delays are expected, the top of riser blind flange will be secured and tightened to prevent any entry of foreign debris.	5-4-GL-GL-PSS-00006	P	P	W
19.	Personnel on VK-900 platform will ensure immediate area around risers is barricaded, and all relevant personnel are aware of the commencement of Flooding operations.	5-4-GL-GL-PSS-00006	P	P	W

4.3 FLOODING OPERATIONS

NOTE: The following procedure will be done for each flowline prior to over boarding of the PLET(s).

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
1.	The WPSS Supervisor shall conduct a JSA/Toolbox Talk at the beginning of the operation with all personnel who will be operating, observing or witnessing for the duration of the operation. This JSA/Toolbox Talk will be reviewed at shift handovers for the duration of the operation. Any new or changing hazards identified and updated as required.	3-4-GL-GL-PSS-00004	P	W	W
2.	During the flooding operation, the following parameters will be recorded and logged every 10 minutes: • Pipeline Pressure.....psig • Flooding Rate.....gpm • Volume of water injected.....gallons • Volume of chemical injected.....strokes **NOTE: Chemical Concentration is 600ppm XC102 and 110ppm OSW490**	5-4-GL-GL-PSS-00012 Appendix E			
3.	Confirm water supply to flooding pump.	5-4-GL-GL-PSS-00006	P	W	W
4.	Begin filling 50 bbl tanks with filtered seawater.	5-4-GL-GL-PSS-00006			
5.	By regulating Chemical injection pump ensure that each 50 bbl tank is dosed with approximately 0.231 gallons of OSW 490 to achieve 110 ppm.	5-4-GL-GL-PSS-00006 Appendix E			
6.	Confirm good communication with personnel on VK-900 platform. Confirm top of riser flange is open to allow air to escape.	5-4-GL-GL-PSS-00006			

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
7.	Walk the line and verify WPSS valves aligned to flood	5-4-GL-GL-PSS-00006	P	W	W
8.	Once tanks have settled for at least 4 minutes. Start flooding pump and begin filling pipeline with chemically treated seawater Total Volume to be pumped per flowline is: **70,295 gallons + 1% = 71,000gals**	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
9.	Upon starting flooding pump, commence chemical injection XC 102 at rate noted below (from Item 4.2.10) to achieve 600ppm. Strokes per Minute |	5-4-GL-GL-PSS-00012 Appendix E	P	W	W
10.	During flooding operations the tanks will be rotated out to allow filling with chemically treated seawater, settling for at least 4 minutes per tank, and injection into the pipeline. Note: Each tank will be allowed at least 4 minutes settling time prior to injection into pipeline.	Appendix E			
11.	During flooding operations WPSS will monitor the flooding pressure on the line. It is expected that once flooding has begun the bottom "U" shape of the line will fill with water and air pressure trapped between the "U" and the injection point will increase throughout the Flooding process. As the pressure increases and as the pipeline becomes full, WPSS will stop pumping and "bleed" the air in the line through the 1" bleed valve on the tie in manifold. The bleed hose will be diverted to a 50bbl tank to capture the chemically treated water.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
12.	Upon reaching a steady state of flow adjust the rate to no less than 120 GPM, as not to exceed 1500 psig on the pump discharge.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
13.	Continue the pumping of water followed by the "bleeding" of air	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
	until the total volume is achieved.				
14.	Upon reaching **71,000gals,** Stop the flooding pump and chemical injection pump.	S-4-GL-GL-PSS-00012 S-4-GL-GL-PSS-00006	P	W	W
15.	Disconnect tie in manifold from pull in head and secure WPSS equipment until the second line is ready. Helix will now install the PLET to the pipe and recover next flowline section.	S-4-GL-GL-PSS-00006	P	W	W
16.	Once second line is recovered and placed in PLET porch WPSS will repeat the previous steps to complete flooding operations.	S-4-GL-GL-PSS-00006	P	W	W
17.	Upon completion of flooding both flowlines the Helix representative shall review and sign the Completion Report at the conclusion of all operations associated with flooding operations.	S-4-GL-GL-PSS-00013 S-4-GL-GL-PSS-00006	P	H	H
18.	*Remaining chemically treated seawater will be neutralized by* mixing at a 1:1 ration of XC102 and OSW490 with a contact time of at least 30 seconds. The neutralized seawater will then be overboarded	Appendix E	P	W	H

4.4 Equipment Demobilization

Item	Description	Reference	WPSS Initial/ Date	HELIX Initial/ Date	CLIENT. Initial/ Date
1.	Await Helix representative's approval to begin demobilization of equipment. Personnel will then be transferred to the Chevron Platform for Hydrotest operations.	5-4-GL-GL-PSS-00006	P	P	W
2.	Ensure all paperwork has been signed by Helix representative and / or relevant parties. • Commencement Reports • Daily Site Reports • Shift Handover Forms • Field Tickets • Pumping Reports • Job Safety Analysis (JSA's) • Post Job Evaluation • All Related Pressure Charts • All Related Temperature Charts • Completion Reports	5-4-GL-GL-PSS-00011 5-4-GL-GL-PSS-00006 5-4-GL-GL-PSS-00007 5-4-GL-GL-PSS-00012 3-4-GL-GL-PSS-00004 6-4-US-GL-PSS-00001 5-4-GL-GL-PSS-00013 5-4-GL-GL-PSS-00008	P	W	W
3.	The WPSS Supervisor shall conduct a JSA/Toolbox Talk at the beginning of the operation with all personnel who will be operating, observing or witnessing for the duration of the operation.	3-4-GL-GL-PSS-00004	P	W	W
4.	Break-down equipment spreads and prepare/secure delicate items prior to load-out.	5-4-GL-GL-PSS-00006	P	W	W
5.	Load-out equipment spread on WPSS supplied transportation. Ensure equipment is properly secured.	5-4-GL-GL-PSS-00006	P	W	W
6.	Demobilize equipment and personnel to the WPSS facilities at the following addresses: **Attn: Taylor Williams** **Phone: (713) 580-9700** **7721 Pinemont Road** **Houston, TX 77040-6203** **USA**	5-4-GL-GL-PSS-00006	P	W	W

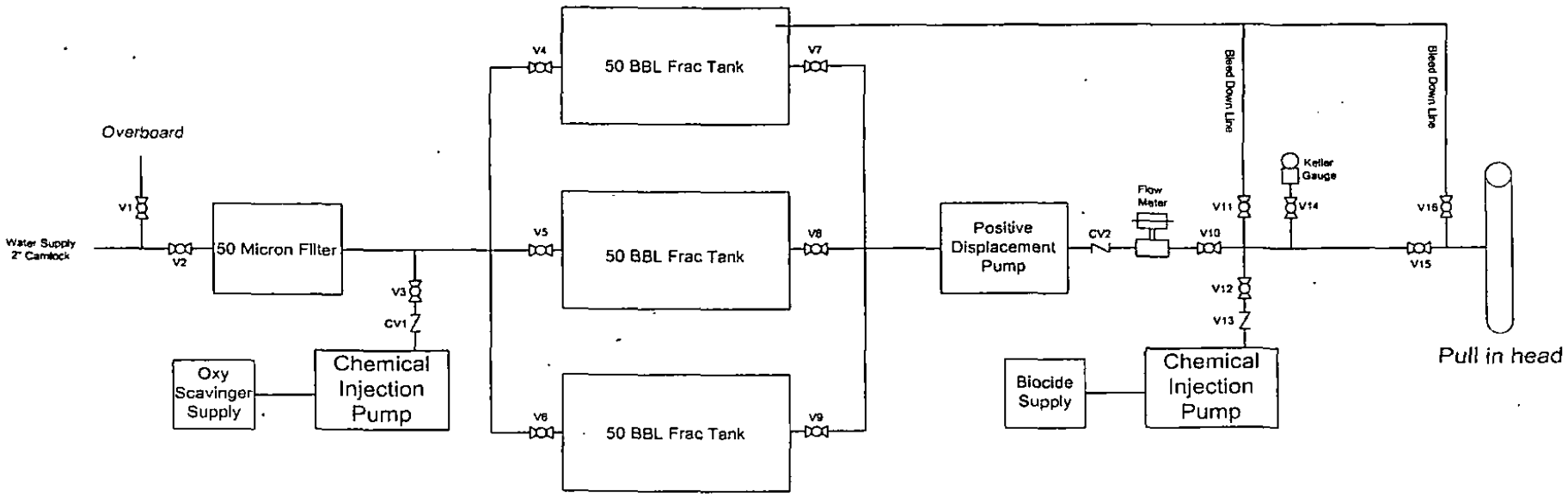
ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
7.	Contact Project Manager or Asset Coordinator to coordinate trucks for equipment and crew to shop. Maintain shipping manifests or other records for Project Manager.	5-4-GL-GL-PSS-00006	P	W	W
8.	Deliver Project Completion Book to Helix at time of final invoice.	WPSS-014550-CB	P	W	W

APPENDIX A: WPSS DIAGRAMS

NUMBER	TITLE
WPSS-014550-DW-02	Flooding Rig-Up Schematic

LEGEND:

- Flowmeter
- Check-valve
- Valve
- Keller Gauge Data Logger



NOTES:

Additional Weatherford equipment not identified in this drawing

This drawing assumes the Express can supply air and water

DESCRIPTION	DATE OF ISSUE	DRAWN BY	CHECKED BY	APPROVED BY
ISSUED FOR INTERNAL USE	19 MAY 11	BS	TS	
ISSUED FOR USE	2 JUNE 11	BS	TS	
ISSUED FOR USE	11 JUNE 11	DL	TW	WB

Weatherford

PIPELINE & SPECIALTY SERVICES
7721 PIEDMONT DR
HOUSTON, TEXAS 77040

CLIENT:	Helix Energy Services	DRAWING NUMBER:	WPSS-014550-DW-02
UNITS:	N/A	DRAWING TITLE:	FLOODING RIG-UP SCHEMATIC
SCALE:	NOT TO SCALE	PROJECT:	NOBLE RATON SOUTH

REVISION: 2

APPENDIX B: ENGINEERING CALCULATIONS

1. Flooding Calculations (Per line)

Pipeline Basic Data: Fill and Test Data

Comments: Noble Raton South

Pipe OD:	4.5	in (actual)			114.30	mm		
Pipe WT:	0.531	in			13.49	mm		
Pipe Length:	145765	ft	27.61	miles	44429.17	m	44.43	km
Fill Pump Rate:	120	gpm			454.24	L/min		
Estimated By-Pass:	3.0%	%						
Test_Press_Max:		psig			0.00	barg	0	kg/cm^2
Pack_Press:	0	psig			0.00	barg	0	kg/cm^2
Press Pump Rate:		gpm			0.00	L/min		
Inhibitor PPM	0	ppm			0.00	ppm		
O2 Scavenger PPM	110	ppm			110.00	ppm		
Biocide PPM	600	ppm			600.00	ppm		
Dye PPM	0	ppm			0.00	ppm		
Actual Volunme to Test Pressure:	0	gal			0.00	L		
Pipe ID:	3.44	in			87.33	mm		
Gal / Foot:	0.4822	gal/ft			5.9891	L/m		
Ft^3 / Foot:	0.06	ft^3/ft			0.01	m^3/m		
Pipeline Total Vol:	70,295.12	gal			266090.24	L		
Pipeline Total Vol:	9,397.09	ft^3			266.10	m^3		
Pipeline Total Vol:	1,673.69	bbl			1673.69	bbl		days
Pipe Fill Time:	10.06	hr	0.42	days	10.06	hr	0.42	km/h
Fill Pig Speed:	4.15	ft/sec	2.83	mph	1.26	m/s	4.55	L/(kg/cm^2)
Gal / psi	0.229370	gal/psi			12.59	L/bar	12.35	
Gal to Test Press:	0.00	gal (at 70 degF)			0.00	L		days
Time to Test Press:	NA	hr	NA	days	NA	hr	NA	(kg/cm^2)/min
Pressurization Rate:	0.00	psi/min	0.00	psi/hr	0.00	bar/min	0.00	tonnes
Est Mill Scale:	1475.80	lb	0.74	tons	669.41	kg	0.67	bbl
Inhibitor Vol:	0.00	gal	0.00	bbl	0.00	L	0.00	bbl
O2 Scavenger Vol:	7.73	gal	0.18	bbl	29.27	L	0.18	bbl
Biocide Vol:	42.18	gal	1.00	bbl	159.65	L	1.00	bbl
Dye Vol:	0.00	gal	0.00	bbl	0.00	L	0.00	bbl
%Trapped Air:	NA				NA			
Max Vol to Press:	140.59	gal			532.18	L		

Trapped Air Acceptance Criterial is 0.2% Maximum

Revision Date: 2-Aug-11

APPENDIX C: WPSS FIELD FORMS

TITLE
Commencement Report (1pg)
Daily Site Reports (DSR) (1pg)
Job Safety Analysis (JSA's) (5pgs)
Field Tickets (6pgs)
Site Safety Meeting (1pg)
Work Safe Plan "Tool Box Talk" (1pg)
Shift Handover Forms (2pgs)
Completion Reports (1pg)
Pumping Report General Purpose (1pg)

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00011	REV: 05	PAGE: 1 of 1	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
PREPARED BY: BIRGIT THIELE	REVIEWED BY: MURDO MORRISON		APPROVED BY: MALCOLM DUNCAN	APPROVED BY:
TITLE:	COMMENCEMENT REPORT			

Project:			Project No.:	
Client:			Client Contract No.:	
Operational Start:	Date:		Time:	
Location:				

Description:

Commencement of the operation described above may be started. All relevant procedures & work instructions have been adhered to.

Weatherford P&SS Rep:	Client:
Name:	Name:
Sign:	Sign:
Date:	Date:

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00006	REV: 05	PAGE: 1 of 1	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
PREPARED BY: BIRGIT THIELE	REVIEWED BY: MURDO MORRISON		APPROVED BY: MALCOLM DUNCAN	APPROVED BY:
TITLE:	DAILY SITE REPORT			

Project Name:			
Project No.:		Operation:	

Date & Time	Operational Details & Remarks

	Name	Signature	Date
Weatherford P&SS Representative			
Client Representative			

Weatherford

PIPELINE & SPECIALTY SERVICES FORM

FORM NUMBER:	REV:	PAGE:	ORIGINAL ISSUE DATE:	REVISION DATE:
3-4-GL-GL-PSS-00004	04	1 of 5	06/14/2004	09/17/2007

PREPARED BY:	REVIEWED BY:	APPROVED BY:	APPROVED BY:
BIRGIT THIELE	CRAIG MORRIS	ADRIAN HOULBROOK	

TITLE: **JOB SAFETY ANALYSIS**

Pre-Job Risk Assessment

Standard Hazards		Hazards Requiring Permits to Work		Hand Protection	
Exposure to Cold/ Heat Extremes	☐	Will a Lock-Out/Tag-Out of Equipment Occur?	☐	Leather Gloves	☐
Presence of or Traveling on Ice, Snow, Water	☐	Will a Confined Space Entry Occur?	☐	Cotton Gloves	☐
Slip/Trip/Fall Hazards	☐	Will Welding, Cutting, or Brazing Occur?	☐	Chemical Resistant Gloves	☐
Pinch Points Present	☐	**Ergonomic Hazards**		Welding Gloves	☐
Poor Lighting	☐	Awkward Position or Balance Will Be Necessary	☐	Vibration Reduction Gloves	☐
Presence of Insects or Wildlife	☐	Poor Posture Will Be Necessary	☐	Insulated Gloves	☐
Wind Conditions	☐	Straining, Lifting, Pushing or Pulling Will Be Necessary	☐	Other	☐
Inclement Weather	☐	Reaching or Climbing Will Be Necessary	☐	**Hearing Protection**	
Physical Hazards		Bending or Twisting Will Be Necessary	☐	Ear Plugs	☐
Pressurized Equipment Hazard	☐	Repetitive Motion Will Be Necessary	☐	Canal Caps	☐
Fire or Explosion Hazard	☐	**Chemical and Material Hazards**		Ear Muffs	☐
Electrical Hazard	☐	Oxygen Content Hazards	☐	**Respiratory Protection**	
Use of Hand Tools or Power Tools	☐	Asbestos Hazards	☐	Air Purifying Respirator	☐
Radiant Energy Hazard (i.e. Welding, Lasers, X-Ray.)	☐	Airborne Dust Hazards	☐	SCBA or Airline Respirator	☐
Flying Debris (Blown or Thrown Particles)	☐	Airborne Toxic Vapour, Fumes or Gas Hazard	☐	Escape Pack	☐
Working at Heights	☐	Absorption of a Chemical Possible	☐	**Special Items**	
High Noise Levels (85dba or greater)	☐	Caustic or Acidic Chemicals	☐	Deluge Station	☐
Lifting Equipment (i.e. Crane, Forklift, Man-lift)	☐	Reactive Chemical Hazard	☐	Active Fall Arrest System	☐
Lifting Equip. (Work on Uneven/Unstable Surfaces)	☐	H2S, CO2 or Natural Gas Hazard	☐	Retrieval System	☐
Access/Egress Hazards or Limitations	☐	**Over Head Protection**		Atmospheric Monitors	☐
Work Practice Hazards		Hard Hat	☐	Cotton or Fire Retardant Clothing	☐
Training Deficiency (Technical and/or HSE)	☐	Safe Zone	☐	Chemical Resistant Clothing (Apron, Cloves, Boots, Etc.)	☐
SSE/SPE Present	☐	**Foot Protection (ANSI Approved)**		Fire Extinguisher	☐
Culture and/or Communication Deficiency	☐	Steel Toe Shoes or Boots	☐	First Aid Kit	☐
Testing and Inspection Hazards	☐	Chemical Resistant Boots	☐		
Performance of a Non-Routine Task Will Occur	☐	Slip, Heat or Puncture Resistant Soles	☐		
Shift Changes Will Occur During Operations	☐	Other	☐		
Policy Variance Will Occur	☐				

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 3-4-GL-GL-PSS-00004	REV: 04	PAGE: 2 of 5	ORIGINAL ISSUE DATE: 06/14/2004	REVISION DATE: 09/14/2007
TITLE:	JOB SAFETY ANALYSIS			

Comments

States	Critical Errors
•	•
•	•
•	•
•	•

Analysis

Job:			Page: of (Use Additional Pages if Necessary)
Location:			Supervisor:
Date:	New ☐	Revised ☐	Reviewed By:

Correctly Sequenced Job Steps	Potential Hazards (Be Specific)	Actions to Eliminate or Reduce Hazards	Assigned Person
1.			
Specific Job Site Hazard			
2.			
Specific Job Site Hazard			

3.			
Specific Job Site Hazard			
4.			
Specific Job Site Hazard			
5.			
Specific Job Site Hazard			
6.			
Specific Job Site Hazard			

7.			
Specific Job Site Hazard			
8.			
Specific Job Site Hazard			
9.			
Specific Job Site Hazard			
10.			
Specific Job Site Hazard			

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 3-4-GL-GL-PSS-00004	REV: 04	PAGE: 5 of 5	ORIGINAL ISSUE DATE: 06/14/2004	REVISION DATE: 09/14/2007
TITLE:	JOB SAFETY ANALYSIS			

Verification of Job Safety Analysis

I have participated in the analysis of this job. I understand the hazards involved in this job. I understand I have an obligation to stop the job if I observe any unsafe acts or conditions to myself or any other person.

Name (Print)	Signature	Company	SSE? (✓)	Mentor? (✓)
YOU HAVE THE POWER				
TO STOP THE JOB				

Post Review of JSA Completed ☐

JSA Requires Update because of: ☐ New Hazard ☐ Near-miss ☐ Injury Incident ☐ Environmental Incident

Distribution:

- Send completed JSA to local Management and Local QHSE
- If Revision is required send this document to Local QHSE, Corporate QHSE, Area Management and Product Line Management

Weatherford

PIPELINE & SPECIALTY SERVICES FORM

FORM NUMBER:	REV:	PAGE:	ORIGINAL ISSUE DATE:	REVISION DATE:
5-4-GL-GL-PSS-00008	07	1 of 6	02/24/2004	05/10/2011

PREPARED BY:	REVIEWED BY:	DOCUMENT APPROVED BY :	ISSUE APPROVED BY:
BIRGIT THIELE	IAN CONDIE / PEGGY CUELLAR	PEGGY CUELLAR	FRASER MCDOWELL

TITLE: **FIELD TICKET**

EQUIPMENT REGISTER

☐ Offshore ☐ Onshore

Project Name:		Project Number:	
Month:		S= Standby	W= Working / T= Transit

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Asset Description / Serial Number																															
Client Initials:																															

Weatherford P&SS Representative Name:		Client Representative Name:		Company Representative Name:	
Weatherford P&SS Representative Sign:		Client Representative Sign:		Company Representative Sign:	
Date:		Date:		Date:	

Weatherford

PIPELINE & SPECIALTY SERVICES FORM

FORM NUMBER:	REV:	PAGE:	ORIGINAL ISSUE DATE:	REVISION DATE:
5-4-GL-GL-PSS-00008	07	2 of 6	02/24/2004	05/10/2011

TITLE: **FIELD TICKET**

EQUIPMENT REGISTER		☐ Offshore	☐ Onshore	
Project Name:		Project Number:		
Month:		S= Standby	W= Working	T= Transit

Day		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Asset Description	Serial Number																															
Client Initials:																																

Weatherford P&SS Representative Name:		Client Representative Name:		Company Representative Name:	
Weatherford P&SS Representative Sign:		Client Representative Sign:		Company Representative Sign:	
Date:		Date:		Date:	

Weatherford

PIPELINE & SPECIALTY SERVICES FORM

FORM NUMBER: 5-4-GL-GL-PSS-00008	REV: 07	PAGE: 3 of 6	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 05/10/2011

TITLE: **FIELD TICKET**

PERSONNEL REGISTER		☐ Offshore		☐ Onshore
Project Name:		**Project Number:**		
Month:		**S= Standby**	**W= Working**	**T= Transit**

	Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
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Client Initials:																																

Weatherford P&SS Representative Name:		*Client Representative Name:*		Company Representative Name:	
Weatherford P&SS Representative Sign:		*Client Representative Sign:*		Company Representative Sign:	
Date:		Date:		Date:	

Weatherford

PIPELINE & SPECIALTY SERVICES FORM

FORM NUMBER: 5-4-GL-GL-PSS-00008	REV: 07	PAGE: 4 of 6	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 05/10/2011

TITLE:	FIELD TICKET

PERSONNEL REGISTER		☐ Offshore	☐ Onshore	
Project Name:		Project Number:		
Month:		S= Standby	W= Working	T= Transit

	Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
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Client Initials:																																

Weatherford P&SS Representative Name:		Client Representative Name:		Company Representative Name:	
Weatherford P&SS Representative Sign:		Client Representative Sign:		Company Representative Sign:	
Date:		Date:		Date:	

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00008	REV: 07	PAGE: 5 of 6	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 05/10/2011
TITLE:	FIELD TICKET			

CONSUMABLE REGISTER				
Project Name:		Project Number:		
Month:		S= Standby	W= Working	T= Transit

Day		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
UOM	Description																															
Client Initials:																																

Weatherford P&SS Representative Name:		Client Representative Name:		Company Representative Name:	
Weatherford P&SS Representative Sign:		Client Representative Sign:		*Company Representative Sign:*	
Date:		Date:		Date:	

Weatherford

PIPELINE & SPECIALTY SERVICES FORM

FORM NUMBER:	REV:	PAGE:	ORIGINAL ISSUE DATE:	REVISION DATE:
5-4-GL-GL-PSS-00008	07	6 of 6	02/24/2004	05/10/2011

TITLE: **FIELD TICKET**

VEHICLE MILEAGE or EQUIPMENT HOURS REGISTER

Project Name:		**Project Number:**	
Month:		**S= Standby**	**W= Working** **T= Transit**

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Description/Miles or Hours																															
Client Initials:																															

Weatherford P&SS Representative Name:		Client Representative Name:		Company Representative Name:	
Weatherford P&SS Representative Sign:		Client Representative Sign:		Company Representative Sign:	
Date:		Date:		Date:	

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 7-4-GL-GL-PSS-00003	REV: 05	PAGE: 1 of 1	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
PREPARED BY: BIRGIT THIELE	REVIEWED BY: MURDO MORRISON		APPROVED BY: MALCOLM DUNCAN	APPROVED BY:
TITLE:	SITE SAFETY MEETING			

Project Name:		Date:	
Project No.		Place:	

Meeting Agenda:
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.

Safety Meeting Attendees	
Name:	Signature:

Weatherford

PIPELINE & SPECIALTY SERVICES FORM

FORM NUMBER:	REV:	PAGE:	ORIGINAL ISSUE DATE:	REVISION DATE:
7-4-GL-GL-PSS-00001	05	1 of 1	02/24/2004	04/02/2007

PREPARED BY:	REVIEWED BY:	APPROVED BY:	APPROVED BY:
BIRGIT THIELE	MURDO MORRISON	MALCOLM DUNCAN	

TITLE: **WORK SAFE PLAN "TOOL BOX TALK"**

1. Write the name of the job task in the space provided.	Project Name	
2. In the first column, list all possible hazards involved in the task or job.	Project Number	
3. In the second column provide the corrective actions that will be taken to prevent hazards.	Date	
4. In the third column list the resources that are needed to achieve the "safe work plan".	Authorised By	
5. Have team members that helped develop this safe work plan sign their name in the space provided at the bottom.		

JOB / TASK

Hazard	Safe Work Plan	Resources	Prompts (not exhaustive)
			General Hazards: Fall protection, guard rails, edge protection, tie off points for safety harnesses, heavy lifts, chemicals, materials and tools, fire risk, access / egress, housekeeping.
			Permit to Work: Excavation, hot work, electrical, confined space, lift, and shaft.
			PPE: Helmet, boots, vests, glasses, goggles, dust mask, gloves, earmuff, ear plugs, safety harness, respirator
			Personnel: Enough personnel on site. Lookout / warning men, banks men

Team members signature:		

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00007	REV: 05 .	PAGE: 1 of 2	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
PREPARED BY: BIRGIT THIELE	REVIEWED BY: MURDO MORRISON		APPROVED BY: MALCOLM DUNCAN	APPROVED BY:
TITLE:	SHIFT HANDOVER FORM			

Project:		Project Number:	
Job Location/System		Date:	
		Time:	

Work Completed (Previous shift):

Work In Progress:

Work to be done in next shift:

System / Pipeline status:

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00007	REV: 05	PAGE: 2 of 2	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
TITLE:	SHIFT HANDOVER FORM			

Permit status:

Barriers / Signs status:

Procedural / system status:

Operational Equipment / safety equipment status / hookup status/ consumable status:

Handover:		Accepted:	
Name:		Name:	
Signed:		Signed:	
Date:		Date:	
Time:		Time:	

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00013	REV: 05	PAGE: 1 of 1	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
PREPARED BY: BIRGIT THIELE	REVIEWED BY: MURDO MORRISON		APPROVED BY: MALCOLM DUNCAN	APPROVED BY:
TITLE:	COMPLETION REPORT			

Project:			Project No.:	
Client:			Client Contract No.:	
Operational End:	Date:		Time:	
Location:				

Description:

The operation described above has been completed in full conformity with the client.

Weatherford P&SS Rep:	Client:
Name:	Name:
Sign:	Sign:
Date:	Date:

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00012	REV: 07	PAGE: 1 of 1	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
PREPARED BY: BIRGIT THIELE	REVIEWED BY: MURDO MORRISON		APPROVED BY: MALCOLM DUNCAN	APPROVED BY:
TITLE:	PUMPING REPORT GENERAL PURPOSE			

Project:		Project Number:	
Client:		Contract Number:	
Operation:			
Location:		Medium	
System / Pipeline Description:			

Time	Discharge Pressure	Discharge Temp	Flow Rate	System / Line Pressure	Volume Pumped	Remarks

Weatherford P&SS Rep:	
Name:	
Sign:	
Date:	

APPENDIX D: HELIX SUPPLIED DRAWINGS

NUMBER	TITLE
16172-A100 Rev 01	Raton South Scope of Supply Schematic

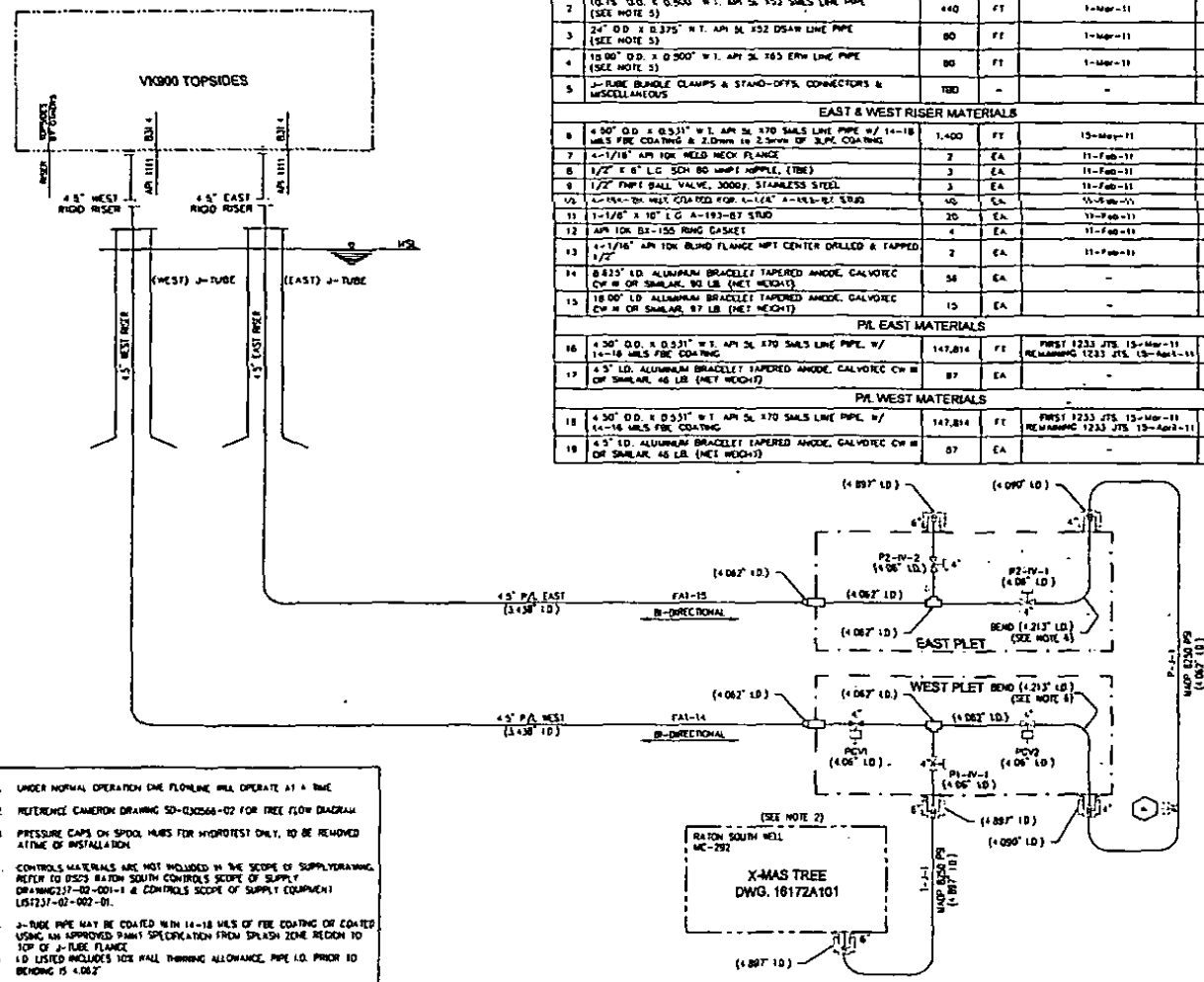
SCOPE OF SUPPLY BILL OF MATERIALS

ITEM	DESCRIPTION	QTY.	UNIT	ANTICIPATED ISSUE DATE	PROVIDED BY
	J-TUBE BUNDLE (EAST & WEST J-TUBES) MATERIALS				
1	8.625" O.D. X 0.500" W.T. API 5L X52 SMLS LINE PIPE (SEE NOTE 3)	1040	FT	1-Mar-11	COMPANY
2	10.75" O.D. X 0.500" W.T. API 5L X52 SMLS LINE PIPE (SEE NOTE 5)	440	FT	1-Mar-11	COMPANY
3	24" O.D. X 0.375" W.T. API 5L X52 DSAW LINE PIPE (SEE NOTE 5)	80	FT	1-Mar-11	COMPANY
4	18.00" O.D. X 0.500" W.T. API 5L X65 ERW LINE PIPE (SEE NOTE 5)	80	FT	1-Mar-11	COMPANY
5	J-TUBE BUNDLE CLAMPS & STAND-OFFS, CONNECTORS & MISCELLANEOUS	TBD	-	-	CONTRACTOR
	EAST & WEST RISER MATERIALS				
6	4.50" O.D. X 0.531" W.T. API 5L X70 SMLS LINE PIPE W/ 14-18 MILS FBE COATING & 2.0mm to 2.5mm OF 3LPE COATING	1,400	FT	15-May-11	COMPANY
7	4-1/16" API 10K WELD NECK FLANGE	2	EA	11-Feb-11	COMPANY
8	1/2" X 6" LG SCH 80 MNPT NIPPLE, (TBE)	3	EA	11-Feb-11	COMPANY
9	1/2" FNPT BALL VALVE, 3000#, STAINLESS STEEL	3	EA	11-Feb-11	COMPANY
10	4-1/16" 10K HEX COATED FOR 1-1/4" A-193-B7 STUD	40	EA	11-Feb-11	COMPANY
11	1-1/8" X 10" LG A-193-B7 STUD	20	EA	11-Feb-11	COMPANY
12	API 10K BX-155 RING GASKET	4	EA	11-Feb-11	COMPANY
13	4-1/16" API 10K BLIND FLANGE NPT CENTER DRILLED & TAPPED 1/2"	2	EA	11-Feb-11	COMPANY
14	8.625" I.D. ALUMINUM BRACELET TAPERED ANODE, GALVOTEC CW III OR SIMILAR, 90 LB (NET WEIGHT)	56	EA	-	CONTRACTOR
15	18.00" I.D. ALUMINUM BRACELET TAPERED ANODE, GALVOTEC CW III OR SIMILAR, 87 LB (NET WEIGHT)	15	EA	-	CONTRACTOR
	P/L EAST MATERIALS				
16	4.50" O.D. X 0.531" W.T. API 5L X70 SMLS LINE PIPE, W/ 14-18 MILS FBE COATING	147,814	FT	FIRST 1233 JTS. 15-Mar-11 REMAINING 1233 JTS. 15-Apr-11	COMPANY
17	4.5" I.D. ALUMINUM BRACELET TAPERED ANODE, GALVOTEC CW III OR SIMILAR, 46 LB (NET WEIGHT)	87	EA	-	CONTRACTOR
	P/L WEST MATERIALS				
18	4.50" O.D. X 0.531" W.T. API 5L X70 SMLS LINE PIPE, W/ 14-18 MILS FBE COATING	147,814	FT	FIRST 1233 JTS. 15-Mar-11 REMAINING 1233 JTS. 15-Apr-11	COMPANY
19	4.5" I.D. ALUMINUM BRACELET TAPERED ANODE, GALVOTEC CW III OR SIMILAR, 46 LB (NET WEIGHT)	87	EA	-	CONTRACTOR

SCOPE OF SUPPLY BILL OF MATERIALS

ITEM	DESCRIPTION	QTY.	UNIT	ANTICIPATED ISSUE DATE	PROVIDED BY
	P-J-1 MATERIALS				
20	5.563" O.D. X 0.750" W.T. API 5L GR X65 SMLS LINE PIPE, W/ 14-18 MILS FBE COATING	160	FT	1-May-11	COMPANY
21	5.563" O.D. X 0.750" W.T. API 5L X65, 90 DEG. 5D (75°) BEND PER DRAWING 16172-M002	8	EA	1-May-11	CONTRACTOR
22	4-1/16" 10K REMOTE ARTICULATED CONNECTOR W/ 2" PUPS	2	EA	1-May-11	COMPANY
23	BAC COMPACT RUNNING TOOLS	2	EA	14-June-11	COMPANY
24	MEASUREMENT INTERFACE CAP & FABRICATION JIG FOR OIL STATES 4-1/16" 10K	2	-	1-May-11	COMPANY
25	CLAMPON, PIGGING DETECTOR 5.63" PIPE	1	EA	20-July-11	COMPANY
	T-J-1 MATERIALS				
26	8.625" O.D. X 0.864" W.T. API 5L X60 SMLS LINE PIPE, W/ 14-18 MILS FBE COATING & 1.5" CSPU INSULATION	80	FT	1-May-11	COMPANY
27	8.625" O.D. X 0.864" W.T. API 5L X60, 90 DEG. 5D (30") BEND PER DRAWING 16172-M003	8	EA	1-May-11	CONTRACTOR
28	MEASUREMENT INTERFACE CAP & FABRICATION JIG FOR CAMERON 6"10K	2	-	1-May-11	COMPANY
29	6" 10K COLLET VERTICAL CONNECTORS w/ 2' PUPS	3	-	13-Dec-10	COMPANY
30	CVC HYDRAULIC RUNNING TOOL	2	-	14-June-11	COMPANY
	EAST PLET MATERIALS				
31	5.563" O.D. X 0.750" W.T. API X65 SMLS LINE PIPE, W/ 14-16 MILS FBE COATING	140	FT	1-May-11	COMPANY
32	4-1/16" 10K SHORT TERM PRESSURE CAPS FOR HUBS	1	EA	1-May-11	COMPANY
33	6" 10K CAMERON LONG TERM PRESSURE CAPS FOR HUBS	1	EA	1-May-11	COMPANY
34	API 6" 10K VERTICAL HUB, CAMERON	1	EA	13-Dec-10	COMPANY
35	API 4-1/16" 10K VERTICAL HUB, OIL STATES	1	EA	1-May-11	COMPANY
36	6" HUB GASKETS	3	EA	1-May-11	COMPANY
37	4-1/16" HUB GASKETS	2	EA	1-May-11	COMPANY
38	4-1/16" 10K ROV MANUAL GATE VALVES	2	EA	5-May-11	COMPANY
39	5.563" O.D. X 0.750" W.T. API 5L X65, 90 DEG. 5D (75°) BEND PER HELIX DWG 11268-EN-DC-A3903	1	EA	-	CONTRACTOR
40	GALVANIC STRUCTURAL ANODES	TBD	-	-	CONTRACTOR
41	FORGED ANCHOR FLANGE, PER HELIX DWG 11268-EN-DC-A3902	1	-	-	CONTRACTOR
42	HUB CLEANING TOOL	1 TBC	-	14-June-11	COMPANY
43	FORGED BAR TEE, PER HELIX DWG 11268-EN-DC-A3901	1	-	-	CONTRACTOR
	WEST PLET MATERIALS				
44	5.563" O.D. X 0.750" W.T. API X65 SMLS LINE PIPE, W/ 14-16 MILS FBE COATING	140	FT	1-May-11	COMPANY
45	4-1/16" 10K SHORT TERM PRESSURE CAPS FOR HUBS	1	EA	1-May-11	COMPANY
46	6" 10K CAMERON SHORT TERM PRESSURE CAPS FOR HUBS	1	EA	1-May-11	COMPANY
47	API 4-1/16" 10K VERTICAL HUBS	1	EA	1-May-11	COMPANY
48	API 6" 10K VERTICAL HUB	1	EA	1-May-11	COMPANY
49	6" HUB GASKETS	5*	EA	1-May-11	COMPANY
50	4-1/16" HUB GASKETS	2	EA	1-May-11	COMPANY
51	4-1/16" 10K ROV MANUAL GATE VALVES	1	EA	5-May-11	COMPANY
52	4-1/16" 10K SUBSEA HYDRAULIC OPERATED FAIL-SAFE VALVES	2	EA	5-May-11	COMPANY
53	5.563" O.D. X 0.750" W.T. API 5L X65, 90 DEG. 5D (75°) BEND, PER HELIX DWG 11268-EN-DC-A3903	1	EA	-	CONTRACTOR
54	GALVANIC STRUCTURAL ANODES	TBD	-	-	CONTRACTOR
55	FORGED ANCHOR FLANGE, PER HELIX DWG 11268-EN-DC-A3902	1	-	-	CONTRACTOR
56	HUB CLEANING TOOL	1 TBC	-	14-June-11	COMPANY
57	FORGED BAR TEE, PER HELIX DWG 11268-EN-DC-A3901	1	-	-	CONTRACTOR

* INCLUDES QUANTITY FOR TREE HUB CONNECTION



NOTE:

1. UNDER NORMAL OPERATION ONE FLOWLINE WILL OPERATE AT A TIME
2. REFERENCE CAMERON DRAWING 50-0X0566-02 FOR TREE FLOW DIAGRAM
3. PRESSURE CAPS ON SPOOL HUBS FOR HYDROTEST ONLY, TO BE REMOVED AT TIME OF INSTALLATION
4. CONTROLS MATERIALS ARE NOT INCLUDED IN THE SCOPE OF SUPPLY DRAWING. REFER TO DSCS RATON SOUTH CONTROLS SCOPE OF SUPPLY DRAWING 237-02-001-1 & CONTROLS SCOPE OF SUPPLY EQUIPMENT LIST 237-02-002-01.
5. J-TUBE PIPE MAY BE COATED WITH 14-18 MILS OF FBE COATING OR COATED USING AN APPROVED PAINT SPECIFICATION FROM SPLASH ZONE REGION TO TOP OF J-TUBE FLANGE
6. I.D. LISTED INCLUDES 10% WALL THINNING ALLOWANCE, PIPE I.D. PRIOR TO BENDING IS 4.062"

LINES AND SYMBOLOGY LEGEND

NO	BY	REVISION DESCRIPTION	DATE	CHK	QAC	APPR
1	GLS	UPDATED BEND and FINAL GRADE FOR P-J-1 AMPER	05/23/11	BP	BP	BP
0	GLS	APPROVED FOR CONSTRUCTION	04/15/11	KA	BP	BP

DESIGNED & DRAWN BY J. GONZALES DATE 04/12/11
CHKD BY G. BYER DATE 04/15/11
APP'D BY B. BUNCH DATE 04/15/11
FILE SCALE: N/A
SCALE: N.T.S.

THESE RESOURCES ENGINEERING INFO

noble energy

UniversalPegasus International

Pegasus International, Inc.

RATON SOUTH TO VK900

RATON SOUTH SCOPE OF SUPPLY SCHEMATIC

JOB NO. 16172 DWG NO. 16172A100 REV 1

BAKER HUGHES

Baker Petrolite

Raton South Hydrotest Recommendation

Introduction:

Before a new or rehabilitated pipeline is placed into service, it must be tested for integrity at a pressure above its designed working pressure. This is usually done with water, which may remain in the system for an extended period of time.

Water used in hydrostatic testing usually comes from one of several sources: aquifers, rivers, ponds, seas, etc. The use of water from any of these sources can cause corrosion and introduce bacteria into the pipeline. The severity of the problem is dependent upon the type and quality of water used, the length of time the water remains in the line, and the ambient temperature,

While the line is filled with water it is subjected to three types of corrosion:

1. Direct reaction of dissolved oxygen with the steel pipe to form ferric oxide/ hydroxide. Pitting may be initiated. This mechanism is not generally serious because the concentration of dissolved oxygen in the water is rapidly depleted due to the reaction with the pipe wall, Our tests indicate that corrosion due to oxygen content, even with air-saturated waters, is usually minimal in a closed steel pipeline and problems rarely result from this mechanism,
2. Localized pitting and corrosion resulting from the growth of sulfate reducing bacteria (SRB) and acid producing bacteria (APB).
3. Attack by hydrogen sulfide produced as a result of SRB growth.

Mechanisms 2 and 3, which involve bacterial growth, are the most serious concerns in hydrotest waters. Sea water and high TDS brines have a greater potential for corrosion than fresh water due to their higher conductivity and sulfate levels,

Conventional wisdom has it that to protect against corrosion during hydrostatic testing, you must add three types of chemicals to the water: on oxygen scavenger, a biocide and a corrosion inhibitor. For large or long pipelines, this can be exceedingly expensive.

BHI research data indicates that much of this expense is not necessary, In a closed system, oxygen is exhausted long before pitting due to oxygen becomes a problem. Controlling bacterial growth is generally sufficient to protect a pipeline from hydrotest damage. This can be accomplished by adding a biocide to the water prior to introducing it into the pipeline.

Baker Petrolite

Recommendation:

Recommendations were based upon the following information:

Water Source: Sea water
Water Quality: Sea water
Expected min. Temp: 40 F
Expected max. Temp: 72 F
Expected ph of water: Sea Water
West Flowline Length: approx. 145402 ft (includes riser length)
East Flowline Length: approx 145335 ft (includes riser length)
Flowline diameter (ID): 3.438 inches
PLET Piping diameter (ID): 4.063 inches
Pigging Jumper diameter (ID): 4.063 inches
Well Jumper diameter (ID): 4.987 inches
Expected shut in duration: 30 to 60 days **(recommendation based on 90 day max)**
Volume of Water: approx. 3343 bbls
Expected min. pressure: 10,313 psi
Expected max. pressure: not to exceed 10, 413 psi
Disposal method: Overboard

Biocide: 600 ppm (88.2 gallons) of XC102 is recommended for these hydrostatic test waters. This assumes a shut-in period not to exceed 90 days and a pH not to exceed 8. The recommended minimum and allowable concentration of active glutaraldehyde at disposal will be 50 ppm (see EPA Discharge Attachment).

Oxygen Scavenger: 11 ppm OSW490 for each ppm of oxygen is recommended for removal of the dissolved oxygen. Sea water typically contains between 8-10 ppm of dissolved oxygen.

Product Application:

Before pumping the hydrostatic test water into the pipeline, a specific treatment regime should be followed to avoid interactions between the products, The oxygen scavenger will deactivate the biocide, so they should not be mixed. The following is a recommended procedure for treating and mixing the water,

1. Measure the amount of dissolved oxygen in the water to be treated. Determine the amount of oxygen scavenger needed (11ppm OSW490 per

ppm oxygen in the water).

2. To remove oxygen, continuously inject the required amount of OSW490 into the seawater upstream of the seawater tank. Allow approximately 3 to 4 minutes for complete scavenging (**see table A below**). Best results are achieved in a closed system to avoid oxygen re-contamination. Because XC102 will interact with the oxygen scavenger, it is important to allow the recommended scavenging time to avoid biocide deactivation. However since the neutralization rate is 1:1 ratio the small OSW490 residual will not have much impact on the biocide treatment in this case.
3. Add the required amount of XC102 to the tank and mix gently or pump in on the fly.

Table A

Temp	pH	O_2 Concentration in ppm after time in minutes									
		0	0.5	1	1.5	2	3	4	5	6	7
20°C	pH 5	8.2	3.8	1.6	1.3	0.9	0.7	0.4	0.2	0.1	0
	pH 6	9	4.3	1.2	0.9	0.6	0.4	0.2	0.1	0	
	pH 7	7.5	6	1.9	0.6	0.3	0.1	0			
30°C	pH 5	7.1	2.9	2.1	1.4	0.6	0.4	0.2	0.1	0	
	pH 6	6.8	1.7	0.6	0.4	0.2	0.1	0			
	pH 7	6.8	1.2	0.6	0.2	0.1	0				

Fluid Disposal:

HYDROSTATIC TEST FLUIDS CONTAINING RESIDUAL LEVELS OF BIOCIDE SHOULD BE DISPOSED OF IN ACCORDANCE WITH PERTINENT STATE AND FEDERAL REGULATIONS.

Hydrostatic test fluids containing XC102 bactericide may be detoxified prior to their release to surface waters, dependent upon the residual level of biocide. A 1:1 ratio of OSW490 should be used if neutralization is necessary. An in-line mixer or surge tank should be used to promote mixing of the detoxifying agent with the hydrostatic test water. A 30-second contact time is sufficient for detoxification to take place. Dilution of the hydro test water with additional seawater can also help to achieve detoxification therefore minimizing risks. If the discharge from a hydrostatic test

displaces a substantial percentage of the receiving water (such as a stream or a small bay), then the discharge should be re-aerated to avoid a fish kill due to the lack of oxygen. Discussions should be held with Cetco to inform them of the relatively small amount of production chemicals that will be returning to VK900 in the dewatering operation. These products are listed below:

PAO3045 – Paraffin Inhibitor

PAO3042 – Asphaltene Inhibitor

PFR14UC – Flushing Solvent

Transaqua – Storage Fluid

Methanol –

Cetco can design their system to capture most of these fluids using their weir tanks, etc. Small residuals can be filtered. Baker representatives can be available to participate in the discussion.

Material Safety Data Sheet

1. Product and company identification

Product name	: OSW490 OXYGEN SCAVENGER
Supplier	: Baker Petrolite A Baker Hughes Company 12645 W. Airport Blvd. Sugar Land, TX 77478 For Product Information/MSDSs Call: 800-231-3606 (8:00 a.m. - 5:00 p.m. cst, Monday - Friday) 281-276-5400
Material Uses	: Special: Oxygen scavenger.
Code	: OSW490
Validation date	: 3/9/2010.
Print date	: 3/9/2010.
Version	: 3
Responsible name	: Global Regulatory Affairs - Telephone 281-276-5400 or 800-231-3606
In case of emergency	: CHEMTREC: 800-424-9300 (U.S. 24 hour) Baker Petrolite: 800-231-3606 (001)281-276-5400 CANUTEC: 613-996-6666 (Canada 24 hours) CHEMTREC Int'l 01-703-527-3887 (International 24 hour)

2. Hazards identification

Physical state	: Liquid. [Clear.]
Odor	: Pungent.
Color	: Greenish-yellow.
OSHA/HCS status	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Emergency overview	: WARNING! CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. Do not get in eyes. Avoid breathing vapor or mist. Avoid contact with skin and clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.
Routes of entry	: Dermal contact. Eye contact. Inhalation.

Potential acute health effects

Inhalation	: Irritating to respiratory system.
Ingestion	: Ingestion may cause gastrointestinal irritation and diarrhea.
Skin	: Irritating to skin.
Eyes	: Severely irritating to eyes. Risk of serious damage to eyes.

Potential chronic health effects

Over-exposure signs/symptoms

Inhalation	: respiratory tract irritation, coughing
Ingestion	: None known.
Skin	: irritation, redness
Eyes	: pain or irritation, watering, redness

See toxicological information (section 11)

Additional information

Corrosive to metal.

3 . Composition/information on ingredients

Name	CAS number	%
Ammonium bisulfite	10192-30-0	30 - 60

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

5 . Fire-fighting measures

Flammability of the product : In a fire or if heated, a pressure increase will occur and the container may burst.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Hazardous thermal decomposition products : *nitrogen oxides,sulfur oxides*

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Dispose of via a licensed waste disposal contractor.

6 . Accidental release measures

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1-800-424-8802.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Use only with adequate ventilation. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see section 10). Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
'gredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
No exposure limit value known.											

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before re-use.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves: Butyl rubber gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state	:	Liquid. [Clear.]
Flash point	:	Not available.
Auto-ignition temperature	:	*Not available.*
Flammable limits	:	Not available.
Color	:	Greenish-yellow.
Odor	:	Pungent.
pH	:	5 to 5.5
	:	Neat - without dilution.
Boiling/condensation point	:	Not available.
Initial Boiling Point	:	Not available.
Melting/freezing point	:	Not available.
Relative density	:	1.298 (16°C)
Density	:	10.81 (lbs/gal)
Vapor density	:	>1 [Air = 1]
Odor threshold	:	Not available.
Evaporation rate	:	Not available.
VOC	:	Not available.
Viscosity	:	Not available.
Solubility (Water)	:	Soluble
Vapor pressure	:	Not available.
Pour Point	:	Not available.
Partition coefficient (LogKow)	:	Not available.

10 . Stability and Reactivity

Chemical stability	:	The product is stable.
Possibility of hazardous *reactions*	:	Under normal conditions of storage and use, hazardous reactions will not occur.
Hazardous polymerization	:	Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid	:	No specific data.
Materials to avoid	:	Reactive or incompatible with the following materials: oxidizing materials, acids and alkalis.
***Hazardous decomposition* products**	:	*Under normal conditions of storage and use, hazardous decomposition products should* not be produced.
Conditions of reactivity	:	Non-flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

11 . Toxicological information

No additional information.

Chronic toxicity Remarks

1) Ammonium bisulfite

Ammonium bisulfite is a component of this product. Prolonged contact can produce corrosion of the skin and permanent damage to the eye. Under acidic conditions, sulfur dioxide may be formed. Inhalation of sulfur dioxide can cause stricture of the esophagus, acute pulmonary edema, and respiratory failure. Sulfur dioxide has been linked to miscarriages, gynecological disease, and abnormal pregnancies (Reprotext).

The ACGIH exposure limits for sulfur dioxide are TWA of 2 ppm and STEL of 5 ppm. The OSHA exposure limit for sulfur dioxide is a TWA of 5 ppm.

11 . Toxicological information

12 . Ecological information

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
OSW490 OXYGEN SCAVENGER	Acute LC50 103 mg/l	Fish - Bluegill sunfish	96 hours
	Acute LC50 100 mg/l	Fish - Threespine stickleback	96 hours

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

Additional information

An EcoTox™ Report, and/or the material's environmental fate is available upon request at the following number: 1-800-235-4249, then press 4.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

sposal should be in accordance with applicable regional, national and local laws and regulations.

efer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	UN2693	BISULFITES, AQUEOUS SOLUTION, N.O.S. (Contains: Ammonium bisulfite)	8	III		-
TDG Classification	UN2963	BISULFITES, AQUEOUS SOLUTION, N.O.S. (Contains: Ammonium bisulfite)	8	III		-
IMDG Class	UN2693	BISULPHITES, AQUEOUS SOLUTION, N.O.S. (Contains: Ammonium bisulfite)	8	III		Emergency schedules (EmS) F-A S-B

PG* : Packing group

DOT Reportable Quantity Ammonium bisulfite, 916 gal of this product.

14 . Transport information

Marine pollutant Not applicable.

North-America NAERG : 154

15 . Regulatory information

HCS Classification : Irritating material

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: ammonium hydrogensulphite
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: OSW490 OXYGEN SCAVENGER: Immediate (acute) health hazard

CERCLA: Hazardous substances.: ammonium hydrogensulphite: 5000 lbs. (2270 kg);
Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: ammonium hydrogensulphite

Clean Air Act (CAA) 112 accidental release prevention: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) : Not listed

SARA 313

	Product name	CAS number	Concentration
Supplier notification	Ammonium bisulfite	10192-30-0	30 - 60

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada

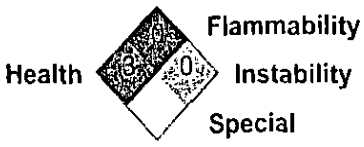
WHMIS (Canada) : Class D-2B: Material causing other toxic effects (Toxic).
Class E: Corrosive material

Canada (CEPA DSL): : All components are listed or exempted.

16 . Other information

Label requirements : CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION.

National Fire Protection Association (U.S.A.) :



Date of printing : 3/9/2010.

Indicates information that has changed from previously issued version.

Notice to reader

16 . Other information

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Material Safety Data Sheet

1. Product and company identification

Product name	: X-CIDE™ 102 INDUSTRIAL BACTERICIDE ™ a trademark of Baker Hughes, Inc.
Supplier	: Baker Petrolite A Baker Hughes Company 12645 W. Airport Blvd. Sugar Land, TX 77478 For Product Information/MSDSs Call: 800-231-3606 (8:00 a.m. - 5:00 p.m. cst, Monday - Friday) 281-276-5400
Material Uses	: Special: Industrial Bactericide.
Code	: XC102
Validation date	: 11/2/2009.
Print date	: 11/2/2009.
Version	: 3
Responsible name	: Global Regulatory Affairs - Telephone 281-276-5400 or 800-231-3606
In case of emergency	: CHEMTREC: 800-424-9300 (U.S. 24 hour) Baker Petrolite: 800-231-3606 (001)281-276-5400 CANUTEC: 613-996-6666 (Canada 24 hours) CHEMTREC Int'l 01-703-527-3887 (International 24 hour)

2. Hazards identification

Physical state	: Liquid.
Odor	: Fruity. Medicinal. [Strong]
Color	: Colorless.
OSHA/HCS status	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Emergency overview	: DANGER! CAUSES EYE BURNS. CAUSES RESPIRATORY TRACT AND SKIN IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. MAY BE HARMFUL IF SWALLOWED. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. Do not breathe vapor or mist. Do not ingest. Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.
Routes of entry	: Dermal contact. Eye contact. Inhalation.

Potential acute health effects

Inhalation	: Severely irritating to the respiratory system.
Ingestion	: Harmful if swallowed. May cause burns to mouth, throat and stomach.
Skin	: Severely irritating to the skin. May cause sensitization by skin contact.
Eyes	: Corrosive to eyes. Causes burns.

Potential chronic health effects

Chronic effects	: Contains material that may cause target organ damage, based on animal data. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.
Target organs	: Contains material which may cause damage to the following organs: upper respiratory tract, skin, eye, lens or cornea.

Over-exposure signs/symptoms

Inhalation	: respiratory tract irritation, coughing
Ingestion	: None known.

2 . Hazards identification

Skin	: irritation, redness
Eyes	: pain, watering, redness
Medical conditions aggravated by over-exposure	: Pre-existing skin disorders and disorders involving any other target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

Additional information

Glutaraldehyde may stain skin and nails to brown or golden brown color.Glutaraldehyde can cause allergic contact dermatitis, asthma and rhinitis and may aggravate existing asthmatic conditions.

3 . Composition/information on ingredients

Name	CAS number	%
Glutaraldehyde	111-30-8	10 - 30

4 . First aid measures

Eye contact	: Get medical attention immediately. Immediately flush the eye(s) continuously with lukewarm, gently flowing water for at least 20-60 minutes while holding the eyelid(s) open.
Skin contact	: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
Inhalation	: Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
Ingestion	: Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Protection of first-aiders	: No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wear suitable protective clothing and gloves. Remove contaminated clothing and shoes.

5 . Fire-fighting measures

Flammability of the product	: In a fire or if heated, a pressure increase will occur and the container may burst.
Extinguishing media	
Suitable	: Use an extinguishing agent suitable for the surrounding fire.
Not suitable	: None known.
Special exposure hazards	: Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.
Hazardous thermal decomposition products	: carbon dioxide,carbon monoxide
Special protective equipment for fire-fighters	: Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1-800-424-8802.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see section 10). Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredient	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Glutaraldehyde	US ACGIH OSHA PEL 1989	- -	- -	- -	- -	- -	- -	0.05 0.2	- 0.8	- -	

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

8 . Exposure controls/personal protection

'vgiene measures	: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before re-use.

Personal protection

Respiratory	: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
Hands	: Chemical-resistant gloves: Nitrile or Neoprene gloves. PVC gloves. 4H gloves. Butyl rubber gloves.
Eyes	: Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.
Skin	: Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state	: Liquid.
Flash point	: Closed cup: >93.4°C (>200.1°F) [SFCC]
Auto-ignition temperature	: Not available.
Flammable limits	: Not available.
Color	: Colorless.
Odor	: Fruity. Medicinal. [Strong]
pH	: 3 to 4.5
	: Neat - without dilution.
›iling/condensation point	: Not available.
..itial Boiling Point	: Not available.
Melting/freezing point	: Not available.
Relative density	: 1.056 (15.6°C)
Density	: 8.8 (lbs/gal)
Vapor density	: >1 [Air = 1]
Odor threshold	: Not available.
Evaporation rate	: Not available.
VOC	: Not available.
Viscosity	: Dynamic (15.6°C): 4 cP
Solubility (Water)	: Soluble
Vapor pressure	: 4.1 kPa (31 mm Hg) at 37.8°C
Pour Point	: -6.7°C (19.9°F)
Partition coefficient (LogKow)	: Not available.

10 . Stability and Reactivity

Chemical stability	: The product is stable.
Possibility of hazardous reactions	: Under normal conditions of storage and use, hazardous reactions will not occur.
Hazardous polymerization	: Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid	: No specific data.
aterials to avoid	: Reactive or incompatible with the following materials: oxidizing materials, acids and alkalis.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

10 . Stability and Reactivity

Conditions of reactivity : Slightly flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Glutaraldehyde	LD50 Dermal	Rabbit	560 uL/kg	-
	LD50 Oral	Rat	134 mg/kg	-
	LC50 Inhalation Vapor	Rat	480 mg/m3	4 hours
X-CIDE™ 102 INDUSTRIAL BACTERICIDE	LD50 Dermal	Rabbit	13600 mg/kg	-
	LD50 Oral	Rat	1990 mg/kg	-

Carcinogenicity

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Glutaraldehyde	A4	-	-	-	-	-

Chronic toxicity Remarks

1) Glutaraldehyde

Glutaraldehyde is a component of this product. In long-term experimental animal studies, glutaraldehyde caused liver damage in mice (ACGIH, 1992), but it was not neurotoxic in rats (Spencer et al, 1978).

Female rats had increased large granular lymphocytic leukemias after receiving glutaraldehyde in the drinking water at levels up to 1,000 ppm for 2 years (Andersen, 1996).

The results of genetic studies have been mixed with no conclusive evidence of positive effects.

In 2-year inhalation studies, there was no evidence of carcinogenic activity in male or female rats exposed to 250, 500 or 750 ppb, or in male or female mice exposed to 62.5, 125, or 250 ppb glutaraldehyde. Incidences of nasal and respiratory lesions were increased in both male/female rats and mice. Reduction in body weight, as compared to the controls was also noted.

Additional information

Draize Test Eye (Rabbit): Extreme Irritant/Corrosive.Draize Test Skin (Rabbit): Extreme Irritant.

12 . Ecological information

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
X-CIDE™ 102 INDUSTRIAL BACTERICIDE	EC50 16 mg/l	Algae - *Selenastrum capricornutum*	96 hours
	EC50 8 mg/l	Algae - Chlorella *vulgaris*	96 hours
	EC50 1.8 mg/l	Algae - Skeletonema *costatum*	96 hours
	LC50 75 mg/l	Fish - Threespine stickleback	96 hours
	LC50 43 mg/l	Daphnia - Daphnia magna	48 hours
	LC50 42 mg/l	Fish - Bluegill sunfish	96 hours
	LC50 33 mg/l	Fish - Rainbow trout	96 hours
	LC50 28.4 ppm	Daphnia - Mysid	96 hours

12 . Ecological information

shrimp

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

Additional information

An EcoTox™ Report, and/or the material's environmental fate is available upon request at the following number: 1-800-235-4249, then press 4.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
OT Classification	Not regulated.	-	-	-		-
TDG Classification	Not regulated.	-	-	-		-
IMDG Class	Not applicable.	-	-	-		-

PG* : Packing group

DOT Reportable Quantity Not applicable.

Marine pollutant Not applicable.

North-America NAERG : Not available.

15 . Regulatory information

HCS Classification : Corrosive material
Sensitizing material
Target organ effects

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: glutaral
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: X-CIDE™ 102 INDUSTRIAL BACTERICIDE: Immediate (acute) health hazard

CERCLA: Hazardous substances.: methanol: 5000 lbs. (2270 kg);
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.

15 . Regulatory information

Clean Air Act (CAA) 112 accidental release prevention: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) : Not listed

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada

WHMIS (Canada) : Class D-1B: Material causing immediate and serious toxic effects (Toxic).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).
Class E: Corrosive material

Canada (CEPA DSL): : All components are listed or exempted.

Additional information

This product is subject to regulation under the US Federal Insecticide, Fungicide and Rodenticide ACT (FIFRA) and is therefore exempt from US Toxic Substance Control Act (TSCA) Inventory listing requirements. EPA Registration No. 10707-40

16 . Other information

Label requirements : CAUSES EYE BURNS. CAUSES RESPIRATORY TRACT AND SKIN IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. MAY BE HARMFUL IF SWALLOWED. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

National Fire Protection Association (U.S.A.) :

Date of printing : 11/2/2009.

Indicates information that has changed from previously issued version.

Notice to reader

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

APPENDIX G: WPSS CONTACTS

WEATHERFORD P&SS				
NAME	POSITION	PHONE: OFFICE	PHONE: CELL	EMAIL
Wayne Berrey	Area Manager (Houston)	713-580-9780	713-449-4680	wayne.berrey@weatherford.com
Taylor Williams	Product Line Specialist (Houston)	713-580-9720	832-492-5739	taylor.williams@weatherford.com
Brock Hennigh	Offshore Product Line Specialist, Western Hemisphere	713-580-9706	832-418-0256	Brock.hennigh@weatherford.com
Hugo Ybarra	Asset Coordinator / Logistics	713-580-9743	832-418-0258	Hugo.ybarra@weatherford.com
Ronnie Singleton	District Manager / Logistics	713-580-9721	832-492-6703	Ronnie.singleton@weatherford.com

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00011	REV: 05	PAGE: 1 of 1	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
PREPARED BY: BIRGIT THIELE	REVIEWED BY: MURDO MORRISON		APPROVED BY: MALCOLM DUNCAN	APPROVED BY:
TITLE:	COMMENCEMENT REPORT			

Project:	Helix Noble Raton		Project No.:	WPSS-014550
Client:	Helix ESG		Client Contract No.:	WPSS-Q-014550-03
Operational Start:	Date:	7 August 2011	Time:	04:00
Location:	M/V Helix Express			

Description:

WPSS will begin work filling the West and East Raton South Flowlines from the deck of the M/V Helix Express.

The fill will consist of flooding the pipelines with no pig and injecting OSW490 Oxygen scavenger at 110 ppm and XC-102 Biocide at 600 ppm.

Commencement of the operation described above may be started. All relevant procedures & work instructions have been adhered to.

Weatherford P&SS Representative:	Helix Representative:
Name: Taylor Williams	Name: Nicholas Okubor
Sign:	Sign:
Date: 7 August 2011	Date: 7-Aug-11

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00012	REV: 07	PAGE: 1 of 3	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
PREPARED BY: BIRGIT THIELE	REVIEWED BY: MURDO MORRISON		APPROVED BY: MALCOLM DUNCAN	APPROVED BY:
TITLE:	PUMPING REPORT GENERAL PURPOSE			

Project:	Helix Noble Raton	Project Number:	WPSS-014550
Client:	Helix ESG	Contract Number:	WPSS-Q-014550-03
Operation:	Pipeline Flooding / Chemical Injection		
Location:	Helix Express	Medium:	Filtered/Treated Seawater
System / Pipeline Description: Raton East Flowline. 145,000 ft of 4.5" OD 0.531" Wall Thickness vessel to VK-900 platform			

Time	Flow Rate (GPM)	Pipeline Pressure (PSI)	Volume Pumped (Gallons)	X-Cide 102 (Gallons)	XCide 102 (PPM)	OSW-490 (Gallons)	OSW-490 (PPM)	Remarks
7:15	0	54	0	0.00	0	0.00	0	Begin Flooding
7:20	210	53	888	0.33	366	0.10	110	
7:30	200	54	2515	1.59	632	0.28	110	
7:40	209	56	5055	3.02	597	0.56	110	
7:50	211	57	7203	4.52	627	0.79	110	
8:00	206	54	9515	5.70	599	1.05	110	
8:10	208	61	11420	6.68	585	1.26	110	
8:20	210	55	13432	7.95	592	1.48	110	
8:30	209	60	15488	9.33	602	1.70	110	
8:40	207	59	17712	10.84	612	1.95	110	
8:50	209	61	20032	12.49	624	2.20	110	
9:00	200	61	22413	13.99	624	2.47	110	
9:10	200	51	23647	14.62	618	2.60	110	
9:20	198	52	24881	15.83	636	2.74	110	
9:30	187	46	27539	17.15	623	3.03	110	
9:40	178	132	29301	18.33	626	3.22	110	
9:50	172	270	31170	19.43	623	3.43	110	
10:00	168	339	32900	20.46	622	3.62	110	

Weatherford P&SS Representative:	
Name:	Taylor Williams
Sign:	
Date:	7 August 2011

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00012	REV: 07	PAGE: 2 of 3	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
TITLE:	PUMPING REPORT			

Project:	Helix Noble Raton	Project Number:	WPSS-014550
Client:	Helix ESG	Contract Number:	WPSS-Q-014550-03
Operation:	Pipeline Flooding / Chemical Injection		
Location:	Helix Express	Medium:	Filtered/Treated Seawater
System / Pipeline Description: Raton East Flowline. 145,000 ft of 4.5" OD 0.531" Wall Thickness vessel to VK-900 platform			

Time	Flow Rate (GPM)	Pipeline Pressure (PSI)	Volume Pumped (Gallons)	X-Cide 102 (Gallons)	XCide 102 (PPM)	OSW-490 (Gallons)	OSW-490 (PPM)	Remarks
10:10	162	369	34752	21.55	620	3.82	110	
10:20	165	554	36524	22.63	620	4.02	110	
10:30	164	610	38296	23.72	619	4.21	110	
10:40	163	817	39419	24.10	611	4.34	110	
10:50	170	1049	41224	24.96	606	4.53	110	
11:00	169	1213	42600	25.67	603	4.69	110	
11:10	169	1220	43976	26.49	602	4.84	110	
11:20	168	1256	45988	27.97	608	5.06	110	
11:30	168	1282	47873	30.06	628	5.27	110	
11:40	167	1256	49846	30.72	579	5.48	110	
11:50	167	1294	50729	31.48	577	5.58	110	
12:00	166	1259	53098	33.06	590	5.84	110	
12:10	165	1398	54583	34.32	592	6.00	110	
12:20	164	1434	56086	35.74	605	6.17	110	
12:30	162	1511	57983	37.35	614	6.38	110	
12:40	160	1507	59036	38.52	620	6.49	110	
12:50	157	1462	60856	39.70	652	6.69	110	
13:00	155	1416	62147	40.81	657	6.84	110	
13:10	152	1492	63964	41.62	651	7.04	110	
13:20	147	1430	65512	42.55	649	7.21	110	

Weatherford P&SS Representative:	
Name:	Taylor Williams
Sign:	
Date:	7 August 2011

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00012	REV: 07	PAGE: 3 of 3	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
TITLE:	PUMPING REPORT			

Project:	Helix Noble Raton	Project Number:	WPSS-014550
Client:	Helix ESG	Contract Number:	WPSS-Q-014550-03
Operation:	Pipeline Flooding / Chemical Injection		
Location:	Helix Express	Medium:	Filtered/Treated Seawater
System / Pipeline Description: Raton East Flowline. 145,000 ft of 4.5" OD 0.531" Wall Thickness vessel to VK-900 platform.			

Time	Flow Rate (GPM)	Pipeline Pressure (PSI)	Volume Pumped (Gallons)	X-Cide 102 (Gallons)	XCide 102 (PPM)	OSW-490 (Gallons)	OSW-490 (PPM)	Remarks
13:30	**142**	**1436**	**66800**	**43.33**	**649**	**7.35**	**110**	
13:40	**130**	**1263**	**68454**	**44.33**	**648**	**7.53**	**110**	
13:50	**0**	**0**	**69055**	**44.91**	**650**	**7.60**	**110**	**Flooding Complete**

Weatherford P&SS Representative:	
Name:	Taylor Williams
Sign:	
Date:	7 August 2011

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00012	REV: 07	PAGE: 1 of 2	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
PREPARED BY: BIRGIT THIELE	REVIEWED BY: MURDO MORRISON		APPROVED BY: MALCOLM DUNCAN	APPROVED BY:
TITLE:	PUMPING REPORT GENERAL PURPOSE			

Project:	Helix Noble Raton	Project Number:	WPSS-014550
Client:	Helix ESG	Contract Number:	337346
Operation:	Pipeline Flooding / Chemical Injection		
Location:	Helix Express	Medium:	Filtered/Treated Seawater
System / Pipeline Description: Raton West Flowline. 145,000 ft of 4.5" OD 0.531" Wall Thickness vessel to VK-900 platform			

Time	Flow Rate (GPM)	Pipeline Pressure (PSI)	Volume Pumped (Gallons)	X-Cide 102 (Gallons)	XCide 102 (PPM)	OSW-490 (Gallons)	OSW-490 (PPM)	Remarks
2:50	0	0	0	0	0	0	0	Begin Flooding
3:00	203	57	2266	1.45	639	0.25	110	
3:10	203	57	4751	2.59	546	0.52	110	
3:20	202	57	6328	3.93	621	0.70	110	
3:30	203	57	8956	5.28	589	0.99	110	
3:40	199	70	11369	7.14	628	1.25	110	
3:50	213	70	12567	7.85	625	1.38	110	
4:00	106	67	14825	9.21	621	1.63	110	
4:10	206	65	16956	10.73	633	1.87	110	
4:20	213	68	18886	11.74	621	2.08	110	
4:30	204	64	21209	13.17	621	2.33	110	
4:40	205	64	23380	14.52	621	2.57	110	
4:50	210	173	25355	15.76	622	2.79	110	
5:00	203	216	27346	16.85	616	3.01	110	
5:10	199	428	29955	18.38	614	3.30	110	
5:20	203	748	31593	19.81	627	3.48	110	
5:30	202	870	33231	21.31	641	3.66	110	
5:40	196	1091	35785	22.20	620	3.94	110	
5:50	196	1218	37222	23.55	633	4.09	110	

Weatherford P&SS Representative:	
Name:	Taylor Williams
Sign:	
Date:	8 August 2011

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00012	REV: 07	PAGE: 2 of 2	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
TITLE:	PUMPING REPORT			

Project:	Helix Noble Raton	Project Number:	WPSS-014550
Client:	Helix ESG	Contract Number:	WPSS-Q-014550-03
Operation:	Pipeline Flooding / Chemical Injection		
Location:	Helix Express	Medium:	Filtered/Treated Seawater
System / Pipeline Description: Raton West Flowline. 145,000 ft of 4.5" OD 0.531" Wall Thickness vessel to VK-900 platform			

Time	Flow Rate (GPM)	Pipeline Pressure (PSI)	Volume Pumped (Gallons)	X-Cide 102 (Gallons)	XCide 102 (PPM)	OSW-490 (Gallons)	OSW-490 (PPM)	Remarks
6:00	192	1347	39533	25.10	635	4.35	110	
6:10	191	1284	41261	26.51	643	4.54	110	
6:20	190	1456	42183	27.15	644	4.64	110	
6:30	186	1470	44546	28.83	647	4.90	110	
6:40	189	1777	46909	30.50	650	5.16	110	
6:50	191	1356	46985	31.39	668	5.17	110	
7:00	172	1471	48985	33.09	675	5.39	110	
7:10	170	1469	50357	34.18	679	5.54	110	
7:20	168	1480	52710	36.00	683	5.80	110	
7:30	167	1533	55063	37.83	687	6.06	110	
7:40	165	1594	55500	38.26	689	6.11	110	
7:50	154	1548	56937	39.24	689	6.26	110	
8:00	157	1594	58905	40.60	689	6.48	110	
8:10	154	1548	60385	41.61	689	6.64	110	
8:20	144	1579	61522	42.47	690	6.77	110	
8:30	147	1505	62561	43.42	694	6.88	110	Flow estimated
8:40	144	1233	64260	44.36	690	7.07	110	
8:50	141	1254	65960	45.29	687	7.26	110	
9:00	138	1298	67660	46.22	683	7.44	110	
9:10	135	1353	69360	47.15	680	7.63	110	Flooding Complete

Weatherford P&SS Representative:	
Name:	Taylor Williams
Sign:	
Date:	8 August 2011

Weatherford

RATON SOUTH CHARTS

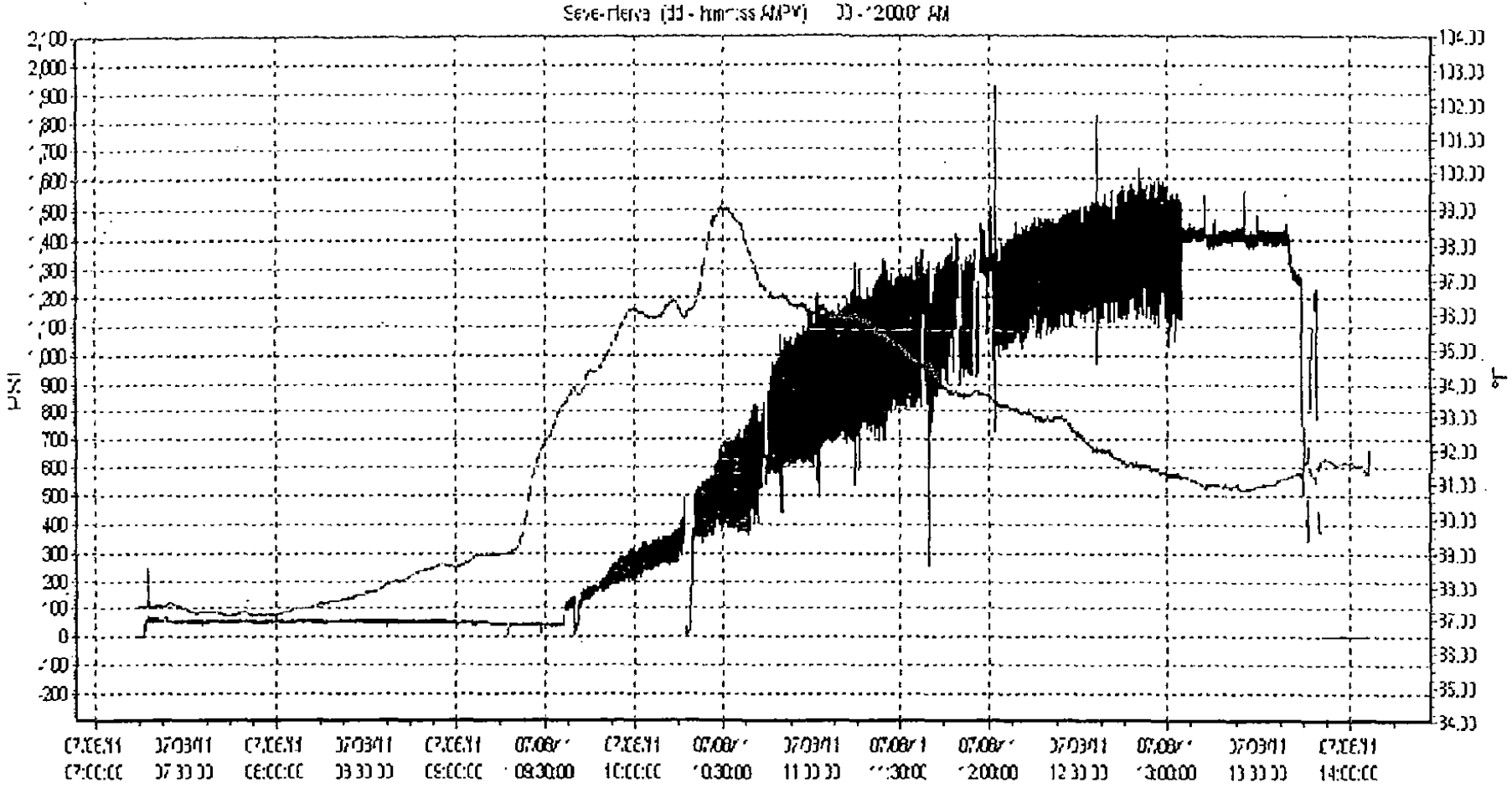
OPERATION: FILLING OF THE RATON SOUTH EAST FLOWLINE.

DATE: 07 AUGUST, 2011 — LOCATION: MC-292

START TIME: 07:15AM — INSTRUMENT SSN: KELLER GAUGE 3819

END TIME: 14:00PM — FILL ACCEPTED: YES

HELIX ENERGY SOLUTIONS



WEATHERFORD REPRESENTATIVE:
Taylor Williams
SIGNATURE/DATE:

CLIENT REPRESENTATIVE:
SIGNATURE/DATE:

CLIENT REPRESENTATIVE:
SIGNATURE/DATE:

Weatherford

RATON SOUTH CHARTS

OPERATION: FILLING OF THE NOBLE RATON WEST FLOWLINE.

DATE: 08 AUGUST, 2011

START TIME: 02:50 AM

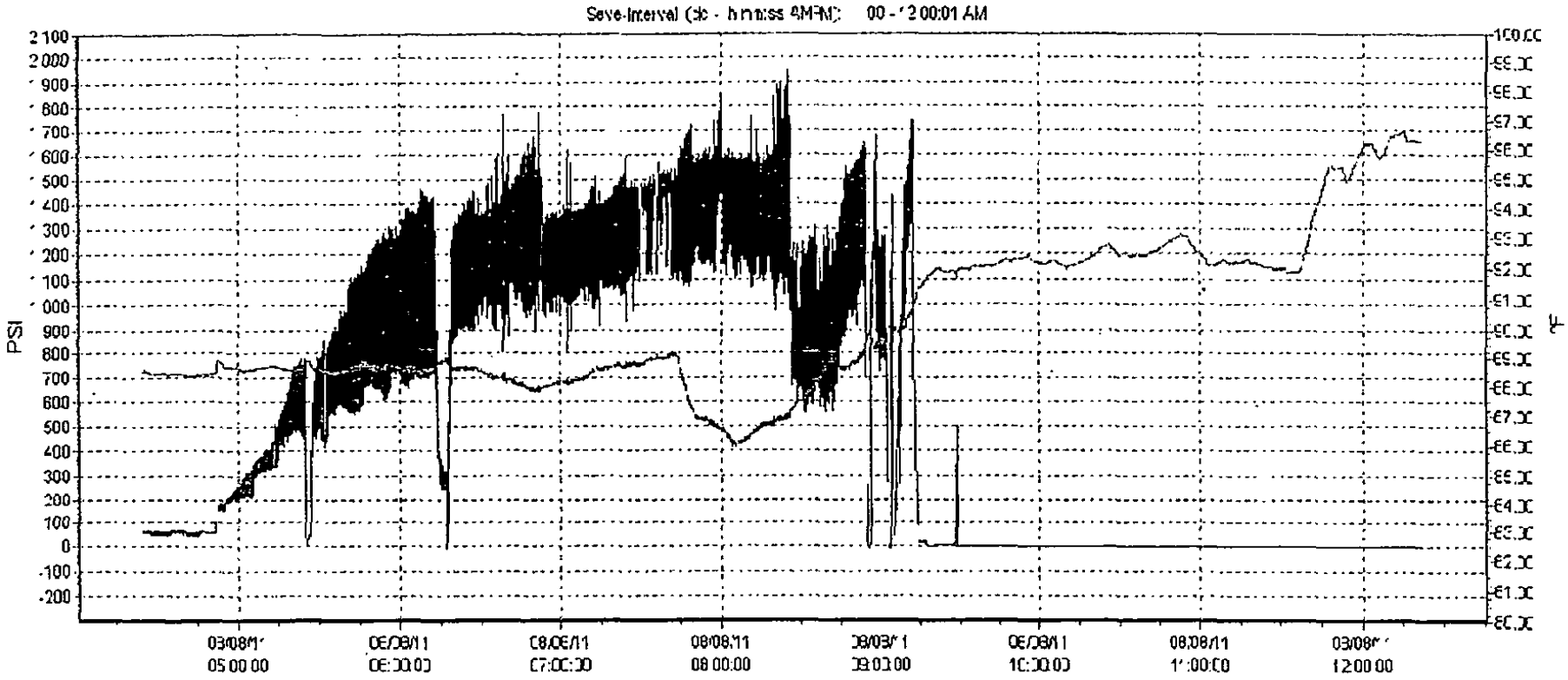
END TIME: 09:10 AM

LOCATION: HELIX EXPRESS MC-292

INSTRUMENT SSN: KELLER GAUGE 3819

FILL ACCEPTED: YES

HELIX ENERGY SOLUTIONS



WEATHERFORD REPRESENTATIVE:
Taylor Williams
SIGNATURE/DATE:

CLIENT REPRESENTATIVE:
SIGNATURE/DATE:

CLIENT REPRESENTATIVE:
SIGNATURE/DATE:

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00013	REV: 05	PAGE: 1 of 1	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
PREPARED BY: BIRGIT THIELE	REVIEWED BY: MURDO MORRISON		APPROVED BY: MALCOLM DUNCAN	APPROVED BY:
TITLE:	COMPLETION REPORT			

Project:	Helix Noble Raton South		Project No.:	WPSS-014550
Client:	Helix ESG		Client Contract No.:	337346
Operational End:	Date:	August 8th 2011	Time:	14:00
Location:	Helix Express			

Description:
WPSS has completed filling the West and East Raton South Flowlines from the deck of the M/V Helix Express.
The flooding was completed with no pig and injecting OSW490 Oxygen Scavenger at 110 ppm and XC-102 Biocide at 600 ppm.

The operation described above has been completed in full conformity with the client.

Weatherford P&SS Representative:	**Helix Representative:**
Name: Taylor Williams	Name: Nicholas Okubo
Sign:	Sign:
Date: 9 August 2011	Date:9 August 2011

HELIX SUBSEA CONSTRUCTION A HELIX ENERGY SOLUTIONS COMPANY	noble energy

DOCUMENT TITLE:	*WEATHERFORD HYDROTEST OF DUAL 4.5" FLOWLINES OPERATIONAL PROCEDURE*		
DOCUMENT NO.:	*11268-HT-PR-N7002*		
CUSTOMER:	*NOBLE ENERGY*	PROJECT:	*RATON SOUTH*
CLIENT JOB NO.:	*N/A*	HELIX JOB NO:	*11268*

THIRD PARTY:	*WEATHERFORD*	REFERENCE NO.:	*WPSS-014550-WP-02*	REV NO: *03*
		NUMBER OF PAGES TO FOLLOW:		*58*

SIGNATURE LEGEND:

ID:	NAME:	TITLE:
HB	Harry Barker	Project Manager
AG	Alex Gomez	Assistant Project Manager
NO	Nicholas Okubo	Field Engineer
BS	Bill Schmidt	Weatherford

HELIX SUBSEA CONSTRUCTION					
0	Issued for Construction	BS	AG	AG	08/12/11
B	Issued for Client Review	BS	HB	HB	07/19/11
A	Issued for Client Review	BS	HB	HB	06/08/11
REV	DESCRIPTION	ORIGIN	CHECK	APPROVAL	DATE

NOBLE ENERGY INC.		
APPROVAL STATUS DESCRIPTION		☑
APPROVED. WORK MAY PROCEED.		✓
REVISE AS NOTED AND RE-SUBMIT FINAL. WORK MAY PROCEED.		
REVISE AS NOTED AND RE-SUBMIT. WORK MAY NOT PROCEED.		
FOR INFORMATION ONLY. RE-SUBMISSION NOT REQUIRED.		
NAME		DATE 7/12/11

CLIENT

HELIX ENERGY SOLUTIONS

LOCATION

VK 900

Weatherford®

PIPELINE AND SPECIALTY SERVICES

RATON SOUTH FIELD DEVELOMPENT

OPERATIONAL PROCEDURE

HYDROTEST OF DUAL 4.5" FLOWLINES

DOCUMENT TYPE: WORK PROCEDURE

DOCUMENT TITLE: OPERATIONAL PROCEDURES

4.5" Dual Flowline Hydrotest

WPSS DOCUMENT NUMBER: WPSS-014550-WP-02

CLIENT DOCUMENT NUMBER:

03	11 August 2011	Issued for Approval	T. Williams			
02	12 July 2011	Re-issued for Review	T. Williams	T. Strahl		
01	7 June 2011	Re-Issued for Review	B. Schmidt	T. Strahl	R. White	
00	31 May 2011	Issued for Review	B. Schmidt	T. Strahl		H. Barker
0A	16 MAY 2011	Internal Review	B. Schmidt	T. Strahl		
REV	DATE	DESCRIPTION	PREPARED BY	CHECKED BY	REVIEWED BY	HESG
REVISIONS			SIGNATURES			

TABLE OF CONTENTS

1.0 GENERAL

Weatherford Pipeline and Specialty Services, hereinafter referred to as "WPSS", has been requested by Helix Energy Solutions Group, hereinafter referred to as "Helix", to perform pre-commissioning hydrotest the crude oil field tieback to the existing Chevron production facility. The tie back consists of twin 4.5-inch O.D, 27.5 mile long flowlines terminating by means of Pipeline End Termination structures (PLETs) near the Raton South wellhead. The tie-in at the Raton South well will be achieved by installing a diverless vertically installed connection jumper. WPSS will have flooded the flowlines beginning Hydrotest operations. This scope of work will take place on the Chevron platform located in Viosca Knoll (VK) 900.

WPSS will Hydrotest from a tapped flange on one riser against a tapped flange on top of the second riser. The test medium will be filtered untreated seawater. Following the Hydrotest WPSS will bleed down the hydrotest water overboard and disconnect their spread from the risers.

System	Length [ft]	OD [in]	WT [in]	ID [in]	WD (max.) [ft]	Test Pressure [psig]	Hold Period [hr]
East Flowline *	145,309	4.500"	0.531	3.438	3,400	10,313	8
West Flowline *	145,378	4.500"	0.531	3.438	3,400	10,313	8
Jumper	93	5.563	0.750	4.063	3,400	10,313	8
NOTE:	Flowline Pipe Specifications		API 5L x70 SMLS Line Pipe. w/ 14 – 16 MILS FBE Coating				

*Including Riser

1.1 Objective

The objective of this document is to provide all personnel a clear understanding of the work scope to ensure the work is completed in a safe, efficient and timely manner. Furthermore it is designed to be an inclusive source of information regarding the activities associated with the Hydrostatic testing operation to be performed on Noble Raton South Development Project, from the Chevron platform, VK900.

1.2 ABBREVIATIONS

ASME	American Society of Mechanical Engineers
ANSI	American National Standards Institute
API	American Petroleum Institute.
ID	Inside Diameter
ITP	Inspection Test Plan
JSA	Job Safety Analysis
MAOP	Maximum Allowable Operating Pressure
MSL	Mean Sea Level
OD	Outside Diameter
PPE	Personal Protective Equipment
PTW	Permit to Work
SOW	Scope of Work
SDV	Shut Down Valve
WFT	Weatherford
WPSS	Weatherford Pipeline & Specialty Services
WT	Wall Thickness
cfm	Cubic Feet per minute
ft	Feet
ft^3	Cubic Feet
gal	Gallons
gpm	Gallons Per Minute
hrs	Hours
in	Inches
mm	Millimeters
psi	Pounds Per Square Inch
psia	Pounds Per Square Inch (Absolute Pressure)
psig	Pounds Per Square Inch (Gauge Pressure)
scf	Standard Cubic Feet
scfm	Standard Cubic Feet Per Minute

Each Operational Procedure has an ITP. In the ITP involvement codes and definitions are used as follows:

"P" - Performance

The Organization involved is responsible for the physical performance of the Inspection Check or Task and for issuing the relevant Quality Record (definition of Record as per ISO 9000:2000 Quality Management Systems – Fundamentals and Vocabulary, para 3.7.6).

"W" - Witness

The Organization involved elects to attend to the Inspection or Check performed by the Performing Organization. The Performing Organization shall notify the Witnessing Organization of the Inspection or Check performance within 24 hours of activity being preformed. Non-attendance of the Witnessing Organization at the notified time shall under no circumstances delay the Inspection or Check being carried out by the Performing Organization.

"H" - Validation (Hold Point)

The Organization involved attends the Inspection or Check performed by the Performing Organization to record the Inspection or Check results. The Performing Organization shall notify the Validation Organization of the Inspection or Check performance within 24 hours of activity being preformed and shall carry out the Inspection or Check only if the Validation Organization is attending. A written waiver from the Validation Organization is required before execution of the Inspection or Check can take place in their absence.

"R" - Review

The Organization involved is responsible for the performance of a review of relevant documentation and/or Quality Records.

"M" - Monitor

The Organization indicated may monitor the works during routine surveillance.

1.3 References

1.3.1 Code References

Number	Title
30 CFR 250(J)	Pipeline and Pipeline Rights of Way
API Spec 5L	Specifications for Line Pipe
API RP 1110	*Pressure Testing of Liquid Petroleum Pipelines*
API RP 1111	Design, Construction, Operation and Maintenance of Offshore Hydrocarbon Pipelines
ASME B31.4.2002	Pipeline Transportation Systems for Liquid Hydrocarbons and other Liquids
ASME B31.8.2003	Gas Transmissions and Distribution Piping Systems
DNVS-OS-F101	*Submarine Pipeline Systems*

1.3.2 WPSS References

Number	Title
WPSS-Q-014550-01	Weatherford Commercial Proposal

1.3.3 Helix Issued References

Number	Title
16172-N002 Rev2	Pigging (PLET to PLET) Jumper
16172-A100 Rev 1	Raton South Scope of Supply Schematic
11268-EN-DG-A3100 Rev C	East PLET Assembly Sheets (1-3)
11268-EN-DG-A3200 Rev C	West PLET Assembly Sheets (1-3)

1.4 RESOURCES

Helix shall provide the following services to support the activities as outlined herein:

- Marine transportation for WPSS equipment and personnel
- Helicopter Transportation (if applicable)
- Meals and lodging for four (4) WPSS personnel onboard the Chevron platform
- Crane services at dock and offshore facilities to transfer WPSS equipment and personnel
- Utility air supply for WPSS equipment onboard the Chevron platform (185cfm @ 100psi)
- Water supply for WPSS equipment onboard the Chevron platform (min 10gpm @ 100psi)
- Electrical supply for WPSS equipment onboard the Chevron platform (110v, 15amp)
- Offshore Rigging / scaffold support as needed

2.0 SAFETY

2.1 SUMMARY

WPSS is fully committed to providing a quality H.S.E. performance in all facets of its operations, at all locations and on all projects in which WPSS is involved. It is a requirement for all work procedures that pre-job safety analysis or JSAs be performed and that all pertinent information be distributed and discussed with all personnel involved prior to start of work. Furthermore, safety meetings shall be held prior to every shift to distribute current information and discuss hazards and safe procedures of the job at hand. WPSS personnel must wear proper PPE on the job; hard hat, safety shoes and safety glasses and other PPE as stipulated by the offshore vessel/platform. There is a possibility diluted chemical present in hydrotest water. All personnel will take precautions to not come in contact with hydrotest discharge water or wear the correct PPE if contact is likely. MSDS for X-cide102 and OSW490 in appendix D.

2.2 SAFETY MEETINGS & JOB SAFETY ANALYSIS

Upon arrival at the work location, a site specific safety meeting will be held to review all aspects of safety relating to the work and location. All relevant personnel will be required to attend. This meeting will be recorded by WPSS.

A Job Safety Analysis (JSA) will be conducted before commencing each new operation and at the beginning of each work shift. The JSAs shall outline tasks to be performed and identify the associated risks for each task along with mitigating procedures to minimize the anticipated risk exposure. All work crewmembers shall participate in the JSA process to ensure everyone understands the risk and mitigating procedures. The JSAs shall also review the means of egress at the specific location.

The JSAs shall include all hazards, control measures, emergency response, fire prevention, safe areas, escape routes, muster points, use of signs and barriers, PPE, handling of hazardous material, awareness of high pressure, noise, First Aid facilities and accident and incident reporting.

Any accidents or incidents, including near misses, will require a total **"ALL STOP"** with a post review of the situation before any activity can resume. With regards to an unsafe act or situation, any personnel involved in operations can give an **"ALL STOP"** but only the WPSS Superintendent in conjunction with the Company Representative and Operations can give an **"ALL START"**.

NOTE:

At any point in time during the WPSS operations, an individual has the right to **"STOP THE JOB"** if there are "unsafe" activities or situations occurring.

2.3 PERMIT TO WORK

WPSS personnel are to ensure that a permit to work is issued by Offshore Vessel / Client on all offshore facilities / vessels thus ensuring that all parties under WPSS control are in full compliance with the facilities operating practices.

2.4 High Pressure Systems Precautions (Air, chemical or Water)

When operating in the vicinity of hoses, equipment, or piping under pressure, all personnel must adhere to the following precautions:

- During pressurization and hold period, a **minimum 15 foot** stand-off distance shall be maintained from test flange/head and a **minimum 10 foot** stand-off distance from pressurized piping. In the case of limited space due to SIMOPS, the client will assist WPSS crew in allocating stand-off distances during the Hydrotesting operations.
- Placement of the test flange/head should take into consideration the ballistic flight path if failures were to occur on the autoclave port fitting and separation from the blind flanges was to occur.
- No work is to be conducted on the pressurized system. In the event that a leak is found, the system must be de-pressurized to ambient pressure or "double-block" isolation must be used before any work can be conducted on the system.
- A suitable area around test spread shall be taped off (red danger tape) to prevent unauthorized entry to area's near the test head.
- Prior to pressurization, the location and test activity shall be announced over the intercom/loud-speaker system.
- A suitable means shall be put in place to provide visual leak detection without having to approach the test flange/head during pressurization or hold period to accomplish the visual verification.
- Whip checks will be utilized to secure all hoses no matter the level of pressure; this will include all "standard" whip checks and/or rope for larger hoses when no "standard" whip checks exist.
- Before beginning work on any operation, the WPSS Crew on site will conduct a walk-through to check each piece of equipment and ensure it is correctly installed and secured with whip checks.

2.5 Equipment Transfer

Prior to mobilization the following will be confirmed for each item of WPSS equipment to be lifted:

- All equipment will be designed to adhere to standards for offshore transit/transfer and operations.
- All equipment will be clearly marked on the lifting frame with its weight.
- Equipment slings, shackles, stingers, etc. will be certified within the last 6 months and certification shall accompany the equipment.

WPSS personnel will adhere to the following precautions when operating in the vicinity of items being lifted overhead:

- Proper PPE will be worn by all individuals.
- Only one individual will provide hand-signals to the crane/forklift operator.
- WPSS personnel will clearly define a plan prior to beginning the lift, and will execute the plan as it was designed.

2.6 Environmental Safety

The following project specific precautions will be put in place to avoid any undue damage to the environment:

- To prevent spillage of fuel during pump to tank transfers, these operations will be performed over drip-pans or pads at all times.
- Water Disposal methods will be in place to remove the water brought onto the facilities and will be disposed of in a manner in accordance with regulations

2.7 Equipment Certification

All WPSS stand alone equipment (containers, pumps, compressors, tanks and hose baskets) shall be supplied with suitable rigging for offshore lifting and designed in accordance with Weatherford installation basis of design and shall include valid certification (certified lifting points and lifting gear). All mechanical instrumentation and electrical gear shall be calibrated by authorized Third party no sooner than 1 month of mobilization of the spread with 6 months validity certificates from time of delivery or testing.

3.0 Equipment, Personnel & Materials Required

3.1 WPSS Hydrotest Equipment

Item	Description	Qty	Dimensions (L x W x H) [ft]	Weight [lbs]
1.	Diesel Driven Test Pump	2	14 x 7 x 6	12,500
2.	Job Box	1	5 x 4 x 4	1,500
3.	50 Micron filter skid	1	2 x 2 x 2	300
4.	Hose Basket	1	4 x 6 x 4	5,000
5.	Storage Container	1	10 x 8 x 8	9,800
6.	MP Test manifold	1	Stored Inside: Hose Basket Job Box Storage Container	
7.	MP Test Hose	Set		
8.	MP Instrumentation Hose	Set		
9.	1" Fill Hose	Set		
10.	1" Air Hose	250'		
11.	4 1/16" 10K API test flange with taps	2		
12.	Pressure Relief Valve (set @ 12,000psi)	2		
13.	Keller Digital Gauge (pressure & temperature) 1,000bar	2		
14.	Pressure Chart Recorders 15K (w/charts)	2		
15.	Temperature Chart Recorder 0-150°F (w/charts)	2		
16.	Hand Tools / Valves / Fittings	1 set each		
17.	Handheld Radio	1 set		
18.	Computer and printer package	1		

3.2 WPSS Personnel

Item	Description	Qty
1.	Supervisor	1
2.	Foreman	1
3.	Technician	2

3.3 WPSS Offshore Requirements

Item	Description	Qty
1.	Seawater Supply	As needed
2.	Utility Air	185cfm / 100psi
3.	Diesel Fuel	As needed
4.	Crane Access	As needed

3.4 Helix Provisions

Item	Description	Qty
1.	Studs, Nuts and Gasket for Tie –in Flange	2 sets

4.0 Operational Procedures

4.1 Equipment and Personnel Mobilization

Once confirmation to mobilize has been received from Helix, WPSS equipment and personnel will be transferred to the Client Specified Dockyard Location for transit to the offshore location. Lift transfers for equipment and personnel will be conducted by the Helix personnel. Staging of the equipment will be carried out by Helix personnel with the assistance of WPSS personnel. All personnel working under WPSS will undergo the vessel orientation before any work can commence.

Item	Description	Reference	WPSS Initial/ Date	Helix Initial/ Date
1.	Prior to mobilization of equipment and personnel, the WPSS crew will stage equipment and review the following: • Pre-Test of manifolds/hoses per workshop procedure • Start-up and run of pumps • Check certification of hoses, lifting slings, shackles, lifting point, etc. • Check instrumentation for operating pressure: 0-15,000psig, 0.1% FS accuracy. • Operating Temperature of 0 ºF to 150 ºF • Check Keller Gauge for Hydrotest operating pressure: 1000bar (14,500psi) • PRV set at 12,000 psig for Hydrotest	WPSS-14550-MAN-01	P	W
2.	Prior to performing any work, WPSS Supervisor will conduct JSA Ensure all relevant parties have read and signed JSA	3-4-GL-GL-PSS-00004	P	W
3.	Load out equipment for Helix Noble Raton South Hydrotest operations	5-4-GL-GL-PSS-00006	P	W

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE
4.	Mobilize equipment and personnel to: COMPANY DOCKYARD ADDRESS (INTER MOOR, FOURCHON LA)	5-4-GL-GL-PSS-00006	P	W
5.	Upon arrival at the COMPANY DOCKYARD ADDRESS, WPSS *personnel to supervise the offloading of WPSS equipment* from transportation	5-4-GL-GL-PSS-00006	P	P
6.	Confirm all items are properly secured for transit to site	5-4-GL-GL-PSS-00006	P	P
7.	Mobilize equipment and personnel onboard CLIENT SPECIFIED VESSEL	5-4-GL-GL-PSS-00006	P	P
8.	Upon arrival WPSS employees will immediately check-in with Platform Safety Officer and receive the platform safety orientation prior to commencing any work activities.	5-4-GL-GL-PSS-00006	P	W
9.	The WPSS Supervisor shall conduct a Site Safety Meeting, JSA and job brief with crew and all relevant personnel before any operation has commenced to review all aspects of safety relating to the location with relevant personnel. Helix, Company, and/or platform representatives shall attend and provide site safety information. *The meeting will be recorded by WPSS on a Site Safety Form.*	3-4-GL-GL-PSS-00004 7-4-GL-GL-PSS-00003	P	W
10.	Platform personnel to lift equipment to platform and spot into the planned position according to predetermined lifting plan. WPSS to review and oversee placement of equipment.	5-4-GL-GL-PSS-00006	W	P

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE
11.	Await Helix representative's instructions to proceed with pre-commissioning activity. Changes to be authorized by WPSS Supervisor and reviewed by Helix representative.	5-4-GL-GL-PSS-00006	P	W

4.2 PREPARATION OF HYDROTEST EQUIPMENT

The WPSS site representative shall agree with the Site Safety Officer the positions of a safe boundary to prevent unauthorized entry to WPSS temporary work zone. Danger tape will be erected at agreed points to warn all personnel in the vicinity of the intended operation. WPSS instrumentation is ideally to be positioned outside or at the limits of the agreed test area. No work other than that controlled by the WPSS and Helix site representative shall be allowed within the defined boundary during operation for which WPSS is responsible and entry by un-authorized personnel shall be prohibited.

The WPSS site representative shall be responsible for ensuring that the equipment and instrumentation that is delivered to the site is in accordance with the equipment and instrument lists. He shall also check that all relevant items are equipped with valid Calibration Certification from a recognized and independent certifying agency/lab. This will include, but may not be limited to Calibration Certificates, Hose Test Certificates and Lifting Gear Certificates.

- Keller Gauge instrumentation shall have a range of minimum 1.25 times the specified test pressure and shall have accuracy better than ±0.1 bar and a sensitivity better than 0.05 bar.
- The volume of water added or subtracted during the pressure test shall be measured with equipment having accuracy better than ±1.0% and a sensitivity better than 0.1%.
- Temperature measuring instruments and recorders shall have accuracy better than ±1.0ºC and sensitivity of 0.1ºC.
- Pressure and temperature recorders shall be used to provide a graphical record of the pressure test for the total duration of the test with the main graphical output being supplied by the Keller Gauge.

All Calibration and Lifting Gear Certificates shall be available for inspection prior to equipment mobilization and be available for inspection by the Helix site representatives if requested. All calibration & test certificate to be submitted by WPSS shall be included in the Mobilization Manual. All original documents shall have a relevant QC stamp & certified as a true copy by WPSS. All certificates shall also be stamped and signed by the inspection company.

Original copies of all certificates shall remain in the possession of the WPSS site representative at all times. Copies can be produced and submitted to the Helix site representative if requested.

4.3 HYDROTEST EQUIPMENT RIG-UP

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
1.	Obtain Permit to Work for rig up and function testing and commence positioning of the equipment as per General Arrangement drawings. Conduct JSA/Tool Box Talk.	3-4-GL-GL-PSS-00004	P	P	W
2.	Lift the Hydrotest pumps and equipment to stage in the planned position if not already done during mobilization of equipment.	5-4-GL-GL-PSS-00006	P	P	W
3.	Confirm all equipment is functional and complete daily maintenance and fuel checks.	5-4-GL-GL-PSS-00006	P	W	W
4.	Install Hydrotest test flange(s) on top of East and West riser(s)	5-4-GL-GL-PSS-00006	P	P	W
5.	Connect the supply hose from platform fire water supply to the inlet of the pressurizing pump.	5-4-GL-GL-PSS-00006	P	W	W
6.	Connect the MP injection hose from the pressurization pump to the double block and bleed assembly. Install the heavy-duty whip checks to all connections and fully tighten.	5-4-GL-GL-PSS-00006	P	W	W
7.	Connect the MP Injection hose from the double block and bleed assembly to the isolation valve assembly on the hydrotest test flange on East Riser. Install the heavy-duty whip checks to all connections and fully tighten.	5-4-GL-GL-PSS-00006	P	W	W
8.	Connect the instrumentation hose to the valve assembly on the hydrotest flange on West Riser and route the hose in the direction of the test pump. Install the heavy-duty whip checks and fully tighten connections.	5-4-GL-GL-PSS-00006	P	W	W

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
9.	Connect the MP depressurization hose from the double block and bleed assembly and route the hose in a safe manner to be discharged over board. NOTE: Install the heavy-duty whip checks to all connections and fully tighten. Securely tie depressurization line off.	5-4-GL-GL-PSS-00006	P	W	W
10.	Prior to testing all temperature monitoring instrumentation will be positioned to allow for thermal equilibrium to be achieved. Spot the pipe wall temperature "Circular Chart" recorder adjacent to the pipeline and attach probe to the pipe wall out of direct sunlight. Ensure that adequate lagging has been installed to the probe to prevent interference from direct sunlight. Ensure that the temperature "Circular Chart" recorder is in the working position and that a new chart and battery have been installed. *Check the orientation of the chart and ensure that the time on the chart is correct.*	5-4-GL-GL-PSS-00006	P	W	W
11.	Install the Keller gauge and 15,000psi pressure recorder to the instrument line from the test flange and fit the PRV. Note the elevation of the instrumentation in reference to the deck. Ensure that the pressure chart recorder is in the working position and that a new chart and battery have been installed. *Check the orientation of the chart and ensure that the time on the chart is correct.* *Instrument Deck Elevation*	5-4-GL-GL-PSS-00006	P	W	W

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
12.	With all equipment in place the Subcontractor Project Engineer, and relevant platform personnel and walk through the testing spread and will carry out a Safety walk-through of rig-up.	5-4-GL-GL-PSS-00006	P	H	H
13.	Upon confirmation of safety walk-through, WPSS will erect safety barriers and place safety warning signs and check functionality of WPSS hydrotest spread	5-4-GL-GL-PSS-00006	P	W	W

4.4 FINAL PLATFORM PREPARATIONS

Safety barriers and warning signs shall be erected around the work area.

Upon completion of all hose and pipework connections to the temporary pumping station, the hoses and manifolds will be subjected to a leak test to 1.05 times the hydrotest pressure of the system (11,000psi). Back pressure on the injection hoses will be achieved by means of pressurizing against the isolation valves on the test flange. The tie-in point shall be the bleed connection located on the double block and bleed assembly fitted to the flange. All required instrumentation hoses shall be connected to the bleed point and pressurized during the injection hose test. The holding time will be no less than 10 minutes. Any leaks found shall be rectified to ensure that the system is leak free. All supply lines will be checked for leaks by utilizing the supply pressure from the platform water supply. Contractor representative witnesses all leak checks.

All instrumentation is to be checked and inspected prior to start-up. These checks are to determine the reliability of the required instruments during the entire phase of operations. All instruments are to be at the zero point prior to start-up. As part of function testing the Pressure Recorder is to be tested against the main pressure measurement Keller Gauge and spot readings taken and officially recorded to verify accuracy of all instruments.

All mechanical devices shall be function tested prior to the commencement of operations. These checks shall include, but not be limited to the start-up of all diesel driven units, function of speed controllers to allow for variable speed operations, the necessary pre-start maintenance checks on all units (oil, water, fuel, etc) A pre-start check sheet is to be completed and filed in the site office.

4.5 PRESSURE CORRECTION

Elevation of instrumentation above sea level is to be confirmed following final installation of instrumentation to determine test pressure with reference to MSL. For example, if the instrumentation is placed on the 100' deck level this shall be a pressure compensation of 100' x 0.445 = 44.5psig. A test pressure of 10,313psig at the 100' level would mean the pipeline would be pressurized to 10,268.5 + 44.5 = 10,313psig at mean sea level.

Top Deck	-	100 feet above sea level
Gauge tied-off 5 feet above deck floor	-	5 feet
Total above sea level	-	**105 feet**

Pressure Compensation - 105 feet x .445 = 47 psig

In order to have test pressure at sea level to be 10,313 psi, the reading on the Gauge will be;

10,313 psi – 47 psi = 10,266 psig.

This is from:

Pressure Correction = $(\rho \times g \times h) \div 100000$

Where:

ρ = Density of the test medium in kg/m^3 (sea water is $1024kg/m^3$)

g = Acceleration due to gravity (9.81m/s)

h = Height above test medium (-32m)

$(1024 \times 9.81 \times 32) \div 100000$ = -3.21barg = **-46.41psig**

All non return valves are to be inspected to check that orientation is correct. All pressure relief valves are to be inspected to determine that the valves are set at the correct pressure.

4.6 Valve and System Status Checklist

Ref: WPSS-014550-DW-01

System Identification	Valve No	Position Required	Checked WPSS	Checked Client	Remarks
Manifold on Test Pump					WPSS-014550-DW-02
Autoclave Ball Valve	ABV-1	OPEN			In-line off pump
Autoclave Ball Valve	ABV-2	OPEN			In-line off pump
Autoclave Ball Valve	ABV-3	Closed			Bleed valve off pump
Valve Manifold Table					WPSS-014550-DW-02
Autoclave Ball Valve	ABV-4	OPEN			In-line to test head
Autoclave Ball Valve	ABV-5	OPEN			In-line to test head
Autoclave Ball Valve	ABV-6	Closed			Bleed Valve for depressurization
Autoclave Needle Valve	ANV-1	Closed			Valve to control depressurization
Check Valve	CV-1	FITTED			Check Proper Orientation
Pressure Relief Valve	PRV-1	FITTED			Installed and set @ 12,000psi
Test Head Injection Manifold					WPSS-014550-DW-02
Autoclave Ball Valve	ABV-7	OPEN			In-line to test head
Autoclave Ball Valve	ABV-8	OPEN			In-line to test head
Autoclave Ball Valve	ABV-9	Closed			Bleed Valve
Test Head Instrument Manifold					WPSS-014550-DW-02
Autoclave Ball Valve	ABV-10	OPEN			In-line to instrumentation
Autoclave Ball Valve	ABV-11	OPEN			In-line to instrumentation
Autoclave Ball Valve	ABV-12	Closed			Bleed Valve
Subsea Valves					
EAST PLET					
4 1/16" 10k ROV Manual Gate Valve	P2-IV-1	OPEN			In-line valve
4 1/16" 10k ROV Manual Gate Valve	P2-IV-2	Closed			To pressure cap
WEST PLET					
4 1/16" 10k Subsea Hydraulic Operated Fail-safe Valve	PGV2	OPEN			In-line valve
4 1/16" 10k Subsea Hydraulic Operated Fail-safe Valve	PGV1	OPEN			In-line valve
4 1/16" 10k ROV Manual Gate Valve	P1-IV-1	Closed			To pressure cap

SYSTEM IDENTIFICATION	Requirements	CHECKED WPSS	CLIENT	REMARKS
Barrier /Caution notification	In place & good condition			
Leak Test	Verified no leaks			
Instrumentation	In place and functioning			
Subsea systems ready	Check List Verified			
Water & Air Supply	Verified ready			

4.7 HYDROTEST OPERATIONS

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
1.	The Helix representative shall review and sign the Commencement Report prior to the start of any operations associated with the Hydrotesting operation.	5-4-GL-GL-PSS-00011	P	P	W
2.	The WPSS Supervisor shall conduct a JSA/Toolbox Talk at the beginning of the operation with all personnel who will be operating, observing or witnessing for the duration of the operation. This JSA/Toolbox Talk will be reviewed at shift handovers for the duration of the operation. Any new or changing hazards identified and updated as required.	3-4-GL-GL-PSS-00004	P	W	W
3.	Install pressure charts to the pressure and temperature recorder. Charts will be clearly indicate: • Pipeline Section • Date • Time • Phase of Operation • Recorder Serial Number • Range • Location Ensure that the clock is in the 24hr operating position, new pen, and new batteries are in place. The system is now ready for operation. Upon removal of any chart during the operation ensure that all charts have been signed-on by the Company, Contractor, Subcontractor and relevant third parties.		P	W	W

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
4.	During the hydrotesting operation, the following parameters will be recorded and logged according to procedure: • Pipeline Pressure.....psig • Volume of water injected.....gallons • Ambient Air Temperature.....°F • Pipeline Wall Temperature.....°F Note: Temperature will be read from the Charts	5-4-GL-GL-PSS-00012			
5.	The flowline will have been previously free flooded and should be topped up to the test flange(s). Air will be bled off at the highest instrumentation point. Topping off of the topside piping will be done prior to pressurization if required.	5-4-GL-GL-PSS-00006	P	W	W
6.	Danger Tape off hydrotesting area and equipment and make a platform announcement of hydrotest operations.	5-4-GL-GL-PSS-00006	P	W	W
7.	Request Helix representative confirms topsides and subsea valves are properly aligned for hydrostatic testing as per valve and system status checklist (sec. 4.6)	5-4-GL-GL-PSS-00006	H	H	H
8.	Confirm water supply to pressure pump.	5-4-GL-GL-PSS-00006	P	W	W
9.	Walk the pressurization line and verify WPSS valves are per valve and system status checklist (sec. 4.6)	5-4-GL-GL-PSS-00006	P	W	W
10.	Start Hydrotest pump and adjust the pressurizing pump speed and commence the pressurization sequence. Pressurization to be done in a safe and controlled manner at approximately 15psig/min .	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
11.	Ensure that the pressurization rate does not exceed 15psig/min. Record the injected volumes in 15psig increments and add to the air inclusion report form.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
12.	Once the pipeline system has reached **525psig** at the instruments, stop pressurization pump. **Close Valve: ABV-4**	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	H	H
13.	Carry out a visual leak check on all connections. WPSS representative to complete the air inclusion calculations. Hold the pressure for a minimum of 15 minutes logging pressure every 5 minutes.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	H	H
14.	For the Air Inclusion calculation, the pipeline pressure versus injected volume will be calculated and presented graphically. With the air inclusion calculation completed verify that the air content is within the specification of less than 0.5% for a non-pigged pipeline. Present the results to Company and Contractor representatives and if the air content is less than 0.5%, obtain permission from the Company representative to continue with the hydrotest. If the air content is greater than 0.5%, obtain written confirmation from Helix to continue or to bleed down.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	H	H
15.	**OPEN Valve: ABV-4** Start the pressurizing pump, adjust the pressurizing pump speed and re-commence the pressurization sequence.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
16.	Adjust the speed on the pressurizing pump, ensuring that the pressurization rate does not exceed 15psig/min. Record the injected volumes in 100psig increments. WPSS representative shall continuously analyze data during pressurization, should data indicate any abnormalities pressurization is be halted and only restarted following instruction from Contractor representative	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
17.	Once the pipeline system has reached 35% of test pressure at the instruments (3,610psig) Shutdown the pressurizing pump; **Close Valve: ABV-4**	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
18.	Carry out a visual leak check on all connections and hold the pressure for a minimum of 15 minutes logging pressure every 5 minutes	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	H	H
19.	If a leak occurs during the pressurization of the riser and flowline, the pressure pump will be shut down and isolated. All hoses and equipment shall be checked for visual leaks on the topside of the platform prior to the Helix representative's inspection for leaks within the risers, flowline, and subsea structures.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	H	H

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
20.	If there are no visible leaks or pressure drops, continue pressuring the flowlines. **OPEN Valve: ABV-4** Start the pressurizing pump, adjust the pressurizing pump speed and re-commence the pressurization sequence. Adjust the speed on the pressurizing pump, ensuring that the pressurization rate does not exceed 15 psig/min. Record the injected volumes in 100psig increments. WPSS Representative shall continuously analyze data during pressurization, should data indicate any abnormalities pressurization is be halted and only restarted following instruction from Contractor representative	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
21.	Once the pipeline system has reached 50% of test pressure at the instruments **(5,166psig)** Shutdown the pressurizing pump; **Close Valve: ABV-4**	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
22.	Carry out a visual leak check on all connections and hold the pressure for a minimum of 15 minutes logging pressure every 5 minutes	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	H	H

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
23.	If there are no visible leaks or pressure drops, continue pressuring the flowlines. **OPEN Valve: ABV-4** Start the pressurizing pump, adjust the pressurizing pump speed and re-commence the pressurization sequence. Adjust the speed on the pressurizing pump, ensuring that the pressurization rate does not exceed 15psig/min. Record the injected volumes in 100psig increments. WPSS Representative shall continuously analyze data during pressurization, should data indicate any abnormalities pressurization is be halted and only restarted following instruction from Contractor representative	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
24.	Once the pipeline system has reached 80% of test pressure at the instruments (**8,250psig**) Shutdown the pressurizing pump; **Close Valve: ABV-4**	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
25.	Carry out a visual leak check on all connections and hold the pressure for a minimum of 15 minutes logging pressure every 5 minutes	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	H	H

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
26.	If there are no visible leaks or pressure drops, continue pressuring the flowlines. **OPEN Valve: ABV-4** Start the pressurizing pump, adjust the pressurizing pump speed and re-commence the pressurization sequence. Adjust the speed on the pressurizing pump, ensuring that the pressurization rate does not exceed 15psig/min. Record the injected volumes in 100psig increments. WPSS Representative shall continuously analyze data during pressurization, should data indicate any abnormalities pressurization is be halted and only restarted following instruction from Contractor representative	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
27.	Once the pipeline system has reached 95% of test pressure at the instruments (9,797psig) Shutdown the pressurizing pump; **Close Valve: ABV-4**	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
28.	Carry out a visual leak check on all connections and hold the pressure for a minimum of 15 minutes logging pressure every 5 minutes	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	H	H
29.	If there are no visible leaks or pressure drops, continue pressuring the flowlines. **OPEN Valve: ABV-4** With the system pressure at 95% of test pressure at the instruments (9,797psig) Reduce the speed of the pressurizing pump. Adjust the speed on the pressurizing pump, ensuring that the pressurization rate does not exceed 10psig/min. Record the injected volumes in 50psig increments.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
30.	With the system pressure at Test pressure(10, 313psig) Plus 200psi at the instruments (10,513psig) Shutdown the pressurizing pump. **Close Valve: ABV-4**	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
31.	The stabilization period will now commence. A minimum of one hour stabilization will be observed with the logging of parameters carried out at 5 minute intervals for the first two hours then at 15 minute intervals thereafter.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	H	H
32.	With pipeline temperature equalizing with seawater temperature, thermal equilibrium will be achieved and pipeline pressure will stabilize. When pressure and thermal stabilization has been confirmed all data will be presented to Company and Contractor representatives and permission gained to commence the 8 hour Hold Period. Examples of stabilization include when previous 4 reading are the same or decay rate is constant over some period of time and can be explained.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	H	H
33.	Should it be required, the pressure shall be increased to test pressure Plus 200psi (10,513psig) following commencement of the stabilization period by opening **ABV-4** on the valve manifold table and starting the pressurizing pump until test pressure is achieved. The pump will be isolated by valve **ABV-4** on valve manifold table with the pressurizing hoses between the pump and the valve manifold depressurized through **ABV-3** to isolate pump from system.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
34.	Once the 8 hour Hold Period commences, no visible topside or observable sub-sea leaks shall be allowed. If leaks are observed during the 8 hour Hold Period, the pipeline system will be depressurized, the leak(s) fixed and the Hydrotest restarted.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	H	H

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
35.	The pressure test Hold period shall be held for a minimum period of 8 hours. Readings of pressure and temperature shall be logged by the Keller Gauge every 15 seconds and at least every 15 minutes by the Technician. The pressure test is acceptable if: 1. The pressure does not drop below the designated test pressure; 2. There are no observable leaks in the pipeline system during the 8-hour hold period; and 3. There are no unexplainable pressure drops	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	H	H
36.	Upon acceptance of Hydrotest, Helix Representative will sign the WPSS Hydrotest Acceptance Certificate (5-4-GL-GL-PSS-00033) prior to commencing depressurization.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	R	R	R

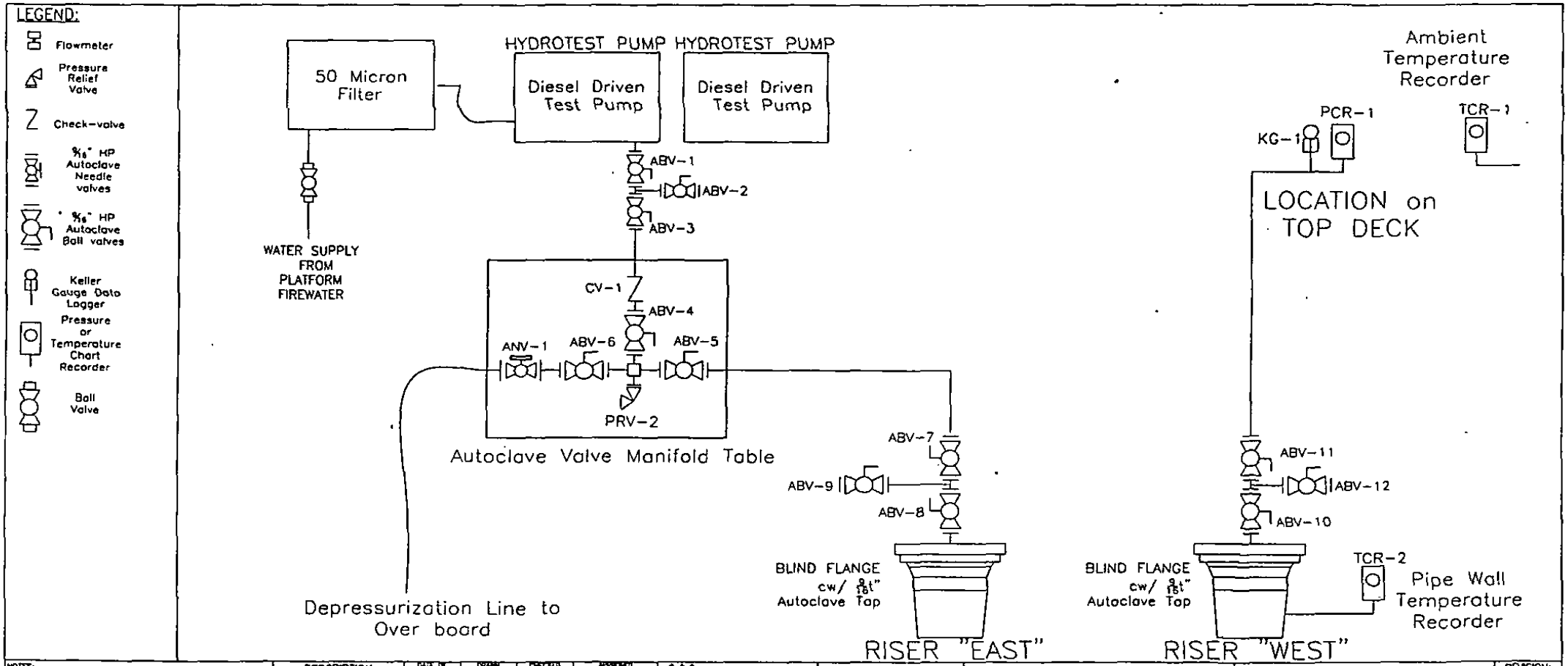
4.8 System Depressurization

Item	Description	Reference	WPSS Initial/ Date	Helix Initial/ Date	Client Initial/ Date
1.	Upon the acceptance of the Hold period and charts and test acceptance certificates signed off by Helix, the pipeline system shall be depressurized.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
2.	Prior to depressurization the platform control room will be notified and all non-essential personnel will be cleared prior to commencing depressurizing operation.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
3.	The depressurization dump line from valves **ABV-6 & ANV-1** will have been installed prior to start of operation keeping the hose as short as possible yet routing the discharge safely over board. Hose will have been securely fastened.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
4.	**OPEN valve ANV-1 completely** **OPEN Valve: ABV-6** **Adjust ANV-1 to control depressurization rate** Commence de-pressurizing the pipeline system.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
5.	A sample of the discharge water will then be taken.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
6.	Depressurize in a safe and controlled manner control the depressurization rate by regulating the bleed valve ANV-1. Monitored pressure every 15minutes and every 15 seconds by the Keller Gauge.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	P	W	W
7.	Once the pipeline is at atmospheric static pressure (0psig), sign off on all charts and Operational Paperwork and complete a Completion Report Form.	5-4-GL-GL-PSS-00012 5-4-GL-GL-PSS-00006	R	R	R

4.9 EQUIPMENT DEMOBILIZATION

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
1.	Await Helix representative's approval to begin demobilization of equipment and personnel.	5-4-GL-GL-PSS-00006	P	P	W
2.	Ensure all paperwork has been signed by Helix representative and / or relevant parties. • Commencement Reports • Daily Site Reports • Shift Handover Forms • Field Tickets • Pumping Reports • Job Safety Analysis (JSA's) • Post Job Evaluation • All Related Pressure Charts • All Related Temperature Charts • Completion Reports	5-4-GL-GL-PSS-00011 5-4-GL-GL-PSS-00006 5-4-GL-GL-PSS-00007 5-4-GL-GL-PSS-00012 3-4-GL-GL-PSS-00004 6-4-US-GL-PSS-00001 5-4-GL-GL-PSS-00013 5-4-GL-GL-PSS-00008	P	W	W
3.	The WPSS Supervisor shall conduct a JSA/Toolbox Talk at the beginning of the operation with all personnel who will be operating, observing or witnessing for the duration of the operation.	3-4-GL-GL-PSS-00004	P	W	W
4.	Break-down equipment spreads and prepare/secure delicate items prior to load-out.	5-4-GL-GL-PSS-00006	P	W	W
5.	Load-out equipment spread on WPSS supplied transportation. Ensure equipment is properly secured.	5-4-GL-GL-PSS-00006	P	W	W
6.	Demobilize equipment and personnel to the WPSS facilities at the following addresses: **Attn: Taylor Williams** **Phone: (713) 580-9700** **7721 Pinemont Road** **Houston, TX 77040-6203** **USA**	5-4-GL-GL-PSS-00006	P	W	W

ITEM	DESCRIPTION	REFERENCE	WPSS INITIAL/ DATE	HELIX INITIAL/ DATE	CLIENT INITIAL/ DATE
7.	Contact Project Manager or Asset Coordinator to coordinate trucks for equipment and crew to shop. Maintain shipping manifests or other records for Project Manager.	5-4-GL-GL-PSS-00006	P	W	W
8.	Deliver Project Completion Book to Helix at time of final invoice.	WPSS-014550-CB	P	W	W



NOTES:

DESCRIPTION	DATE OF ISSUE	DRAWN BY	ENGINEER BY	APPROVED BY
ISSUED FOR INTERNAL USE	16 MAY 11	BS	TS	
ISSUED FOR REVIEW	3 JUNE 11	BS	TS	
ISSUED FOR REVIEW	11 JUNE 11	DL	TW	WB

Weatherford

PIPELINE & SPECIALTY SERVICES
7721 PINEMONT DR
HOUSTON, TEXAS 77040

CLIENT: Helix Energy Services
UNITS: N/A
SCALE: NOT TO SCALE

DRAWING NUMBER: WPSS-014550-DW-01
REVISION: 2
DRAWING TITLE: HYDROTEST RIG-UP SCHEMATIC
PROJECT: NOBLE RATON SOUTH

APPENDIX B: ENGINEERING CALCULATIONS

1. Hydrotest Calculations

Pipe ID:	3.44	in		
Gal / Foot:	0.4822	gal/ft		
Ft^3 / Foot:	0.06	ft^3/ft		
Pipeline Total Vol:	140,228.56	gal		
Pipeline Total Vol:	18,745.83	ft^3		
Pipeline Total Vol:	3,338.78	bbl		
Gal / psi	0.457559	gal/psi		
Gal to Test Press:	4718.81	gal (at 70 degF)		
Time to Test Press:	11.24	hr	0.47	days
Pressurization Rate:	15.30	psi/min	917.91	psi/hr
Est Mill Scale:	2944.00	lb	1.47	tons

Trapped Air Acceptance Criterial is 0.4% Maximum

APPENDIX C: WPSS FIELD FORMS

TITLE
Commencement Report (1pg)
Daily Site Reports (DSR) (1pg)
Job Safety Analysis (JSA's) (5pgs)
Field Tickets (6pgs)
Site Safety Meeting (1pg)
Work Safe Plan "Tool Box Talk" (1pg)
Shift Handover Forms (2pgs)
Completion Reports (1pg)
Pumping Report General Purpose (1pg)

Material Safety Data Sheet

1. Product and company identification

Product name	: OSW490 OXYGEN SCAVENGER
Supplier	: Baker Petrolite A Baker Hughes Company 12645 W. Airport Blvd. Sugar Land, TX 77478 For Product Information/MSDSs Call: 800-231-3606 (8:00 a.m. - 5:00 p.m. cst, Monday - Friday) 281-276-5400
Material Uses	: Special: Oxygen scavenger.
Code	: OSW490
Validation date	: 3/9/2010.
Print date	: 3/9/2010.
Version	: 3
Responsible name	: Global Regulatory Affairs - Telephone 281-276-5400 or 800-231-3606
In case of emergency	: CHEMTREC: 800-424-9300 (U.S. 24 hour) Baker Petrolite: 800-231-3606 (001)281-276-5400 CANUTEC: 613-996-6666 (Canada 24 hours) CHEMTREC Int'l 01-703-527-3887 (International 24 hour)

2. Hazards identification

Physical state	: Liquid. [Clear.]
Odor	: Pungent.
Color	: Greenish-yellow.
OSHA/HCS status	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Emergency overview	: WARNING! CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. Do not get in eyes. Avoid breathing vapor or mist. Avoid contact with skin and clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.
Routes of entry	: Dermal contact. Eye contact. Inhalation.

Potential acute health effects

Inhalation	: Irritating to respiratory system.
Ingestion	: Ingestion may cause gastrointestinal irritation and diarrhea.
Skin	: Irritating to skin.
Eyes	: Severely irritating to eyes. Risk of serious damage to eyes.

Potential chronic health effects

Over-exposure signs/symptoms

Inhalation	: respiratory tract irritation, coughing
Ingestion	: None known.
Skin	: irritation, redness
Eyes	: pain or irritation, watering, redness

See toxicological information (section 11)

Additional information

Corrosive to metal.

3 . Composition/information on ingredients

Name	CAS number	%
Ammonium bisulfite	10192-30-0	30 - 60

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

5 . Fire-fighting measures

Flammability of the product : In a fire or if heated, a pressure increase will occur and the container may burst.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Hazardous thermal decomposition products : nitrogen oxides,sulfur oxides

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Dispose of via a licensed waste disposal contractor.

6 . Accidental release measures

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1-800-424-8802.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Use only with adequate ventilation. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see section 10). Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
gredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
No exposure limit value known.											

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before re-use.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves: Butyl rubber gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state	: Liquid. [Clear.]
Flash point	: Not available.
Auto-ignition temperature	: Not available.
Flammable limits	: Not available.
Color	: Greenish-yellow.
Odor	: Pungent.
pH	: 5 to 5.5
	: Neat - without dilution.
Boiling/condensation point	: Not available.
Initial Boiling Point	: Not available.
Melting/freezing point	: Not available.
Relative density	: 1.298 (16°C)
Density	: 10.81 (lbs/gal)
Vapor density	: >1 [Air = 1]
Odor threshold	: Not available.
Evaporation rate	: Not available.
VOC	: Not available.
Viscosity	: Not available.
Solubility (Water)	: Soluble
Vapor pressure	: Not available.
Pour Point	: Not available.
Partition coefficient (LogKow)	: Not available.

10 . Stability and Reactivity

Chemical stability	: The product is stable.
Possibility of hazardous reactions	: Under normal conditions of storage and use, hazardous reactions will not occur.
Hazardous polymerization	: Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid	: No specific data.
Materials to avoid	: Reactive or incompatible with the following materials: oxidizing materials, acids and alkalis.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Conditions of reactivity	: Non-flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

11 . Toxicological information

No additional information.

Chronic toxicity Remarks

1) Ammonium bisulfite

Ammonium bisulfite is a component of this product. Prolonged contact can produce corrosion of the skin and permanent damage to the eye. Under acidic conditions, sulfur dioxide may be formed. Inhalation of sulfur dioxide can cause stricture of the esophagus, acute pulmonary edema, and respiratory failure. Sulfur dioxide has been linked to miscarriages, gynecological disease, and abnormal pregnancies (Reprotext).

The ACGIH exposure limits for sulfur dioxide are TWA of 2 ppm and STEL of 5 ppm. The OSHA exposure limit for sulfur dioxide is a TWA of 5 ppm.

11 . Toxicological information

12 . Ecological information

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
OSW490 OXYGEN SCAVENGER	Acute LC50 103 mg/l	Fish - Bluegill sunfish	96 hours
	Acute LC50 100 mg/l	Fish - Threespine stickleback	96 hours

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

Additional information

An EcoTox™ Report, and/or the material's environmental fate is available upon request at the following number: 1-800-235-4249, then press 4.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	UN2693	BISULFITES, AQUEOUS SOLUTION, *N.O.S.* (Contains: Ammonium bisulfite)	8	III		-
TDG Classification	UN2963	BISULFITES, AQUEOUS SOLUTION, N.O.S. (Contains: Ammonium bisulfite)	8	III		-
IMDG Class	UN2693	BISULPHITES, AQUEOUS SOLUTION, N.O.S. (Contains: Ammonium bisulfite)	8	III		Emergency schedules (EmS) F-A S-B

PG* : Packing group

DOT Reportable Quantity Ammonium bisulfite, 916 gal of this product.

14 . Transport information

Marine pollutant Not applicable.

North-America NAERG : 154

15 . Regulatory information

HCS Classification : Irritating material

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: ammonium hydrogensulphite
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: OSW490 OXYGEN SCAVENGER: Immediate (acute) health hazard

CERCLA: Hazardous substances.: ammonium hydrogensulphite: 5000 lbs. (2270 kg);
Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: ammonium hydrogensulphite

Clean Air Act (CAA) 112 accidental release prevention: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) : Not listed

SARA 313

	Product name	CAS number	Concentration
Supplier notification	Ammonium bisulfite	10192-30-0	30 - 60

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada

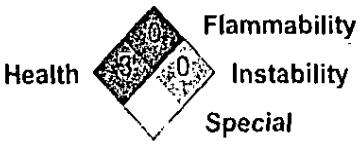
WHMIS (Canada) : Class D-2B: Material causing other toxic effects (Toxic).
Class E: Corrosive material

Canada (CEPA DSL): : All components are listed or exempted.

16 . Other information

Label requirements : CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION.

National Fire Protection Association (U.S.A.) :



Date of printing : 3/9/2010..

Indicates information that has changed from previously issued version.

Notice to reader

16 . Other information

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes, owever, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this ,nformation.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Material Safety Data Sheet

1. Product and company identification

Product name	: X-CIDE™ 102 INDUSTRIAL BACTERICIDE ™ a trademark of Baker Hughes, Inc.
Supplier	: Baker Petrolite A Baker Hughes Company 12645 W. Airport Blvd. Sugar Land, TX 77478 For Product Information/MSDSs Call: 800-231-3606 (8:00 a.m. - 5:00 p.m. cst, Monday - Friday) 281-276-5400
Material Uses	: Special: Industrial Bactericide.
Code	: XC102
Validation date	: 11/2/2009.
Print date	: 11/2/2009.
Version	: 3
Responsible name	: Global Regulatory Affairs - Telephone 281-276-5400 or 800-231-3606
In case of emergency	: CHEMTREC: 800-424-9300 (U.S. 24 hour) Baker Petrolite: 800-231-3606 (001)281-276-5400 CANUTEC: 613-996-6666 (Canada 24 hours) CHEMTREC Int'l 01-703-527-3887 (International 24 hour)

2. Hazards identification

Physical state	: Liquid.
Odor	: Fruity. Medicinal. [Strong]
Color	: Colorless.
OSHA/HCS status	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Emergency overview	: DANGER! CAUSES EYE BURNS. CAUSES RESPIRATORY TRACT AND SKIN IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. MAY BE HARMFUL IF SWALLOWED. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. Do not breathe vapor or mist. Do not ingest. Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.
Routes of entry	: Dermal contact. Eye contact. Inhalation.

Potential acute health effects

Inhalation	: Severely irritating to the respiratory system.
Ingestion	: Harmful if swallowed. May cause burns to mouth, throat and stomach.
Skin	: Severely irritating to the skin. May cause sensitization by skin contact.
Eyes	: Corrosive to eyes. Causes burns.

Potential chronic health effects

Chronic effects	: Contains material that may cause target organ damage, based on animal data. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.
Target organs	: Contains material which may cause damage to the following organs: upper respiratory tract, skin, eye, lens or cornea.

Over-exposure signs/symptoms

Inhalation	: respiratory tract irritation, coughing
Ingestion	: None known.

2 . Hazards identification

Skin	: irritation, redness
Eyes	: pain, watering, redness
Medical conditions aggravated by over-exposure	: Pre-existing skin disorders and disorders involving any other target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

Additional information

Glutaraldehyde may stain skin and nails to brown or golden brown color.Glutaraldehyde can cause allergic contact dermatitis, asthma and rhinitis and may aggravate existing asthmatic conditions.

3 . Composition/information on ingredients

Name	CAS number	%
Glutaraldehyde	111-30-8	10 - 30

4 . First aid measures

Eye contact	: Get medical attention immediately. Immediately flush the eye(s) continuously with lukewarm, gently flowing water for at least 20-60 minutes while holding the eyelid(s) open.
Skin contact	: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
Inhalation	: Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
gestion	: Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Protection of first-aiders	: No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wear suitable protective clothing and gloves. Remove contaminated clothing and shoes.

5 . Fire-fighting measures

Flammability of the product	: In a fire or if heated, a pressure increase will occur and the container may burst.
Extinguishing media	
Suitable	: Use an extinguishing agent suitable for the surrounding fire.
Not suitable	: None known.
Special exposure hazards	: Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.
Hazardous thermal decomposition products	: carbon dioxide,carbon monoxide
Special protective equipment for fire-fighters	: Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1-800-424-8802.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see section 10). Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredient	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Glutaraldehyde	US ACGIH OSHA PEL 1989	- -	- -	- -	- -	- -	- -	0.05 0.2	- 0.8	- -	

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

8 . Exposure controls/personal protection

Hygiene measures	: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before re-use.

Personal protection

Respiratory	: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
Hands	: Chemical-resistant gloves: Nitrile or Neoprene gloves. PVC gloves. 4H gloves. Butyl rubber gloves.
Eyes	: Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.
Skin	: Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state	: Liquid.
Flash point	: Closed cup: >93.4°C (>200.1°F) [SFCC]
Auto-ignition temperature	: Not available.
Flammable limits	: Not available.
Color	: Colorless.
Odor	: Fruity. Medicinal. [Strong]
pH	: 3 to 4.5
	: Neat - without dilution.
Boiling/condensation point	: Not available.
Initial Boiling Point	: Not available.
Melting/freezing point	: Not available.
Relative density	: 1.056 (15.6°C)
Density	: 8.8 (lbs/gal)
Vapor density	: >1 [Air = 1]
Odor threshold	: Not available.
Evaporation rate	: Not available.
VOC	: Not available.
Viscosity	: Dynamic (15.6°C): 4 cP
Solubility (Water).	: Soluble
Vapor pressure	: 4.1 kPa (31 mm Hg) at 37.8°C
Pour Point	: -6.7°C (19.9°F)
Partition coefficient (LogKow)	: Not available.

10 . Stability and Reactivity

Chemical stability	: The product is stable.
Possibility of hazardous reactions	: Under normal conditions of storage and use, hazardous reactions will not occur.
Hazardous polymerization	: Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid	: No specific data.
Materials to avoid	: Reactive or incompatible with the following materials: oxidizing materials, acids and alkalis.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

10 . Stability and Reactivity

Conditions of reactivity : Slightly flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Glutaraldehyde	LD50 Dermal	Rabbit	560 uL/kg	-
	LD50 Oral	Rat	134 mg/kg	-
	LC50 Inhalation Vapor	Rat	480 mg/m3	4 hours
X-CIDE™ 102 INDUSTRIAL BACTERICIDE	LD50 Dermal	Rabbit	13600 mg/kg	-
	LD50 Oral	Rat	1990 mg/kg	-

Carcinogenicity

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Glutaraldehyde	A4	-	-	-	-	-

Chronic toxicity Remarks

1) Glutaraldehyde

Glutaraldehyde is a component of this product. In long-term experimental animal studies, glutaraldehyde caused liver damage in mice (ACGIH, 1992), but it was not neurotoxic in rats (Spencer et al, 1978).

Female rats had increased large granular lymphocytic leukemias after receiving glutaraldehyde in the drinking water at levels up to 1,000 ppm for 2 years (Andersen, 1996).

The results of genetic studies have been mixed with no conclusive evidence of positive effects.

In 2-year inhalation studies, there was no evidence of carcinogenic activity in male or female rats exposed to 250, 500 or 750 ppb, or in male or female mice exposed to 62.5, 125, or 250 ppb glutaraldehyde. Incidences of nasal and respiratory lesions were increased in both male/female rats and mice. Reduction in body weight, as compared to the controls was also noted.

Additional information

Draize Test Eye (Rabbit): Extreme Irritant/Corrosive.Draize Test Skin (Rabbit): Extreme Irritant.

12 . Ecological information

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
X-CIDE™ 102 INDUSTRIAL BACTERICIDE	EC50 16 mg/l	Algae - Selenastrum capricornutum	96 hours
	EC50 8 mg/l	Algae - Chlorella vulgaris	96 hours
	EC50 1.8 mg/l	Algae - Skeletonema costatum	96 hours
	LC50 75 mg/l	Fish - Threespine stickleback	96 hours
	LC50 43 mg/l	Daphnia - Daphnia magna	48 hours
	LC50 42 mg/l	Fish - Bluegill sunfish	96 hours
	LC50 33 mg/l	Fish - Rainbow trout	96 hours
	LC50 28.4 ppm	Daphnia - Mysid	96 hours

12 . Ecological information

shrimp

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

Additional information

An EcoTox™ Report, and/or the material's environmental fate is available upon request at the following number: 1-800-235-4249, then press 4.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	Not regulated.	-	-	-		-
TDG Classification	Not regulated.	-	-	-		-
IMDG Class	Not applicable.	-	-	-		-

PG* : Packing group

DOT Reportable Quantity Not applicable.

Marine pollutant Not applicable.

North-America NAERG : Not available.

15 . Regulatory information

HCS Classification : Corrosive material
Sensitizing material
Target organ effects

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: glutaral
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: X-CIDE™ 102 INDUSTRIAL BACTERICIDE: Immediate (acute) health hazard

CERCLA: Hazardous substances.: methanol: 5000 lbs. (2270 kg);
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.

15 . Regulatory information

Clean Air Act (CAA) 112 accidental release prevention: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs)	: Not listed
United States inventory (TSCA 8b)	: *All components are listed or exempted.*

Canada

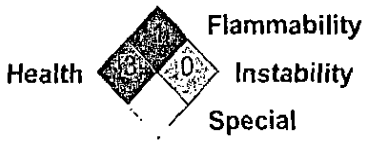
WHMIS (Canada)	: Class D-1B: Material causing immediate and serious toxic effects (Toxic). Class D-2A: Material causing other toxic effects (Very toxic). Class D-2B: Material causing other toxic effects (Toxic). Class E: Corrosive material
Canada (CEPA DSL):	: All components are listed or exempted.

Additional information

This product is subject to regulation under the US Federal Insecticide, Fungicide and Rodenticide ACT (FIFRA) and is therefore exempt from US Toxic Substance Control Act (TSCA) Inventory listing requirements. EPA Registration No. 10707-40

16 . Other information

Label requirements	: CAUSES EYE BURNS. CAUSES RESPIRATORY TRACT AND SKIN IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. MAY BE HARMFUL IF SWALLOWED. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
National Fire Protection Association (U.S.A.)	:



Date of printing : **11/2/2009.**

Indicates information that has changed from previously issued version.

Notice to reader

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

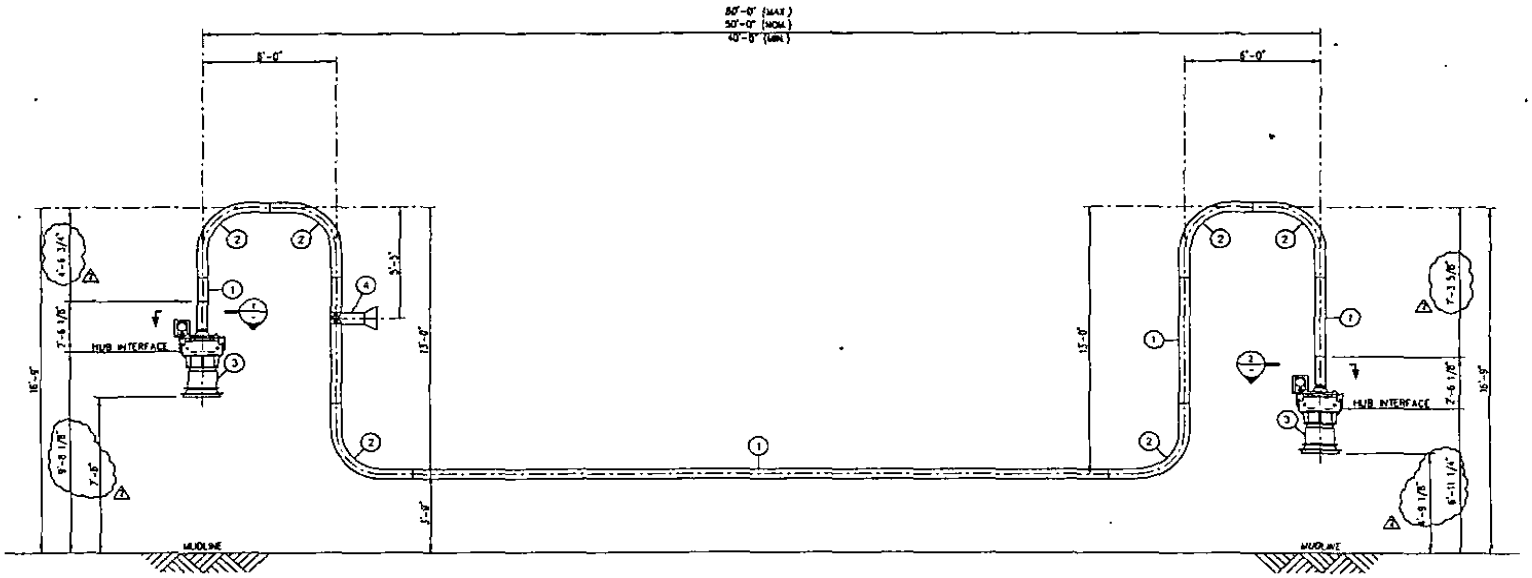
The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

APPENDIX E: HELIX SUPPLIED DRAWINGS

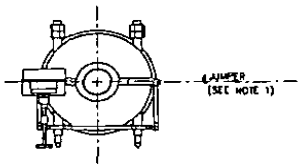
NUMBER	TITLE
16172-N002 Rev 2	Pigging (PLET to PLET) Jumper
16172-A100 Rev 1	Raton South Scope of Supply Schematic

BILL OF MATERIALS (MAX.)		
ITEM	QTY	DESCRIPTION
1	50'	5.563" O.D. x 0.750" W.T. API 5L X65 SMLS LINE PIPE
2	6	5.563" O.D. x 0.750" W.T. API 5L X65 SMLS INDUCTION BEND, 90 DEG. 50 [25"] RAD, 16" TANGENTS
3	2	FEMALE 4" RAC CONNECTOR w/ REDUCER, API 5L X65 w/ 30" PUP PIECE
4	1	CLAMPON PIG DETECTOR, 5.63" O.D. PIPE

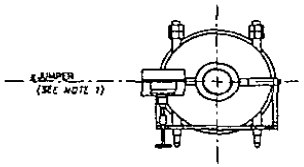


DUAL HUB WEST PLET

DUAL HUB EAST PLET



SECTION 1
SCALE: 1"=1'-0"



SECTION 2
SCALE: 1"=1'-0"

SUPERSEDES DRAWING 18172-F011

NOTES:
1. CONNECTOR DETAILS SUPPLIED BY NOBLE, REFERENCE DSI DRAWING RA-080674, RA-080675, RA-080782, & RA-080783.
2. ALL DIMENSIONS TO BE CONFIRMED BY PRE-INSTALLATION METROLOGY.

NO.	BY	REVISION DESCRIPTION	DATE	CHK	ENG	APPR
2	GLS	MODIFIED TO MATCH PLET DESIGN	08/16/11	B.B	B.P	B.P
1	GLS	MODIFIED NOTES & ADDED ITEM 4	04/15/11	R.L	B.P	
0	GLS	APPROVED FOR CONSTRUCTION	03/08/11	S.B	B.P	B.P

THE INFORMATION PROVIDED BY THIS DRAWING IS NOT TO BE ACCEPTED AS VALID UNLESS IT IS SIGNED BY ORIGINAL PROFESSIONAL ENGINEER'S STAMP. IF COPIES OF DRAWINGS ARE USED, THE ORIGINAL SIGNATURE AND SEAL MUST BE AFFIXED TO EACH COPY.

ENGINEER: S. PATEL — DATE: 08/02/10
DRAWN BY: C. SPRADLEY — DATE: 08/02/10
CHKD BY: S. PATEL — DATE: 08/11/10
APPR'D BY: B. BUNCH — DATE: 08/11/10
PLOT SCALE: 1:1
SCALE: 3/8"=1'-0"
SCALE VALID FOR B-SIZE DRAWINGS ONLY (11"x17")
TEXAS REGISTERED ENGINEERING FIRM — FIRM NO. F-3761

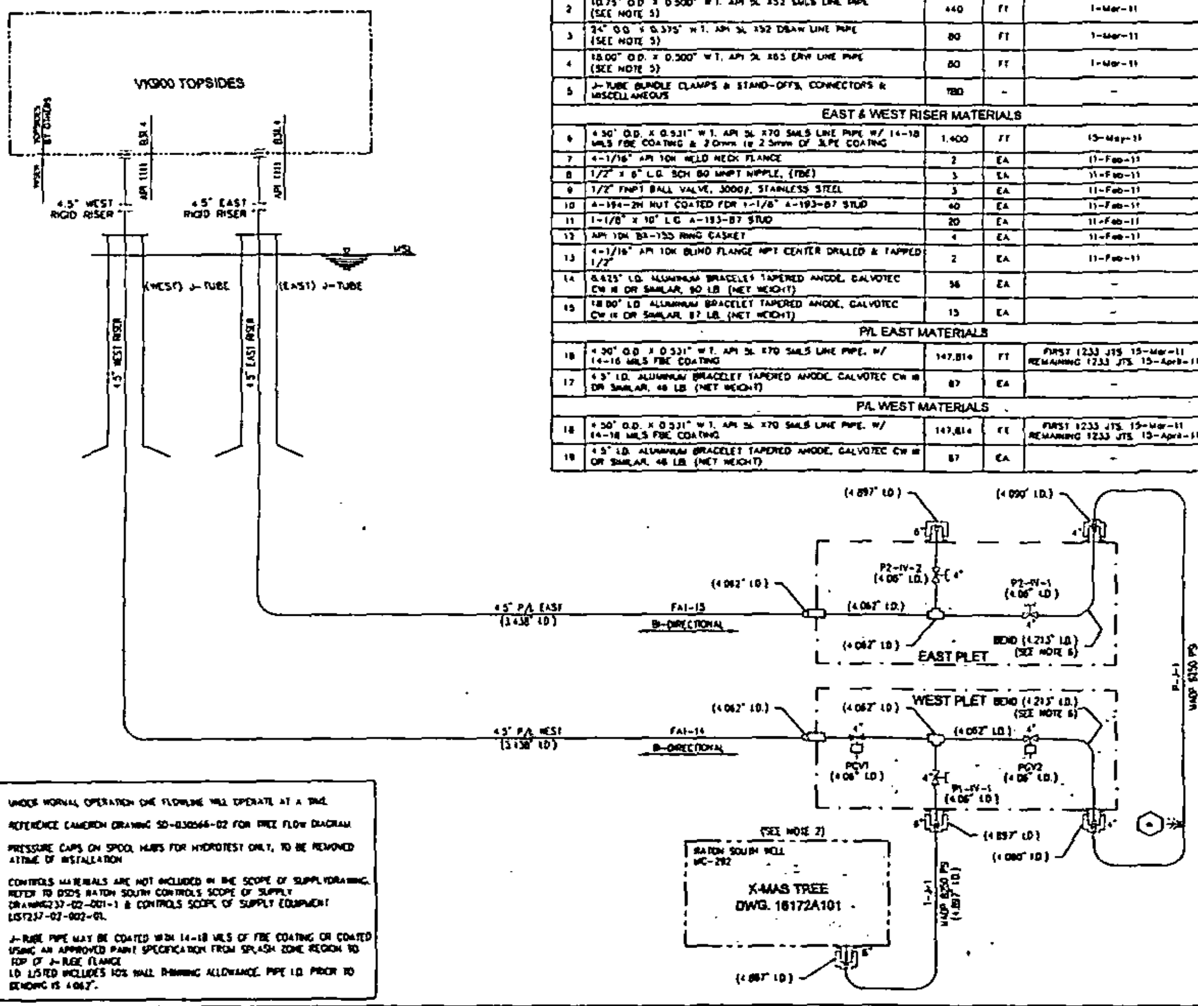
noble energy

UniversalPegasus INTERNATIONAL
Pegasus International, Inc.

RATON SOUTH TO VK-900 PROJECT

PIGGING (PLET TO PLET) JUMPER

JOB NO.	DWG. NO.	REV.
18172	18172-N002	2



SCOPE OF SUPPLY BILL OF MATERIALS

ITEM	DESCRIPTION	QTY.	UNIT	ANTICIPATED ISSUE DATE	PROVIDED BY
	J-TUBE BUNDLE (EAST & WEST J-TUBES) MATERIALS				
1	8.625" O.D. X 0.500" W.T. API 5L X52 SMLS LINE PIPE (SEE NOTE 5)	1040	FT	1-Mar-11	COMPANY
2	10.75" O.D. X 0.500" W.T. API 5L X52 SMLS LINE PIPE (SEE NOTE 5)	440	FT	1-Mar-11	COMPANY
3	24" O.D. X 0.375" W.T. API 5L X52 DSAW LINE PIPE (SEE NOTE 5)	80	FT	1-Mar-11	COMPANY
4	18.00" O.D. X 0.500" W.T. API 5L X65 ERW LINE PIPE (SEE NOTE 5)	80	FT	1-Mar-11	COMPANY
5	J-TUBE BUNDLE CLAMPS & STAND-OFFS, CONNECTORS & MISCELLANEOUS	TBD	-	-	CONTRACTOR
	EAST & WEST RISER MATERIALS				
6	4.50" O.D. X 0.531" W.T. API 5L X70 SMLS LINE PIPE W/ 14-18 MILS FBE COATING & 2.0mm to 2.5mm OF 3LPE COATING	1,400	FT	15-May-11	COMPANY
7	4-1/16" API 10K WELD NECK FLANGE	2	EA	11-Feb-11	COMPANY
8	1/2" X 6" L.G. SCH 80 MNPT NIPPLE, (TBE)	3	EA	11-Feb-11	COMPANY
9	1/2" FNPT BALL VALVE, 3000#, STAINLESS STEEL	3	EA	11-Feb-11	COMPANY
10	A-194-2H NUT COATED FOR 1-1/8" A-193-B7 STUD	40	EA	11-Feb-11	COMPANY
11	1-1/8" X 10" L.G. A-193-B7 STUD	20	EA	11-Feb-11	COMPANY
12	API 10K BX-155 RING GASKET	4	EA	11-Feb-11	COMPANY
13	4-1/16" API 10K BLIND FLANGE NPT CENTER DRILLED & TAPPED 1/2"	2	EA	11-Feb-11	COMPANY
14	8.625" I.D. ALUMINUM BRACELET TAPERED ANODE, GALVOTEC CW III OR SIMILAR, 90 LB. (NET WEIGHT)	56	EA	-	CONTRACTOR
15	18.00" I.D. ALUMINUM BRACELET TAPERED ANODE, GALVOTEC CW III OR SIMILAR, 87 LB. (NET WEIGHT)	15	EA	-	CONTRACTOR
	P/L EAST MATERIALS				
16	4.50" O.D. X 0.531" W.T. API 5L X70 SMLS LINE PIPE, W/ 14-16 MILS FBE COATING	147,814	FT	FIRST 1233 JTS 15-Mar-11 REMAINING 1233 JTS. 15-April-11	COMPANY
17	4.5" I.D. ALUMINUM BRACELET TAPERED ANODE, GALVOTEC CW III OR SIMILAR, 46 LB. (NET WEIGHT)	87	EA	-	CONTRACTOR
	P/L WEST MATERIALS				
18	4.50" O.D. X 0.531" W.T. API 5L X70 SMLS LINE PIPE, W/ 14-18 MILS FBE COATING	147,814	FT	FIRST 1233 JTS. 15-Mar-11 REMAINING 1233 JTS. 15-April-11	COMPANY
19	4.5" I.D. ALUMINUM BRACELET TAPERED ANODE, GALVOTEC CW III OR SIMILAR, 46 LB. (NET WEIGHT)	87	EA	-	CONTRACTOR

SCOPE OF SUPPLY BILL OF MATERIALS

ITEM	DESCRIPTION	QTY.	UNIT	ANTICIPATED ISSUE DATE	PROVIDED BY
	P-J-1 MATERIALS				
20	5.563" O.D. X 0.750" W.T. API 5L GR. X65 SMLS LINE PIPE, W/ 14-16 MILS FBE COATING	180	FT	1-May-11	COMPANY
21	5.563" O.D. X 0.750" W.T. API 5L X65, 90 DEG. 5D (25") BEND PER DRAWING 16172-N002	6	EA	1-May-11	CONTRACTOR
22	4-1/16" 10K REMOTE ARTICULATED CONNECTOR W/ 2' PUPS	2	EA	1-May-11	COMPANY
23	RAC COMPACT RUNNING TOOLS	2	EA	14-June-11	COMPANY
24	MEASUREMENT INTERFACE CAP & FABRICATION JIG FOR OIL STATES 4-1/16" 10K	2	-	1-May-11	COMPANY
25	CLAMPON, PIGGING DETECTOR, 5.63" PIPE	1	EA	20-July-11	COMPANY
	T-J-1 MATERIALS				
26	6.625" O.D. X 0.864" W.T. API 5L X60 SMLS LINE PIPE, W/ 14-16 MILS FBE COATING & 1.5" GSPU INSULATION	60	FT	1-May-11	COMPANY
27	6.625" O.D. X 0.864" W.T. API 5L X60, 90 DEG. 5D (30") BEND PER DRAWING 16172-N003	6	EA	1-May-11	CONTRACTOR
28	MEASUREMENT INTERFACE CAP & FABRICATION JIG FOR CAMERON 6" 10K	2	-	1-May-11	COMPANY
29	6" 10K COLLET VERTICAL CONNECTORS W/ 2' PUPS	3	-	15-Dec-10	COMPANY
30	CVC HYDRAULIC RUNNING TOOL	2	-	14-June-11	COMPANY
	EAST PLET MATERIALS				
31	5.563" O.D. X 0.750" W.T. API X65 SMLS LINE PIPE, W/ 14-16 MILS FBE COATING	140	FT	1-May-11	COMPANY
32	4-1/16" 10K SHORT TERM PRESSURE CAPS FOR HUBS	1	EA	1-May-11	COMPANY
33	6" 10K CAMERON LONG TERM PRESSURE CAPS FOR HUBS	1	EA	1-May-11	COMPANY
34	API 6" 10K VERTICAL HUB, CAMERON	1	EA	15-Dec-10	COMPANY
35	API 4-1/16" 10K VERTICAL HUB, OIL STATES	1	EA	1-May-11	COMPANY
36	6" HUB GASKETS	3	EA	1-May-11	COMPANY
37	4-1/16" HUB GASKETS	2	EA	1-May-11	COMPANY
38	4-1/16" 10K ROV MANUAL GATE VALVES	2	EA	5-May-11	COMPANY
39	5.563" O.D. X 0.750" W.T. API 5L X65, 90 DEG. 5D (25") BEND PER HELIX DWG. 11268-EN-DG-A3903	1	EA	-	CONTRACTOR
40	GALVANIC STRUCTURAL ANODES	TBD	-	-	CONTRACTOR
41	FORGED ANCHOR FLANGE, PER HELIX DWG. 11268-EN-DG-A3902	1	-	-	CONTRACTOR
42	HUB CLEANING TOOL	1 TBC	-	14-June-11	COMPANY
43	FORGED BAR TEE, PER HELIX DWG. 11268-EN-DG-A3901.	1	-	-	CONTRACTOR
	WEST PLET MATERIALS				
44*	5.563" O.D. X 0.750" W.T. API X65 SMLS LINE PIPE, W/ 14-16 MILS FBE COATING	140	FT	1-May-11	COMPANY
45	4-1/16" 10K SHORT TERM PRESSURE CAPS FOR HUBS	1	EA	1-May-11	COMPANY
46	6" 10K CAMERON SHORT TERM PRESSURE CAPS FOR HUBS	1	EA	1-May-11	COMPANY
47	API 4-1/16" 10K VERTICAL HUBS	1	EA	1-May-11	COMPANY
48	API 6" 10K VERTICAL HUB	1	EA	1-May-11	COMPANY
49	6" HUB GASKETS	5*	EA	1-May-11	COMPANY
50	4-1/16" HUB GASKETS	2	EA	1-May-11	COMPANY
51	4-1/16" 10K ROV MANUAL GATE VALVES	1	EA	5-May-11	COMPANY
52	4-1/16" 10K SUBSEA HYDRAULIC OPERATED FAIL-SAFE VALVES	2	EA	5-May-11	COMPANY
53	5.563" O.D. X 0.750" W.T. API 5L X65, 90 DEG. 5D (25") BEND, PER HELIX DWG. 11268-EN-DG-A3903	1	EA	-	CONTRACTOR
54	GALVANIC STRUCTURAL ANODES	TBD	-	-	CONTRACTOR
55	FORGED ANCHOR FLANGE, PER HELIX DWG. 11268-EN-DG-A3902	1	-	-	CONTRACTOR
56	HUB CLEANING TOOL	1 TBC	-	14-June-11	COMPANY
57	FORGED BAR TEE, PER HELIX DWG. 11268-EN-DG-A3901.	1	-	-	CONTRACTOR

* INCLUDES QUANTITY FOR TREE HUB CONNECTION

NOTE:

1. UNDER NORMAL OPERATION ONE FLOWLINE WILL OPERATE AT A TIME.
2. REFERENCE CAMERON DRAWING SD-030566-02 FOR TREE FLOW DIAGRAM.
3. PRESSURE CAPS ON SPOOL HUBS FOR HYDROTEST ONLY, TO BE REMOVED AT TIME OF INSTALLATION.
4. CONTROLS MATERIALS ARE NOT INCLUDED IN THE SCOPE OF SUPPLY DRAWING. REFER TO DSDS RATON SOUTH CONTROLS SCOPE OF SUPPLY DRAWING237-02-001-1 & CONTROLS SCOPE OF SUPPLY EQUIPMENT LIST237-02-002-01.
5. J-TUBE PIPE MAY BE COATED WITH 14-18 MILS OF FBE COATING OR COATED USING AN APPROVED PAINT SPECIFICATION FROM SPLASH ZONE REGION TO TOP OF J-TUBE FLANGE.
6. I.D. LISTED INCLUDES 10% WALL THINNING ALLOWANCE. PIPE I.D. PRIOR TO BENDING IS 4.062".

LINES AND SYMBOLOGY LEGEND

noble energy

UniversalPegasus INTERNATIONAL

Pegasus International, Inc.

RATON SOUTH TO VK900

RATON SOUTH SCOPE OF SUPPLY SCHEMATIC

16172 | 16172A100 | 1

APPENDIX F: WPSS CONTACTS

WEATHERFORD P&SS				
NAME	POSITION	PHONE: OFFICE	PHONE: CELL	EMAIL
Wayne Berrey	Area Manager (Houston)	713-580-9780	713-449-4680	wayne.berrey@weatherford.com
Taylor Williams	Product Line Specialist (Houston)	713-580-9720	832-492-5739	taylor.williams@weatherford.com
Brock Hennigh	Offshore Product Line Specialist, Western Hemisphere	713-580-9706	832-418-0256	Brock.hennigh@weatherford.com
Hugo Ybarra	Asset Coordinator / Logistics	713-580-9743	832-418-0258	Hugo.ybarra@weatherford.com
Ronnie Singleton	District Manager / Logistics	713-580-9721	832-492-6703	Ronnie.singleton@weatherford.com

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00011	REV: 05	PAGE: 1 of 1	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
PREPARED BY: BIRGIT THIELE	REVIEWED BY: MURDO MORRISON		APPROVED BY: MALCOLM DUNCAN	APPROVED BY:
TITLE:	COMMENCEMENT REPORT			

Project:	Helix Noble Raton		Project No.:	WPSS-014550
Client:	Helix ESG		Client Contract No.:	337346
Operational Start:	Date:	13 August 2011	Time:	1:00
Location:	VK-900 Platform			

Description:
WPSS will begin hydrostatic testing operations on the Raton South flowline system. All preparations are made and the pipeline has been made ready for testing.

Commencement of the operation described above may be started. All relevant procedures & work instructions have been adhered to.

Weatherford P&SS Representative:	**Helix Representative:**
Name:	Name:
Sign:	Sign:
Date: 14 Aug 2011	Date: May 14 11

Weatherford®

Project:	Helix Noble Raton South
Job No.:	WPSS-014550
Contractor:	Helix ESG
Location:	VK-900
Section:	Raton South Looped Flowlines
Length:	290,000 feet
Diameter:	4.5"
Volume gal:	140228.00
Date:	Saturday, August 13, 2011

Pressurisation Report
(Air Inclusion)

Time	Press (psi)		Volume Diff.	Total Volume	Time	Press (psi)		Volume Diff.	Total Volume
2:56	0		0.0	0.0	3:26	270		8.0	174.0
3:00	15		0.0	0.0	3:28	285		10.0	184.0
3:01	30		42.0	42.0	3:30	300		8.0	192.0
3:02	45		3.0	45.0	3:32	315		8.0	200.0
3:03	60		7.0	52.0	3:34	330		9.0	209.0
3:04	75		9.0	61.0	3:36	345		10.0	219.0
3:05	90		9.0	70.0	3:38	360		8.0	227.0
3:06	105		10.0	80.0	3:39	375		8.0	235.0
3:07	120		7.0	87.0	3:41	390		9.0	244.0
3:08	135		10.0	97.0	3:42	405		8.0	252.0
3:12	150		9.0	106.0	3:42	420		9.0	261.0
3:13	165		8.0	114.0	3:45	435		9.0	270.0
3:15	180		8.0	122.0	3:46	450		7.0	277.0
3:17	195		9.0	131.0	3:48	465		8.0	285.0
3:19	210		9.0	140.0	3:49	480		9.0	294.0
3:20	225		9.0	149.0	3:51	495		9.0	303.0
3:22	240		8.0	157.0	3:53	510		9.0	312.0
3:24	255		9.0	166.0	3:56	525		8.0	320.0

AIR INCLUSION CALCULATIONS:

(A) Actual Volume (gal)	320.0
(B) Theoretical Volume (gal)	297.5
(C) Difference in Volume (gal)	22.5
(D) Total Fill Volume (gal)	140228.0

AIR INCLUSION =

$$\frac{A - B}{D} = \frac{C}{D} \times 100$$

0.0160 % AIR CONTENT

Weatherford Representative

Name: Jacob Wills Signature: _____ Date: 19 Aug 2011

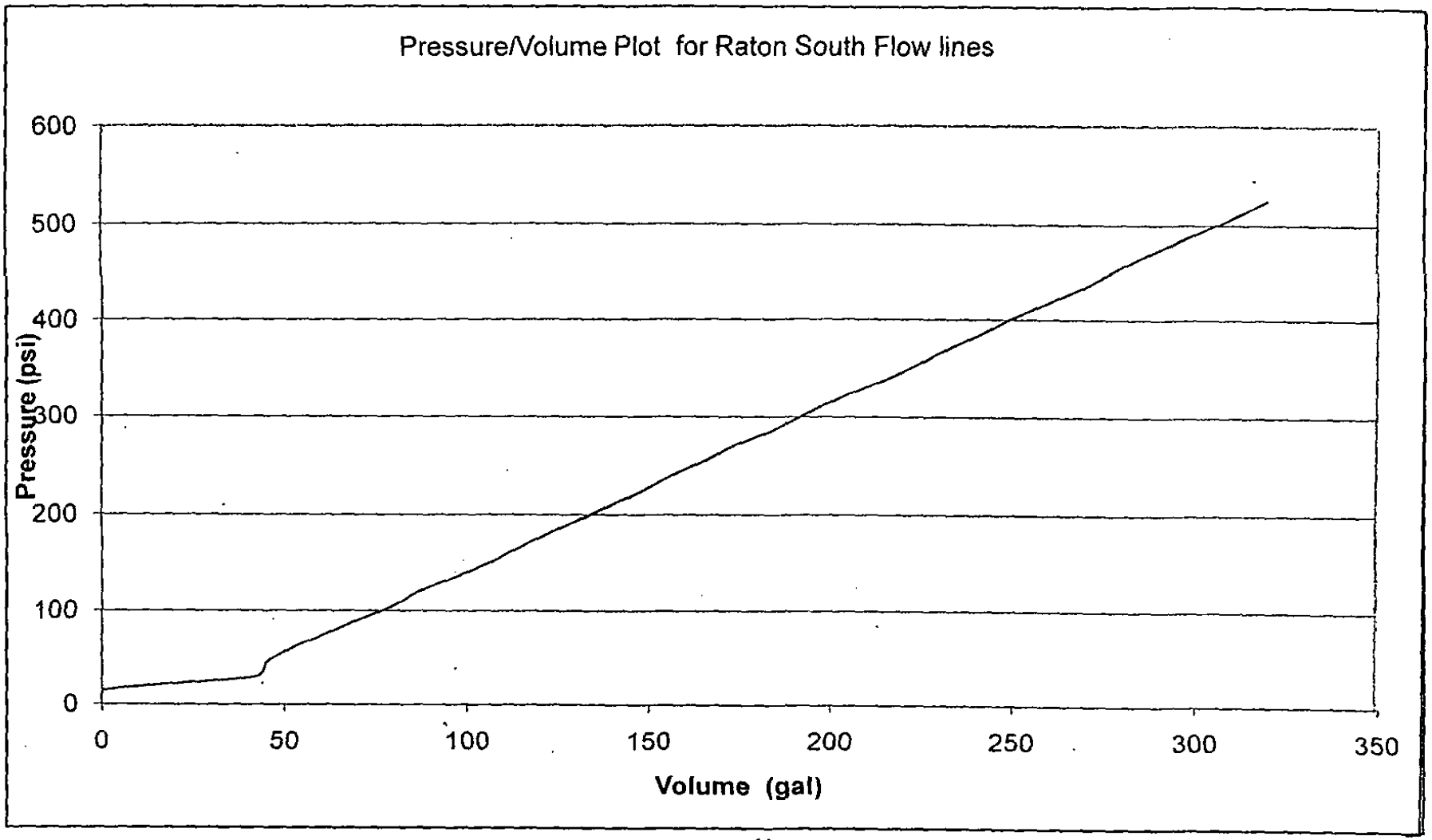
Contractor Representative:

Name: Ken Summers Signature: _____ Date: 8-14-11

Company Representative:

Name: Mike Pool Signature: _____ Date: 8-14-11

Pressure	Volume
0	0.00
15	0.00
30	42.00
45	45.00
60	52.00
75	61.00
90	70.00
105	80.00
120	87.00
135	97.00
150	106.00
165	114.00
180	122.00
195	131.00
210	140.00
225	149.00
240	157.00
255	166.00
270	174.00
285	184.00
300	192.00
315	200.00
330	209.00
345	219.00
360	227.00
375	235.00
390	244.00
405	252.00
420	261.00
435	270.00
450	277.00
465	285.00
480	294.00
495	303.00
510	312.00
525	320.00



Weatherford
Pipeline & Specialty Services

	Name	Signature	Date
Weatherford Representive:	Taylor Williams		18 Aug 2011
Contractor Representative:	Ken Simmons		8-14-11
Company Representative:	Mike Pena		8-14-11

Weatherford®

Project:	Helix Noble Raton
Job No.:	WPSS-014550
Customer:	Helix ESG
Location:	VK-900
Section:	Raton South Looped flowlines
Length:	290,000 feet
Date:	13-Aug-11

Hydrotest Stabilisation/Hold Report

Date	Time	Pressure psiG		Ambient Temp. °F	Pipewall Temp. °F	Remarks
13-Aug-11	15:45 pm	10502.0		85.0	96.0	
13-Aug-11	16:00 pm	10501.0		86.0	95.0	
13-Aug-11	16:15 pm	10501.0		86.0	94.0	
13-Aug-11	16:30 pm	10499.0		86.0	93.0	Begin 8 hour hold
13-Aug-11	16:45 pm	10499.0		86.0	92.0	
13-Aug-11	17:00 pm	10499.0		86.0	92.0	
13-Aug-11	17:15 pm	10499.0		86.0	92.0	
13-Aug-11	17:30 pm	10499.0		86.0	92.0	
13-Aug-11	17:45 pm	10499.0		86.0	92.0	
13-Aug-11	18:00 pm	10499.0		87.0	92.0	
13-Aug-11	18:15 pm	10499.0		87.0	92.0	
13-Aug-11	18:30 pm	10499.0		87.0	92.0	
13-Aug-11	18:45 pm	10499.0		87.0	91.0	
13-Aug-11	19:00 pm	10499.0		87.0	91.0	
13-Aug-11	19:15 pm	10499.0		87.0	91.0	
13-Aug-11	19:30 pm	10499.0		87.0	90.0	
13-Aug-11	19:45 pm	10499.0		87.0	90.0	
13-Aug-11	20:00 pm	10499.0		87.0	90.0	
13-Aug-11	20:15 pm	10499.0		87.0	90.0	
13-Aug-11	20:30 pm	10499.0		87.0	89.0	
13-Aug-11	20:45 pm	10499.0		87.0	89.0	
13-Aug-11	21:00 pm	10499.0		87.0	89.0	
13-Aug-11	21:15 pm	10499.0		87.0	89.0	
13-Aug-11	21:30 pm	10499.0		87.0	89.0	
13-Aug-11	21:45 pm	10499.0		87.0	88.0	
13-Aug-11	22:00 pm	10499.0		87.0	88.0	
13-Aug-11	22:15 pm	10499.0		87.0	88.0	
13-Aug-11	22:30 pm	10499.0		87.0	88.0	
13-Aug-11	22:45 pm	10499.0		87.0	88.0	
13-Aug-11	23:00 pm	10499.0		87.0	88.0	
13-Aug-11	23:15 pm	10499.0		86.0	87.0	
13-Aug-11	23:30 pm	10499.0		86.0	87.00	
13-Aug-11	23:45 pm	10499.0		86.0	87.00	

Weatherford Representative:

Name: Michael Templeman Signature: Signature: Date: 14 August, 2011

Contractor Representative:

Name: Signature: Signature: Date: 14 August, 2011

Company Representative:

Name: Signature: Signature: Date: 14 August, 2011

Weatherford®

Project:	Helix Noble Raton
Job No.:	WPSS-014550
Customer:	Helix ESG
Location:	VK-900
Section:	Raton South Looped flowlines
Length:	290,000 feet
Date:	13-Aug-11

Hydrotest Stabilisation Report

Date	Time	Pressure psiG		Ambient Temp. °F	Pipewall Temp. °F	Remarks
14-Aug-11	24:00 am	10499.0		86.0	87.0	
14-Aug-11	24:15 am	10499.0		86.0	87.0	
14-Aug-11	24:30 am	10499.0		86.0	87.0	8 hour hold complete.
14-Aug-11	24:45 am	10499.0		86.0	87.0	Begin depressurizing.

Subcontractor Representative:

Name: Michael Templeman Signature: Signature: Date: 14 August, 2011

Contractor Representative:

Name: Ken Simmons Signature: Signature: Date: 14 August, 2011

Company Representative:

Name: Mike Pena Signature: Signature: Date: 14 August, 2011

Weatherford

Project:	Helix Noble Raton
Job No.:	WPSS-014550
Contractor:	Helix ESG
Location:	Viosca Knoll - 900
Section:	Noble Raton South Looped Flow lines
Length:	290,000 feet
Diameter:	4.5"

Pressurization Report

Time	Pressure (psi)	Differential Volume (gal)	Flowmeter (gal)	Time	Pressure (psi)	Differential Volume (gal)	Flowmeter (gal)
2:56	0		0.00	9:35	5500	52.00	2996.0
3:06	100	79.0	79.0	9:41	5600	52.00	3048.0
3:18	200	52.0	131.0	9:47	5700	52.00	3100.0
3:30	300	61.0	192.0	9:53	5800	50.00	3150.0
3:42	400	58.0	250.0	9:58	5900	51.00	3201.0
3:52	500	54.0	304.0	10:04	6000	50.00	3251.0
4:27	600	60.0	364.0	10:10	6100	52.00	3303.0
4:32	700	54.0	418.0	10:16	6200	52.00	3355.0
4:38	800	56.0	474.0	10:22	6300	51.00	3406.0
4:44	900	56.0	530.0	10:27	6400	51.00	3457.0
4:49	1000	55.0	585.0	10:35	6500	51.00	3508.0
4:54	1100	56.0	641.0	10:40	6600	51.00	3559.0
5:00	1200	57.0	698.0	10:45	6700	51.00	3610.0
5:06	1300	51.0	749.0	10:51	6800	53.00	3663.0
5:12	1400	56.0	805.0	10:56	6900	52.00	3715.0
5:18	1500	55.0	860.0	11:03	7000	39.00	3754.0
5:23	1600	56.0	916.0	11:09	7100	60.00	3814.0
5:29	1700	54.0	970.0	11:36	7200	50.00	3864.0
5:34	1800	55.0	1025.0	11:42	7300	51.00	3915.0
5:40	1900	55.0	1080.0	11:49	7400	39.00	3954.0
5:46	2000	53.0	1133.0	11:55	7500	65.00	4019.0
5:51	2100	55.0	1188.0	12:0-1	7600	47.00	4066.0
5:57	2200	56.0	1244.0	12:07	7700	49.00	4115.0
6:03	2300	54.0	1298.0	12:14	7800	55.00	4170.0
6:08	2400	54.0	1352.0	12:20	7900	47.00	4217.0
6:14	2500	55.0	1407.0	12:26	8000	50.00	4267.0
6:20	2600	60.0	1467.0	12:32	8100	50.00	4317.0
6:25	2700	48.0	1515.0	12:38	8200	50.00	4367.0
6:31	2800	58.0	1573.0	13:01	8300	52.00	4419.0
6:37	2900	69.0	1642.0	13:07	8400	48.00	4467.0
6:43	3000	32.0	1674.0	13:13	8500	48.00	4515.0
6:49	3100	60.0	1734.0	13:19	8600	50.00	4565.0
6:54	3200	50.0	1784.0	13:25	8700	48.00	4613.0
7:00	3300	55.0	1839.0	13:31	8800	50.00	4663.0
7:05	3400	52.0	1891.0	13:37	8900	37.00	4700.0
7:11	3500	53.0	1944.0	13:43	9000	64.00	4764.0
7:14	3600	54.0	1998.0	13:49	9100	47.00	4811.0
7:39	3700	57.0	2055.0	13:55	9200	49.00	4860.0
7:44	3800	51.0	2106.0	14:01	9300	48.00	4908.0
7:50	3900	53.0	2159.0	14:07	9400	49.00	4957.0
7:55	4000	54.0	2213.0	14:13	9500	50.00	5007.0
8:00	4100	50.0	2263.0	14:19	9600	48.00	5055.0
8:06	4200	53.0	2316.0	14:25	9700	51.00	5106.0
8:12	4300	52.0	2368.0	14:31	9800	46.00	5152.0
8:17	4400	53.0	2421.0	15:00	9900	49.00	5201.0
8:23	4500	54.0	2475.0	15:07	10000	50.00	5251.0
8:28	4600	52.0	2527.0	15:14	10100	49.00	5300.0
8:34	4700	50.0	2577.0	15:21	10200	49.00	5349.0
8:40	4800	55.0	2632.0	15:28	10300	47.00	5396.0
8:45	4900	50.0	2682.0	15:35	10400	48.00	5444.0
8:51	5000	53.0	2735.0	15:43	10500	49.00	5493.0
8:56	5100	52.0	2787.0				
9:18	5200	65.0	2852.0				
9:24	5300	39.0	2891.0				
9:30	5400	53.0	2944.0				

Total Volume Pumped = 5493 gallons

Weatherford Representative:

Name: [illegible] Signature: [signature] Date: 2/14/11

Helix Representative:

Name: [signature] Signature: _____ Date: _____

[signature]

Weatherford®

RATON SOUTH HYDROTEST CHART

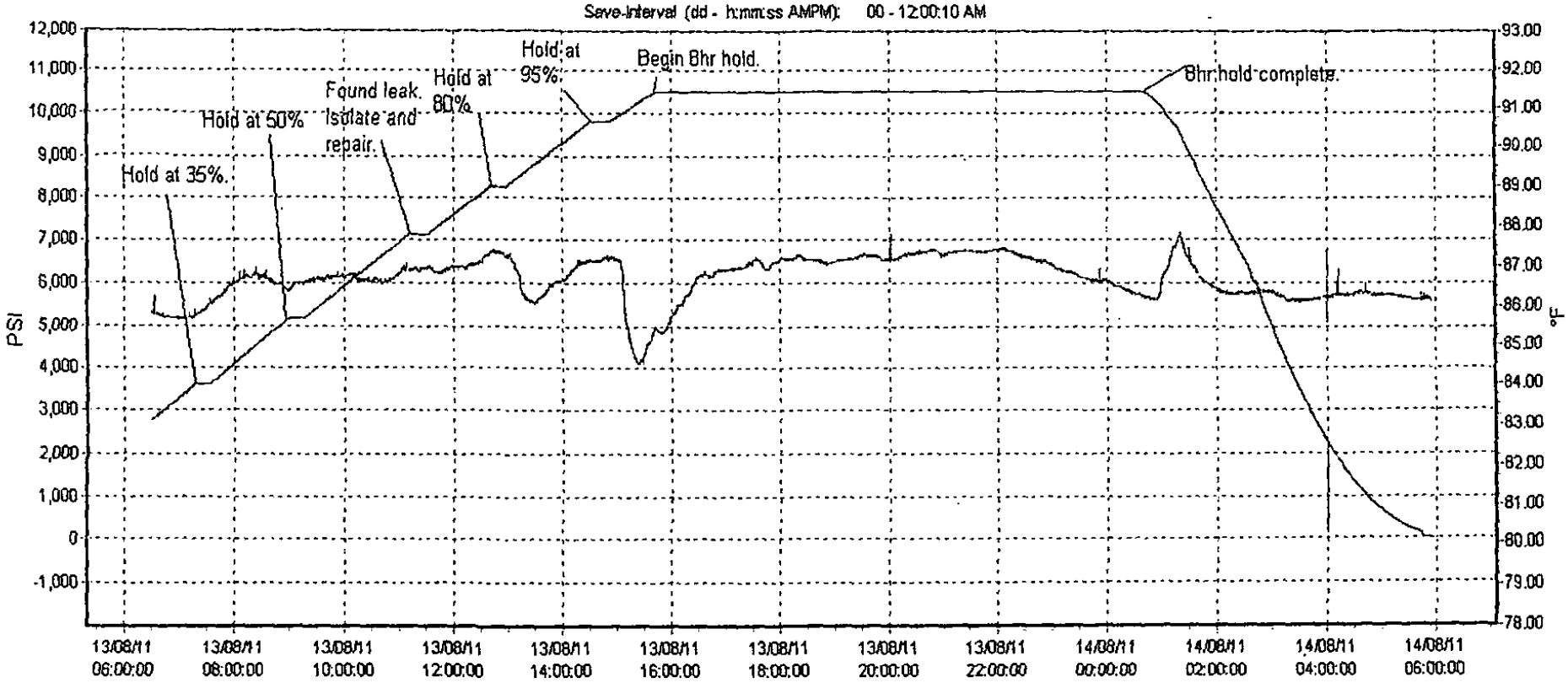
OPERATION: HYDROTEST OF THE NOBLE RATON SOUTH LOOPED FLOWLINE

DATE: 13 AUGUST, 2011 TO 14 AUGUST, 2011 **LOCATION:** CHEVRON VK 900A PLATFORM

START TIME: 16:30 PM/ 13 AUGUST, 2011 **INSTRUMENT SSN:** 2994

END TIME: 00:30 AM/ 14 AUGUST, 2011 **TEST ACCEPTED:** YES

HELIX ENERGY SOLUTIONS



WEATHERFORD REPRESENTATIVE:
Taylor Williams
SIGNATURE/DATE:
8/14/11

COMPANY REPRESENTATIVE:
MIKE PENA
SIGNATURE/DATE:
8/14/11

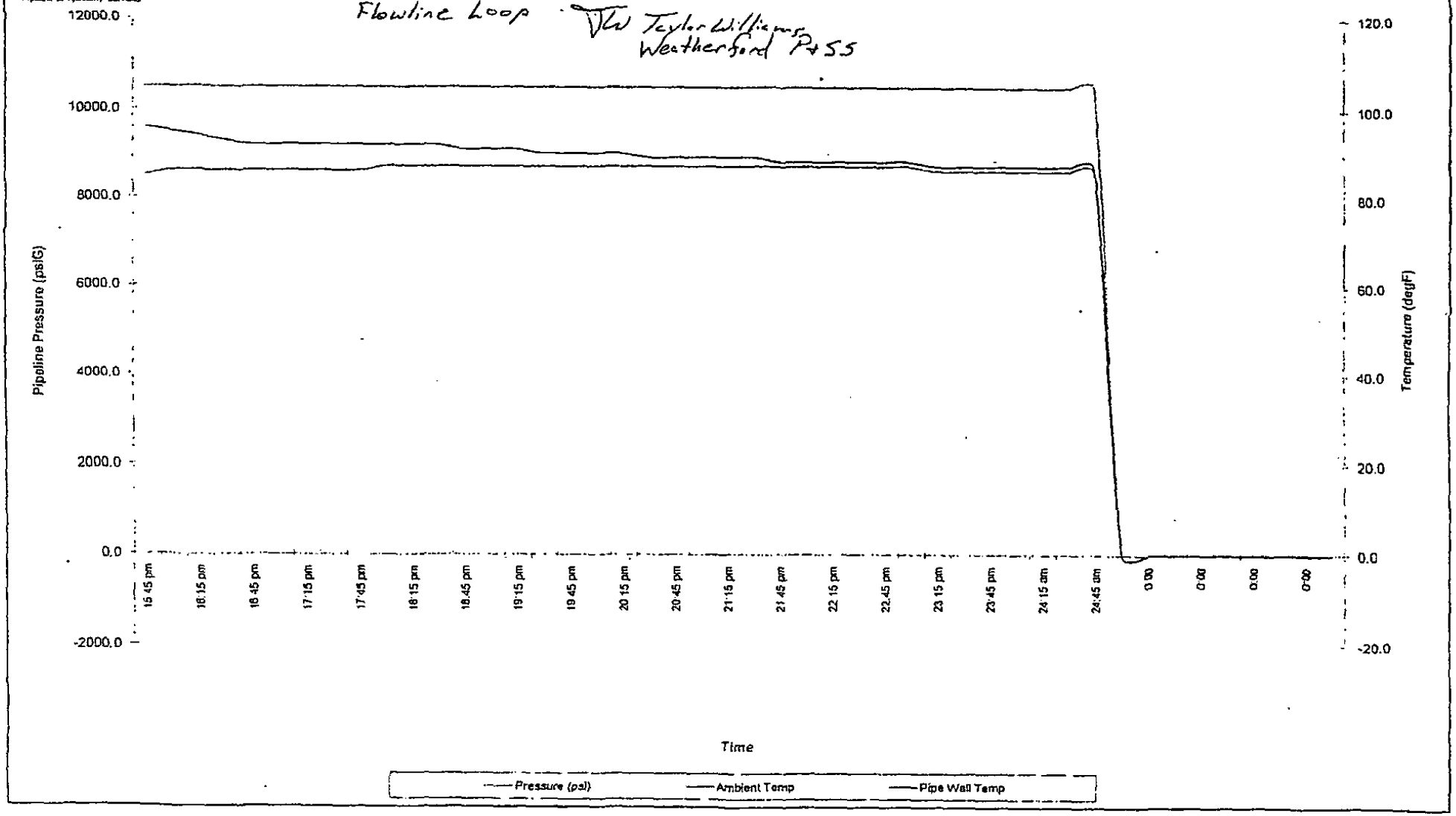
CLIENT REPRESENTATIVE:
KEN SIMMONS
SIGNATURE/DATE:

Weatherford
Pipeline & Specialty Services

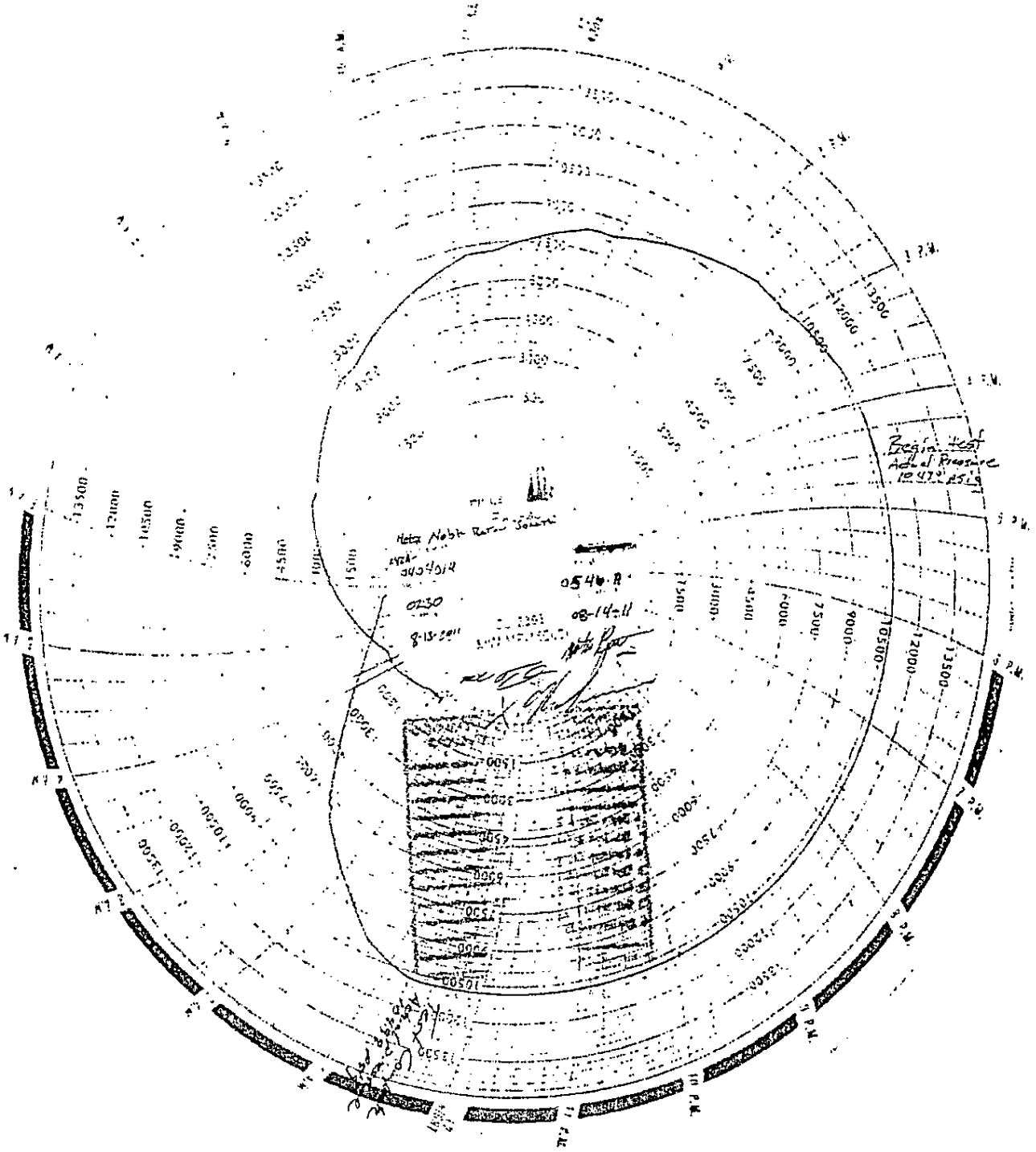
~~5" Balboa~~ Pipeline Hydrotest Hold Period Chart

4.5" Raton South
Flowline Loop

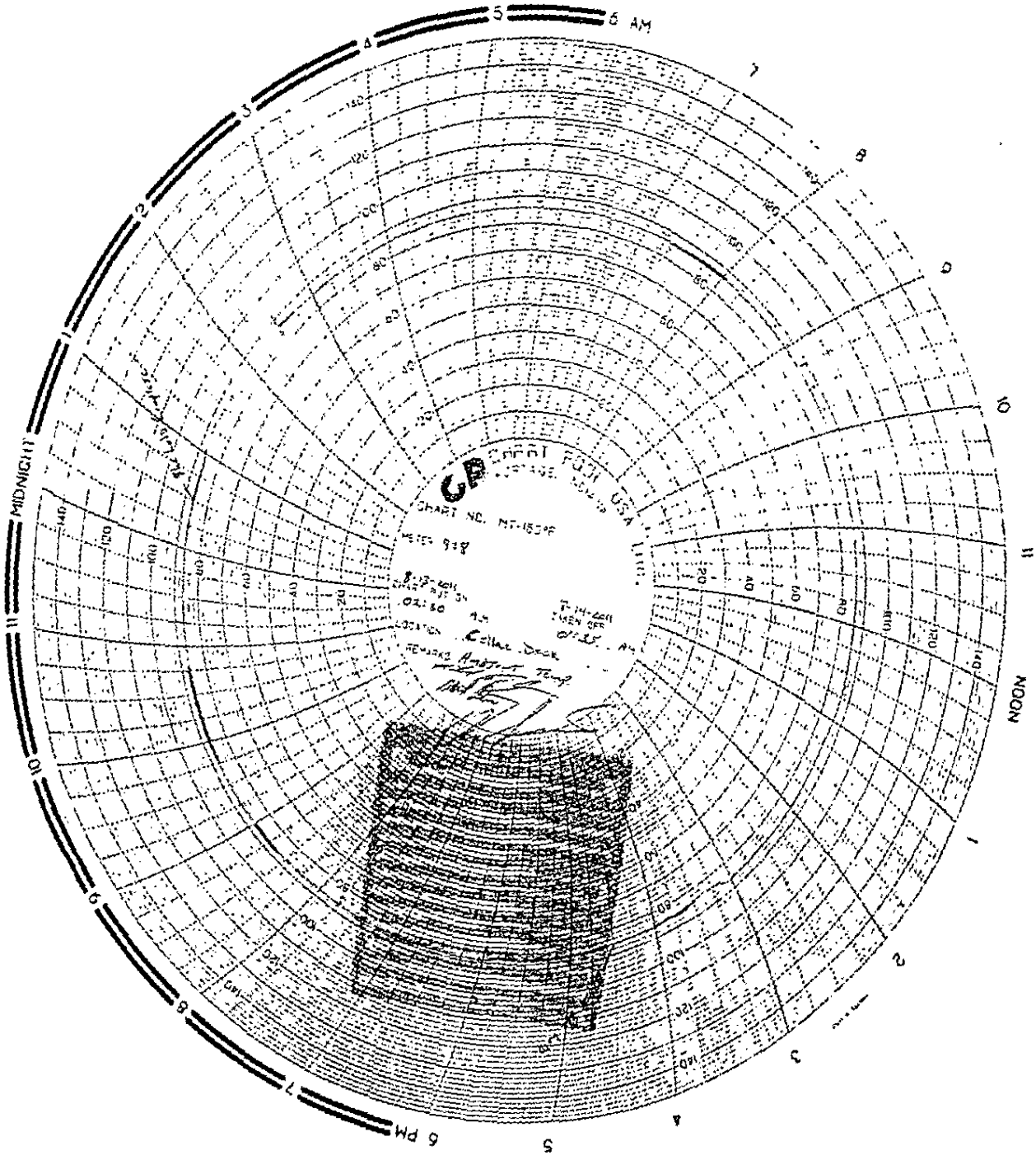
TW Taylor Williams
Weatherford P+SS



	Name	Signature	Date
Weatherford Representative:	Michael Templeman		14-August-2011
Contractor Representative:	Lee Simmons		14-8-11
Company Representative:	Mike Pena		8-14-11


Begin Test
Actual Pressure
Meter Make
0230
8-13-2011
0540
08-14-11

6 AM
NOON
6 PM
MIDNIGHT
CHART POOL USA
PORTAGE, INDIANA
CHART NO. MT-150°F
METER 1089
8-13-2011
8-14-2011
LOCATION
REMARKS


6 AM
NOON
6 PM
MIDNIGHT
CHART NO. MT-150-P
Cellar Deck


Hydro Static Leak Test

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00033	REV: 05	PAGE: 1 of 1	ORIGINAL ISSUE DATE: 05/27/2004	REVISION DATE: 11/17/2009
PREPARED BY: BIRGIT THIELE	REVIEWED BY: TRENT STRAHL		DOCUMENT APPROVED BY: PEGGY CUELLAR	ISSUANCE APPROVED BY: Peggy Cuellar
TITLE:	HYDROSTATIC TESTING ACCEPTANCE CERTIFICATE			

PROJECT:	Helix Noble Raton South	**COMPANY:**	Noble Energy
CONTRACTOR:	Helix ESG	**CONTRACT NO:**	337346
PRESSURE TEST NO.:	1	**DATE:**	14 August, 2011

This is to certify that the pipeline or pipeline section described below was hydrostatically tested in accordance with the Terms of the Specification.

PIPELINE:	Raton South	**FROM:**	Chevron VK900	**TO:**	Loop flowline VK 900 to MC292		
LENGTH:	290,000ft	**PIPE O.D.:**	4.500in	**WALL THK:**	0.531in	**GRADE:**	5L
LENGTH:		**PIPE O.D.:**		**WALL THK:**		**GRADE:**	
LENGTH:		**PIPE O.D.:**		**WALL THK:**		**GRADE:**	

Pressure Recorder S/N	**242A040401R**	**Pipewall Recorder S/N**	**1029**
Ambient Recorder S/N	**928**	**Dead Weight Gauge S/N**	**N/A**
Digital Test Gauge S/N	**2994**	**Test Gauge S/N**	**N/A**
Ground Temp. Recorder S/N	**N/A**		

LOCATION OF TEST EQUIPMENT:	Chevron VK900A platform cellar deck.
Nominal Test Pressure:	10,313 psig
Initial Test Pressure at Testing Location:	10,499 psig
Final Test Pressure at Testing Location:	10,499 psig
Initial Temperature of Test Medium:	93 degrees F
Final Temperature of Test Medium:	87 degrees F
Duration of Test Holding Period:	8 (eight) **hours**
Description and Cause of Leak (if any):	**N/A**
Total Water added to reach Final Test Pressure:	5,493 **Gallons**
Pressure remaining in Pipeline upon Completion of all Test Operations:	**0 psig**
REMARKS:	

Company Representative	Client Representative	Weatherford P&SS Representative
Mike Pena		michael Templeman
Signature	Signature	Signature

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00013	REV: 05	PAGE: 1 of 1	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
PREPARED BY: BIRGIT THIELE	REVIEWED BY: MURDO MORRISON		APPROVED BY: MALCOLM DUNCAN	APPROVED BY:
TITLE:	COMPLETION REPORT			

Project:	Helix Noble Raton South		Project No.:	WPSS-014550
Client:	Helix ESG		Client Contract No.:	337346
Operational End:	Date:	August 14th 2011	Time:	06:00
Location:	Chevron Platform VK-900			

Description:

WPSS has pressurized and hydrostatically tested the Raton South looped flow lines. The test was held for 8 hours and depressurized and left at zero psig.

The operation described above has been completed in full conformity with the client.

Weatherford P&SS Representative:	Helix Representative:
Name: Taylor Williams	Name: Ken Simmons
Sign:	Sign:
Date: 14 August 2011	Date: 14 August 2011

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00006	REV: 05	PAGE: 1	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
PREPARED BY: BIRGIT THIELE	REVIEWED BY: MURDO MORRISON		APPROVED BY: MALCOLM DUNCAN	APPROVED BY:
TITLE:	DAILY SITE REPORT			

Project Name:	Helix Noble Raton South		
Project No.:	PS-14550	**Operation:**	Flooding/Hydrostatic Testing

Date & Time	Operational Details & Remarks
04-Aug-2011	
07:00	**Arrive WPSS office Houston**
10:45	**Personnel and equipment depart Houston.**
18:00	**Arrive in Galliano, LA. WPSS crew standing by for mobilization of vessel.**

	Name	Signature	Date
Weatherford P&SS Representative	Taylor Williams		9 August 2011
Helix ESG Representative	Nicholas Okubo		9 August 2011

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00006	REV: 05	PAGE: 2	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
TITLE:	DAILY SITE REPORT			

Project Name:	Helix Noble Raton South		
Project No.:	PS-14550	**Operation:**	Flooding/Hydrostatic Testing

Date & Time	Operational Details & Remarks
05-Aug-2011	
04:00	**All personnel on shift.**
05:00	***Arrive at Inter Moor dock, Port Fourchon.***
08:00	**All Flooding equipment on M/V Int'l Thunder. Taking on fuel.**
10:00	**Vessel departs Fourchon. In route to Helix Express.**
22:00	**Arrive at the Helix Express. Off loading the Weatherford equipment and 4 of the Weatherford personnel.**
23:00	**4 WPSS personnel on Express. Supply vessel is in transit to the VK900 platform to drop off 1 Weatherford person.**

	Name	Signature	Date
Weatherford P&SS Representative	Taylor Williams		9 August 2011
Helix ESG Representative	Nicholas Okubo		9 August 2011

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00006	REV: 05	PAGE: 3	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
TITLE:	DAILY SITE REPORT			

Project Name:	Helix Noble Raton South		
Project No.:	PS-14550	**Operation:**	Flooding/Hydrostatic Testing

Date & Time	Operational Details & Remarks
06-Aug-2011	
08:00	Vessel orientation.
9:00	Begin rigging up flooding equipment
11:45	50bbl tanks set up. Rigging up chemical and flooding pumps.
13:42	Begin test run of chemical injection pump for OSW 490.
14:00	2637 strokes to pump 5 gallons = .0019 gal/stroke. Injection determined to be 115 strokes to correctly dose 100ppm to one 2000 gallon tank with Oxygen Scavenger.
15:05	Begin test run of chemical injection pump for the XC 102.
15:21	2550 strokes to pump 5 gallons = 0.00188 gal/stroke. Injection rate to be determined once flooding rate is established to achieve 600ppm of Biocide.
16:52	Begin filling the 50bbl tanks.
17:35	The first tank is full. The second and third tanks are half full.
17:36	Begin purging the hoses.
18:30	Complete function test of equipment. Waiting for instruction to begin flooding operations.

	Name	Signature	Date
Weatherford P&SS Representative	Taylor Williams		9 August 2011
Helix ESG Representative	Nicholas Okubo		9 August 2011

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00006	REV: 05	PAGE: 4	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
TITLE:	DAILY SITE REPORT			

Project Name:	Helix Noble Raton South		
Project No.:	PS-14550	**Operation:**	Flooding/Hydrostatic Testing

Date & Time	Operational Details & Remarks
07-Aug-2011	
04:00	**Informed of imminent start of flooding operations**
04:30	**Perform JSA with Weatherford personnel.**
05:00	**Speak with the platform and inform them of start up. Connect flooding hose to pipeline.**
05:30	**Begin filling the tanks with filtered water and OSW490 at 110ppm.**
05:40	**Tanks are full.**
07:15	**All valves correctly aligned. Begin flooding the east flowline with chemically treated filtered seawater.**
13:48	**Informed that the platform is receiving water. All stop on pumping at 69,055 total gallons.**
14:00	**Equipment shut down and secured.**
14:30	**Waiting for retrieval of West flow line to continue flooding ops.**

	Name	Signature	Date
Weatherford P&SS Representative	Taylor Williams		9 August 2011
Helix ESG Representative	Nicholas Okubo		9 August 2011

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00006	REV: 05	PAGE: 5	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
TITLE:	DAILY SITE REPORT			

Project Name:	Helix Noble Raton South		
Project No.:	PS-14550	**Operation:**	Flooding/Hydrostatic Testing

Date & Time	Operational Details & Remarks
08 Aug, 2011	
01:00	Informed of imminent start up of flooding operation
01:20	Speak with the platform and inform them of start up on the West flowline.
01:45	Filling tanks with filtered seawater and OSW490 chemical at 110ppm. Rig up hose to the flowline.
02:00	Conduct JSA with the affected personnel.
02:50	Begin flooding the West flow line with filtered chemically treated seawater.
06:15	Shut down to repair a leak on the hose.
06:16	Continue pumping.
7:40	Note extreme fluxes in flow rate according to flow meter.
7:55	Install diaphragm pump in line with tanks to boost flow.
08:40	Informed that platform is receiving water. Shut down pumps. Final flow meter reading 64,740 total gallons. Mechanical failure on the meter caused last part of flood to register incorrectly. Tanks indicate approximately 69,500 gallons injected into the flowline.
09:10	Restart pumps to ensure line is topped off.
9:11	Shut down pumps and depressurize to tanks.
09:45	Discharge hose is disconnected from the flowline.
09:52	Begin circulating the tanks with XC102 to neutralize any remaining OSW490.
09:56	All stop on number 1 tank.
09:58	Begin circulating on tank number 2.
10:05	All stop on number 2 tank.
10:08	Begin circulating on the number 3 tank.
10:15	All stop on number 3.
10:40	Begin rigging down the equipment spread.
12:40	All Weatherford crew off deck. Helix crew will let us know when the crane is available for use to complete rig down.
continued	

	Name	Signature	Date
Weatherford P&SS Representative	Taylor Williams		9 August 2011
Helix ESG Representative	Nicholas Okubo		9 August 2011

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00006	REV: 05	PAGE: 6	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
TITLE:	DAILY SITE REPORT			

Project Name:	Helix Noble Raton South		
Project No.:	WPSS-014550	**Operation:**	Flooding/Hydrostatic Testing

Date & Time	Operational Details & Remarks
08 August 2011	***continued***
19:00	**Informed that crane is free for use in breaking down equipment.**
19:30	**Continue rigging down equipment.**
21:30	**Hose basket loaded. Tanks rigged down. Equipment ready for transfer.**
21:45	**WPSS off deck.**

	Name	Signature	Date
Weatherford P&SS Representative	Taylor Williams		9 August 2011
Helix ESG Representative	Nicholas Okubo		9 August 2011

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00006	REV: 05	PAGE: 7	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
TITLE:	DAILY SITE REPORT			

Project Name:	Helix Noble Raton South		
Project No.:	WPSS-014550	**Operation:**	Flooding/Hydrostatic Testing

Date & Time	Operational Details & Remarks
09 August 2011	
07:30	**Attend vessel operations meeting. Informed of possible demob of personnel and equipment.**
13:00	**Waiting for demob of Flooding equipment and mobilization of hydro test pumps.**

	Name	Signature	Date
Weatherford P&SS Representative	Taylor Williams		9 August 2011
Helix ESG Representative	Nicholas Okubo		9 August 2011

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00006	REV: 05	PAGE: 1 of 1	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
TITLE:	DAILY SITE REPORT			

Project Name:	*Helix Noble Raton South*		
Project No.:	PS-14550	**Operation:**	Demob vessel.

Date & Time	Operational Details & Remarks
10 August, 2011	
08:00 am	The Helix crew has informed us that our vessel has arrived and they will be moving us over to it shortly.
08:35 am	We are moved over to the MV Aegena. Equipment is being back loaded now and we will be headed to port very shortly.
09:30 am	We are headed into Fourchon, LA.
19:00 pm	We have arrived back in Fourchon, LA. We are offloading the flooding gear and awaiting the arrival of the Hydrotesting spread.
23:30 pm	The Hydrotesting spread has arrived. We are in the process of getting it loaded onto the vessel for transit. We will transit out to the Chevron VK 900 platform at 06:00 am.

	Name	Signature	Date
Weatherford P&SS Representative			
Client Representative			

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00006	REV: 05	PAGE: 1 of 1	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
PREPARED BY: BIRGIT THIELE	REVIEWED BY: MURDO MORRISON		APPROVED BY: MALCOLM DUNCAN	APPROVED BY:
TITLE:	DAILY SITE REPORT			

Project Name:	Helix Noble Raton South		
Project No.:	PS-14550	Operation:	Mobilize hydrotest spread

Date & Time	Operational Details & Remarks
11 August, 2011	
00:01 am	Hydrotest pumps and flange arrives at the dock. Load the equipment onto the MV Aegena for transit in the early morning.
06:00 am	Leaving the dock, headed out to the Chevron VK 900 platform.
16:00 pm	Arrive at the Chevron VK 900 platform. After we are transferred to the platform and have gone through the orientation, we are told that the crane cannot offload our equipment due to the fact their weight indicator is malfunctioning.
19:15 pm	The crane's weight indicator has been repaired. We begin offloading our equipment.
20:30 pm	All equipment is off loaded from the boat and placed where needed on the platform. We begin rigging up what we can.
22:00 pm	We have run out some hose's. We have moved most of the testing equipment down to the cellar deck. We are shutting down for the night.

	Name	Signature	Date
Weatherford P&SS Representative	Michael Templeman		11-Aug-2011
Client Representative	Ken Simmons		11-Aug-2011

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00006	REV: 05	PAGE: 1 of 1	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
TITLE:	DAILY SITE REPORT			

Project Name:	Helix Noble Raton South		
Project No.:	PS-14550	**Operation:**	Rig up test spread.

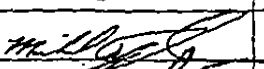
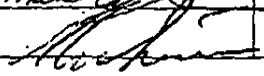
Date & Time	Operational Details & Remarks
12 August, 2011	
06:00 am	After platform safety meeting, continue with the rig up of the Hydrotesting spread.
11:30 am	The flanges have been installed and torqued by the Helix crew. The hose's and manifolds have been set up and in place for function testing after lunch.
12:45 pm	Begin pressurizing the hydrotest spread to check for leaks.
13:15 pm	After a few attempts at pressuring up, we believe that the pump is air locked. Kurt and Michael shut down to come back on for night shift.
13:30 pm	Diagnosing the issues with the two PD pumps.
16:00 pm	After testing both of the PD pumps, and completing the leak test of the hydrotest spread, everything is working as it should. Now waiting on the go ahead from Helix to be given.

	Name	Signature	Date
Weatherford P&SS Representative	Michael Templeman		12-Aug-2011
Client Representative	Ken Simmons		12-Aug-2011

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00006	REV: 05	PAGE: 1 of 1	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
TITLE:	DAILY SITE REPORT			

Project Name:	Helix Noble Raton South		
Project No.:	PS-14550	**Operation:**	Hydrotesting.

Date & Time	Operational Details & Remarks
13 August, 2011	
00:30 am	The Helix Express calls and informs us that the jumper is installed and that they will be performing the back seal tests very shortly. They should be ready for us to begin in about an hour.
02:30 am	The Helix Express calls and they are ready for us to begin pressuring up the flowline.
03:00 am	Begin pressurizing the flowline.
03:56 am	All stop on the pumping. We have reached 525 psig, thus completing the air inclusion of the flowline.
04:21 am	Resume pumping.
07:17 am	All stop on the pumping. We have reached 3,610 psig, which is our 35% hold point.
07:33 am	Resume pumping.
09:00 am	All stop on the pumping. We have reached 5,171 psig, which is our 50% hold period.
09:17 am	Resume pumping.
11:11 am	All stop. Found a small leak on the test manifold. Isolate to fix and replace the check valve.
11:32 am	Resume pumping.
12:41 pm	All stop on the pumping. We have reached 8,256 psig, which is our 80% hold point.
12:58 pm	Resume pumping.
14:31 pm	All stop on pumping. We are at 9,800 psig, which is our 95% hold period.
14:52 pm	Resume pumping.
15:43 pm	All stop on the pumping. We have reached test pressure, 10,502 psig. Total gallons that were pumped in were 5,493 gallons.
15:47 pm	Bleed down the top side hose from the pump to zero psig.
16:00 pm	Begin the hold for the test. Shortly after the beginning of the test hold period, it was noticed that the pressure recorder circular chart was approximately 250 psig higher than the Keller Gauge. It was determined by Mike Pena to make a notation of the deviation, on the chart after the test is complete.
21:00 pm	Pressure is still holding good.

	Name	Signature	Date
Weatherford P&SS Representative	Michael Templeman		13-Aug-2011
Client Representative	Ken Simmons		13-Aug-2011

Weatherford	PIPELINE & SPECIALTY SERVICES FORM			
FORM NUMBER: 5-4-GL-GL-PSS-00006	REV: 05	PAGE: 1 of 1	ORIGINAL ISSUE DATE: 02/24/2004	REVISION DATE: 04/02/2007
TITLE:	DAILY SITE REPORT			

Project Name:	Helix Noble Raton South		
Project No.:	PS-14550	**Operation:**	Hydrotesting and Demob.

Date & Time	Operational Details & Remarks
14 August, 2011	
00:30 am	**Hydrotest is complete. Mike Pena has approved the hydrotest.**
00:45 am	**After taking two samples of the discharge water, we begin bleeding down the flowline.**
05:30 am	**The line is bled down to 0psig. Begin rigging down the last of the equipment that is tied into the read back line. The Helix crew is downstairs and they are removing our flanges and installing the blind flanges on the riser tops.**
07:30 am	**Everything is rigged down and loaded up in the conex. Finalize getting all paperwork signed off on by both Helix representative and the Noble Energy representative. Weatherford P&SS crew is ready to load the vessel and head into the Intermoor dock in Fourchon, LA.**

	Name	Signature	Date
Weatherford P&SS Representative	Taylor Williams		8/23/11
Client Representative			

For Flocking

O.G.M.E. Oil & Gas Measurement Equipment O.G.M.E.

5227 DOW ROAD - 77040 * P.O. BOX 55641 * HOUSTON, TX 77255 * PH. (713) 263-0740 * FAX (713) 263-0741 *E-MAIL:sales@ogme.net

INSTRUMENT CERTIFICATION

DATE OF CALIBRATION: 07/13/11 CERTIFICATION DUE DATE: 01/13/12

CUSTOMER: WEATHERFORD PIPELINE SERVICES

OGME JOB NUMBER: 10981

TYPE OF INSTRUMENT: LEO KELLER GAUGE

PRESSURE RANGE: 0-300 BAR (CALIBRATED TO 0-4,000 PSI)
ACCURACY ±: 0.1%
SERIAL NUMBER: 3819

THE ABOVE INSTRUMENT HAS BEEN CERTIFIED IN ACCORDANCE WITH OGME QC MANUAL LATEST REVISION. ALL STANDARDS TRACABLE TO U.K.A.S. (UNITED KINGDOM NATIONAL STANDARDS LAB) OR N.I.S.T. (UNITED STATES NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY) IN ACCORDANCE WITH A.N.S.I. Z540.3 (2008)

DEAD WEIGHT	INSTRUMENT	% Accuracy
0#	0#	
1000	997	0.075
2000	1993	0.175
3000	2988	0.3
4000	3984	0.4
2500	2495	0.125
1500	1496	0.1
0#	0#	

N.I.S.T AND UKAS TRACABLE STANDARDS

MANUFACTURER	SERIAL NUMBER	RANGE	ACCURACY	RECERTIFICATION DUE DATE
*D.H. BUDENBERG (MOD. 283)	25509	1000-30,000 PSI	0.05%	03/08/12
D.H. BUDENBERG (MOD. 558)	26490	10-2000 PSI	0.03%	05/18/12
AMETEK RK (RK1600WC)	85345	4"WC-1600" WC	0.05%	02/22/15
KESSLER 24" SPEC PREC	441806	30/220°F.	.1°F.	02/01/15

* INDICATES MASTER STANDARD USED FOR THIS INSTRUMENT

CALIBRATION TECH: _____

QUALITY CONTROL INSPECTOR: _____

Insp. Q.C. 4

same not used

O.G.M.E.	Oil & Gas Measurement Equipment	O.G.M.E.

5227 DOW ROAD - 77040 * P.O. BOX 55641 * HOUSTON, TX 77255 * PH. (713) 263-9740 * FAX (713) 263-9741 *E-MAIL:sales@ogme.net

INSTRUMENT CERTIFICATION

DATE OF CALIBRATION: 07/13/11 CERTIFICATION DUE DATE: 01/13/12

CUSTOMER: WEATHERFORD PIPELINE SERVICES

OGME JOB NUMBER: 10981

TYPE OF INSTRUMENT: LEO KELLER GAUGE

PRESSURE RANGE: 0-300 BAR (CALIBRATED TO 0-4,000 PSI)
ACCURACY ±: 0.1%
SERIAL NUMBER: 5603

THE ABOVE INSTRUMENT HAS BEEN CERTIFIED IN ACCORDANCE WITH OGME QC MANUAL LATEST REVISION. ALL STANDARDS TRACABLE TO U.K.A.S. (UNITED KINGDOM NATIONAL STANDARDS LAB) OR N.I.S.T. (UNITED STATES NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY) IN ACCORDANCE WITH A.N.S.I. Z540.3 (2008)

DEAD WEIGHT	INSTRUMENT	% Accuracy
0#	0#	
1000	996	0.1
2000	1995	0.125
3000	2993	0.175
4000	3989	0.275
2500	2498	0.05
1500	1498	0.05
0#	0#	

N.I.S.T AND UKAS TRACABLE STANDARDS

MANUFACTURER	SERIAL NUMBER	RANGE	ACCURACY	RECERTIFICATION DUE DATE
*D.H. BUDENBERG (MOD. 283)	25509	1000-30,000 PSI	0.05%	03/08/12
D.H. BUDENBERG (MOD. 558)	26490	10-2000 PSI	0.03%	05/18/12
AMETEK RK (RK1600WC)	85345	4"WC-1600" WC	0.05%	02/22/15
KESSLER 24" SPEC PREC	441806	30/220°F.	.1°F.	02/01/15

* INDICATES MASTER STANDARD USED FOR THIS INSTRUMENT

CALIBRATION TECH: _____

QUALITY CONTROL INSPECTOR: _____

Insp. Q.C. 4

For Hydro

O.G.M.E. Oil & Gas Measurement Equipment O.G.M.E.

5227 DOW ROAD - 77040 * P.O. BOX 55641 * HOUSTON, TX 77255 * PH. (713) 263-9740 * FAX (713) 263-9741 *E-MAIL:sales@ogme.net

INSTRUMENT CERTIFICATION

DATE OF CALIBRATION: 07/28/11 CERTIFICATION DUE DATE: 01/28/12

CUSTOMER: WEATHERFORD PIPELINE SERVICES

OGME JOB NUMBER: 11055

TYPE OF INSTRUMENT: LEO KELLER GAUGE

PRESSURE RANGE: 0-1,000 BAR (CALIBRATED 0-14,000 PSI)
ACCURACY ±: 0.1%
SERIAL NUMBER: 2994

THE ABOVE INSTRUMENT HAS BEEN CERTIFIED IN ACCORDANCE WITH OGME QC MANUAL LATEST REVISION. ALL STANDARDS TRACABLE TO U.K.A.S. (UNITED KINGDOM NATIONAL STANDARDS LAB) OR N.I.S.T. (UNITED STATES NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY) IN ACCORDANCE WITH A.N.S.I. Z540.3 (2008)

DEAD WEIGHT	INSTRUMENT	% Accuracy
0#	0#	
3000	2996	0.02857143
7000	6988	0.08571429
11000	10978	0.15714286
14000	13964	0.25714286
8000	7983	0.12142857
6000	5989	0.07857143
0#	0#	

N.I.S.T AND UKAS TRACABLE STANDARDS

MANUFACTURER	SERIAL NUMBER	RANGE	ACCURACY	RECERTIFICATION DUE DATE
* D.H. BUDENBERG (MOD. 283)	25509	1000-30,000 PSI	0.05%	03/08/12
D.H. BUDENBERG (MOD. 558)	26490	10-2000 PSI	0.03%	05/18/12
AMETEK RK (RK1600WC)	85345	4"WC-1600" WC	0.05%	02/22/15
KESSLER 24" SPEC PREC	441806	30/220°F.	.1°F.	02/01/15

* INDICATES MASTER STANDARD USED FOR THIS INSTRUMENT

CALIBRATION TECH: _____

QUALITY CONTROL INSPECTOR: _____

Insp. Q.C. 17

For SPARE NOT USED

O.G.M.E. Oil & Gas Measurement Equipment O.G.M.E.

5227 DOW ROAD - 77040 * P.O. BOX 55641 * HOUSTON, TX 77255 * PH. (713) 263-9740 * FAX (713) 263-9741 *E-MAIL:sales@ogme.net

INSTRUMENT CERTIFICATION

DATE OF CALIBRATION: 07/28/11 CERTIFICATION DUE DATE: 01/28/12

CUSTOMER: WEATHERFORD PIPELINE SERVICES

OGME JOB NUMBER: 11055

TYPE OF INSTRUMENT: LEO KELLER GAUGE

PRESSURE RANGE: 0-1,000 BAR (CALIBRATED 0-14,000 PSI)
ACCURACY ±: 0.1%
SERIAL NUMBER: 1184

THE ABOVE INSTRUMENT HAS BEEN CERTIFIED IN ACCORDANCE WITH OGME QC MANUAL LATEST REVISION. ALL STANDARDS TRACABLE TO U.K.A.S. (UNITED KINGDOM NATIONAL STANDARDS LAB) OR N.I.S.T. (UNITED STATES NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY) IN ACCORDANCE WITH A.N.S.I. Z540.3 (2008)

DEAD WEIGHT	INSTRUMENT	% Accuracy
0#	0#	
3000	2994	0.04285714
7000	6985	0.10714286
11000	10979	0.15
14000	13966	0.24285714
8000	7983	0.12142857
6000	5992	0.05714286
0#	0#	

N.I.S.T AND UKAS TRACABLE STANDARDS

MANUFACTURER	SERIAL NUMBER	RANGE	ACCURACY	RECERTIFICATION DUE DATE
* D.H. BUDENBERG (MOD. 283)	25509	1000-30,000 PSI	0.05%	03/08/12
D.H. BUDENBERG (MOD. 558)	26490	10-2000 PSI	0.03%	05/18/12
AMETEK RK (RK1600WC)	85345	4"WC-1600" WC	0.05%	02/22/15
KESSLER 24" SPEC PREC	441806	30/220°F.	.1°F.	02/01/15

* INDICATES MASTER STANDARD USED FOR THIS INSTRUMENT

CALIBRATION TECH: _____

QUALITY CONTROL INSPECTOR: _____

Insp. Q.C. 17

O.G.M.E. Oil & Gas Measurement Equipment O.G.M.E.

5227 DOW ROAD - 77040 * P.O. BOX 55641 * HOUSTON, TX 77255 * PH. (713) 263-9740 * FAX (713) 263-9741 *E-MAIL:sales@ogme.net

INSTRUMENT CERTIFICATION

DATE OF CALIBRATION: 07/20/11 CERTIFICATION DUE DATE: 01/20/12

CUSTOMER: WEATHERFORD PIPELINE SERVICES

OGME JOB NUMBER: 10999

TYPE OF INSTRUMENT: SINGLE PEN CHART RECORDER

PRESSURE RANGE: 0-15,000 PSI

ACCURACY ±: 0.1%

SERIAL NUMBER: 242A-040401R

THE ABOVE INSTRUMENT HAS BEEN CERTIFIED IN ACCORDANCE WITH OGME QC MANUAL LATEST REVISION. ALL STANDARDS TRACABLE TO U.K.A.S. (UNITED KINGDOM NATIONAL STANDARDS LAB) OR N.I.S.T. (UNITED STATES NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY) IN ACCORDANCE WITH A.N.S.I. Z540.3 (2008)

DEAD WEIGHT	INSTRUMENT	% Accuracy
0#	0#	
3000	3000	0
7500	7500	0
12000	12000	0
15000	15000	0
9000	9150	-1
6000	6150	-1
0#	0#	

N.I.S.T AND UKAS TRACABLE STANDARDS

MANUFACTURER	SERIAL NUMBER	RANGE	ACCURACY	RECERTIFICATION DUE DATE
*D.H. BUDENBERG (MOD. 283)	25509	1000-30,000 PSI	0.05%	03/08/12
D.H. BUDENBERG (MOD. 558)	26490	10-2000 PSI	0.03%	05/18/12
AMETEK RK (RK1600WC)	85345	4"WC-1600" WC	0.05%	02/22/15
KESSLER 24" SPEC PREC	441806	30/220°F.	.1°F.	02/01/15

* INDICATES MASTER STANDARD USED FOR THIS INSTRUMENT

CALIBRATION TECH: _____

QUALITY CONTROL INSPECTOR: _____

Insp. Q.C. 17

O.G.M.E. Oil & Gas Measurement Equipment O.G.M.E.

5227 DOW ROAD - 77040 * P.O. BOX 55641 * HOUSTON, TX 77255 * PH. (713) 263-9740 * FAX (713) 263-9741 *E-MAIL:sales@ogme.net

INSTRUMENT CERTIFICATION

DATE OF CALIBRATION: 07/20/11 CERTIFICATION DUE DATE: 01/20/12

CUSTOMER: WEATHERFORD PIPELINE SERVICES

OGME JOB NUMBER: 10999

TYPE OF INSTRUMENT: SINGLE PEN CHART RECORDER

PRESSURE RANGE: 0-15,000 PSI
ACCURACY ±: 0.1%
SERIAL NUMBER: 11827

THE ABOVE INSTRUMENT HAS BEEN CERTIFIED IN ACCORDANCE WITH OGME QC MANUAL LATEST REVISION. ALL STANDARDS TRACABLE TO U.K.A.S. (UNITED KINGDOM NATIONAL STANDARDS LAB) OR N.I.S.T. (UNITED STATES NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY) IN ACCORDANCE WITH A.N.S.I. Z540.3 (2008)

DEAD WEIGHT	INSTRUMENT	% Accuracy
0#	0#	
3000	3000	0
7500	7500	0
12000	12000	0
15000	15000	0
9000	9150	-1
6000	6150	-1
0#	0#	

N.I.S.T AND UKAS TRACABLE STANDARDS

MANUFACTURER	SERIAL NUMBER	RANGE	ACCURACY	RECERTIFICATION DUE DATE
*D.H. BUDENBERG (MOD. 283)	25509	1000-30,000 PSI	0.05%	03/08/12
D.H. BUDENBERG (MOD. 558)	26490	10-2000 PSI	0.03%	05/18/12
AMETEK RK (RK1600WC)	853d5	4"WC-1600" WC	0.05%	02/22/15
KESSLER 24" SPEC PREC	441806	30/220°F.	.1°F.	02/01/15

* INDICATES MASTER STANDARD USED FOR THIS INSTRUMENT

CALIBRATION TECH: _____

QUALITY CONTROL INSPECTOR: _____

Insp. Q.C. 17

O.G.M.E. Oil & Gas Measurement Equipment O.G.M.E.

5227 DOW ROAD - 77040 * P.O. BOX 55841 * HOUSTON, TX 77255 * PH. (713) 263-9740 * FAX (713) 263-9741 *E-MAIL:sales@ogme.net

INSTRUMENT CERTIFICATION

DATE OF CALIBRATION: 07/20/11 CERTIFICATION DUE DATE: 01/20/12

CUSTOMER: WEATHERFORD PIPELINE SERVICES

OGME JOB NUMBER: 10999

TYPE OF INSTRUMENT: TEMPERATURE RECORDER

TEMPERATURE RANGE: 0-150° F.

SERIAL NUMBER: 1029

THE ABOVE INSTRUMENT HAS BEEN CERTIFIED IN ACCORDANCE WITH OGME QC MANUAL LATEST REVISION. ALL STANDARDS TRACABLE TO U.K.A.S. (UNITED KINGDOM NATIONAL STANDARDS LAB) OR N.I.S.T. (UNITED STATES NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY) IN ACCORDANCE WITH A.N.S.I. Z540.3 (2008)

TEMP.CALIBRATED TO MASTER KESSLER THERMOMETER SN# 441806 TRACEABLE TO NATIONAL INSTITUTE OF STANDARDS & TECHNOLOGY TEMPERATURE: 32.00°F.REFERENCE: ICE BATH TRANSFER STANDARDS:N/A, ICE POINT PER NIST SPEC PUB 819; TEMPERATURE: 120.00°F. REFERENCE: NIST THERMOMETER STANDARDS: 2Z9150 & 9C8073 TEMPERATURE: 212.00°F.REFERENCE: NIST THERMOMETER 40350, TRANSFER STANDARDS: 3B2847 & 2Y6628

STANDARD	TEMP READING
33°F.	33°F.
75°F.	75°F.
150°F.	150°F.
75°F.	75°F.
33°F.	33°F.

N.I.S.T AND UKAS TRACABLE STANDARDS

MANUFACTURER	SERIAL NUMBER	RANGE	ACCURACY	RECERTIFICATION DUE DATE
D.H. BUDENBERG (MOD. 283)	25509	1000-30,000 PSI	0.05%	03/08/12
D.H. BUDENBERG (MOD. 558)	26490	10-2000 PSI	0.03%	05/18/12
AMETEK RK (RK1600WC)	85345	4"WC-1600" WC	0.05%	02/22/15
*KESSLER 24" SPEC PREC	441806	30/220°F.	.1°F.	02/01/15

* INDICATES MASTER STANDARD USED FOR THIS INSTRUMENT

CALIBRATION TECH: _____

QUALITY CONTROL INSPECTOR: _____

Insp. Q.C. 17

Technology & Calibration, Inc.
"When Quality Counts"
Established 1984

Report Number: 66754

CERTIFICATE OF CALIBRATION

Tech Cal Temp Recorder , S/N#: 00928

150.00 °F Capacity

Issued To:

Weatherford

Houston, Texas

This instrument has been tested and calibrated in accordance with Technology & Calibration's procedure, WI-8.19, Latest Revision with temperature measuring instruments certified to N.I.S.T. traceable standards. This calibration is in conformance with Technology & Calibration's Quality Assurance Program, ANSI/NCSL Z540.1 and ISO 10012-1. Environmental conditions during calibration are 72 degrees F +/- 4 degrees F and less than 65% relative humidity. The collective uncertainty of the measurement standard does not exceed 25% of the acceptable tolerance for each characteristic of the measuring and test equipment being certified.

PO Number: **Work Location:** Tech Cal, Houston

Temp. Range: 150.00 **Units:** °F **Rated Accuracy :** 0.50 **% of Span**

As Found							As Left						
Applied Temp.	Actual Reading	% of Span Error					Applied Temp	Actual Reading	% of Span Error				
0.00	0.00	0.00	%	Downscale	Percent		0.00		0.00	%	Downscale	Percent	
30.00	30.00	0.00	%	Rdg @ 40%	Hysteresis		30.00		-20.00	%	Rdg @ 40%	Hysteresis	
60.00	60.25	0.17	%	60.25	0.17	%	60.00		-40.00	%		-40.00	%
90.00	90.00	0.00	%				90.00		-60.00	%			
120.00	120.00	0.00	%				120.00		-80.00	%			
150.00	150.00	0.00	%				150.00		-100.00	%			

[X] **As Found / As Left**

Calibration Date January 17, 2011 **Recall Date** July 17, 2011

NIST Tracable Standard(s)

Manufacture	Serial Number	Range	Accuracy	Recall Date
Instrulab	3506 / 61578	-32 - 725 Deg. F	+/- .1% OR	10/13/2011

Comments: None.

Calibrated By:

C. Swailes

Approved By

N. Green, QA Mgr.

Heat # 293878

SOUTHERN FLOW COMPANIES **METER PROVING REPORT**

107 ROW 3,CANEBRAKE-LAFAYETTE,LA-70508			PHONE- (337) - 234-7017 FAX (337)-232-0136		
PROVE-DATE	15-Jul-2011		PROVE FOR	WEATHERFORD PIPELINE	
MET SER. NO.	75SAE29203		FIELD LOC	BROUSSARD	
SF-CUST NO	645901		STA/MET ID	N/A	
MET MAKE	NUFLO .75 SAE		OTHER ID	ATTN: BROUSSARD	
* MIN. RATE	1.97 GPM	* PRV TYPE	LOOP-PIPE 4 IN - 1 BBL CERT #748		
* MAX RATE	15.09 GPM	* GR-OBS @ Deg-F	43.1@71	* GRAV - API @ 60-F	42.1
* REG UNITS	PULSES	* MET ATG --- :	NO	* PRV RATES:	1

5 RUN AVG/RATE-LOOP		10 GPM	
*PROVER DATA		RATE #1	
GROSS TOTAL	PROVER VOLUME	0.905333	
TEMP-DEG F		79.92	
PRESSURE-PSIG		39.0	
CTLP FACTOR		0.99005	
CTSP FACTOR		1.00037	
CPSP FACTOR		1.00002	
CPLP FACTOR		1.00023	
COMB FACTOR		0.99066	
NET TOTAL	GSVP	0.896877	
*METER DATA		RATE #1	
TOTAL PULSES		94638	
K-FACTOR		104549	
TEMP-DEG F		78.76	
PRESSURE-PSIG		26.0	
GROSS TOTAL	IVMM	0.905199	
CPLM FACTOR		1.00016	
CTLM FACTOR		0.99063	
COMB FACTOR		0.99079	
NET TOTAL	ISVMM	0.896862	
MECH MET FACTOR		1.0000	
CORRECTED PULSES		93766	
K-FACTOR-CORR		104549	

15-Jul-2011	PROVE-MET/FCT/bbl	Met-Fct-var R/R	PROVE-K-FCT/BBL	Corr-K-FCT/bbl	Corr-MET/FCT/bbl
10 GPM	1.0000	0.0000	104549.000	104549	1.0000
	Prev. MET-FCT	MET-FCT CHANGE	Prev K-FCT/BBL	K-FCT CHANGE	%-F-FCT CHG
10 GPM	0.0000		0.000		0.00%

NEW KIT INSTALLED -PROVE TO ESTABLISH NEW FACTOR

PAUL ARDENEAUX

TESTER: SOUTHERN FLOW COMPANIES

WITNESS: _____

LOOP PROVING RUN DATA INPUT

15-Jul-2011

75SAE29203 WEATHERFORD PIPELINE N/A BROUSSARD

COPIES ROW-9 to ROWS 10..13 > | T-5 | P 5 | T | P

	RATE	DATA RATE #1				
INP>	10 GPM	METER DATA			PROVER	
	PULSES	RUN/RUN	TEMP	PRES	TEMP	PRES
1	94624		78.30	26.00	79.70	39.00
2	94625	0.0000	78.60	26.00	79.80	39.00
3	94634	0.0001	78.80	26.00	79.90	39.00
4	94645	0.0001	78.90	26.00	80.00	39.00
5	94660	0.0002	79.20	26.00	80.20	39.00
	AVG-PULSES		TEMP	PRES	TEMP	PRES
AVG>	94638		78.76	26.0	79.92	39.0
RUNS	5		5	5	5	5

COPIES ROW-9 to ROWS 10..13 > | T 5 | P 5 | T | P

RATE	DATA RATE #2				
	METER DATA			PROVER	
PULSES	RUN/RUN	TEMP	PRES	TEMP	PRES
AVG-PULSES		TEMP	PRES	TEMP	PRES

COPIES ROW-22 to ROWS 23..26 > | T-5 | P-5 | T | P

RATE	DATA RATE #3				
0	METER DATA			PROVER	
PULSES	RUN/RUN	TEMP	PRES	TEMP	PRES
AVG-PULSES		TEMP	PRES	TEMP	PRES

COPIES ROW-22 to ROWS 23..26 > | T-5 | P-5 | T | P

RATE	DATA RATE #4				
	METER DATA			PROVER	
PULSES	RUN/RUN	TEMP	PRES	TEMP	PRES
AVG-PULSES		TEMP	PRES	TEMP	PRES

Head # 306563

SOUTHERN FLOW COMPANIES — **METER PROVING REPORT**

107 ROW 3,CANEBRAKE-LAFAYETTE,LA-70508 PHONE- (337) - 234-7017 FAX (337)-232-0136

PROVE-DATE	15-Jul-2011		PROVE FOR	WEATHERFORD PIPELINE	
MET SER. NO.	5SAE18540		FIELD LOC	BROUSSARD	
SF-CUST.NO.	645901		STA/MET ID	N/A	
MET MAKE	NUFLO .5 SAE		OTHER ID	ATTN: BROUSSARD	
* MIN. RATE	.73 GPM	* PRV TYPE	LOOP-PIPE 4 IN - 1 BBL CERT #748		
* MAX RATE	7.52 GPM	* GR-OBS @ Deg-F	43.1@71	* GRAV - API @ 60-F	42.1
* REG UNITS	PULSES	* MET ATG --- :	NO	* PRV RATES:	1

5 RUN AVG/RATE-LOOP		4 GPM	
*PROVER DATA		RATE #1	
GROSS TOTAL	PROVER VOLUME	0.905333	
TEMP-DEG F		81.40	
PRESSURE-PSIG		39.0	
CTLP FACTOR		0.98931	
CTSP FACTOR		1.00040	
CPSP FACTOR		1.00002	
CPLP FACTOR		1.00024	
COMB FACTOR		0.98996	
NET TOTAL	GSVP	0.896243	
*METER DATA		RATE #1	
TOTAL PULSES		561851	
K-FACTOR		620912	
TEMP-DEG F		79.52	
PRESSURE-PSIG		29.0	
GROSS TOTAL	IVMM	0.904880	
CPLM FACTOR		1.00017	
CTLM FACTOR		0.99025	
COMB FACTOR		0.99042	
NET TOTAL	ISVMM	0.896211	
MECH MET FACTOR		1.0000	
CORRECTED PULSES		556468	
K-FACTOR-CORR		620912	

15-Jul-2011	PROVE-MET/FCT/bbl	Met-Fct-var R/R	PROVE-K-FCT/BBL	Corr-K-FCT/bbl	Corr-MET/FCT/bbl
4 GPM	1.0178	-0.0356	631964.000	620912	1.0000
	Prev MET-FCT	MET-FCT CHANGE	Prev K-FCT/BBL	K-FCT CHANGE	%-F-FCT CHG
4 GPM	0.0000		0.000		0.00%

NEW KIT INSTALLED -PROVE TO ESTABLISH NEW FACTOR

PAUL ARDENEAUX

TESTER: SOUTHERN FLOW COMPANIES

WITNESS: _____

LOOP PROVING RUN DATA INPUT

15-Jul-2011

5SAE18540 WEATHERFORD PIPELINE N/A BROUSSARD

COPIES ROW-9 to ROWS 10..13 > T-5 P 5 T P

	RATE	DATA RATE #1				
INP>	4 GPM		METER DATA		PROVER	
	PULSES	RUN/RUN	TEMP	PRES	TEMP	PRES
1	562033		78.50	29.00	80.70	39.00
2	561870	-0.0003	79.30	29.00	81.10	39.00
3	561700	-0.0003	79.60	29.00	81.40	39.00
4	561885	0.0003	80.00	29.00	81.80	39.00
5	561765	-0.0002	80.20	29.00	82.00	39.00
	AVG-PULSES		TEMP	PRES	TEMP	PRES
AVG>	561851		79.52	29.0	81.40	39.0
RUNS	5		5	5	5	5

COPIES ROW-9 to ROWS 10..13 > T 5 P 5 T P

RATE	DATA RATE #2				
	METER DATA			PROVER	
PULSES	RUN/RUN	TEMP	PRES	TEMP	PRES
AVG-PULSES		TEMP	PRES	TEMP	PRES

COPIES ROW-22 to ROWS 23..26 > T-5 P-5 T P

	RATE	DATA RATE #3				
	0		METER DATA		PROVER	
	PULSES	RUN/RUN	TEMP	PRES	TEMP	PRES
1						
2						
3						
4						
5						
	AVG-PULSES		TEMP	PRES	TEMP	PRES
AVG>						
RUNS						

COPIES ROW-22 to ROWS 23..26 > T-5 P-5 T P

RATE	DATA RATE #4				
	METER DATA			PROVER	
PULSES	RUN/RUN	TEMP	PRES	TEMP	PRES
AVG-PULSES		TEMP	PRES	TEMP	PRES

SOUTHERN FLOW COMPANIES METER PROVING REPORT

107 ROW 3,CANEBRAKE-LAFAYETTE,LA-70508			PHONE- (337) - 234-7017 FAX (337)-232-0136		
PROVE-DATE	29-Jul-2011		PROVE FOR	WEATHERFORD PIPELINE	
MET SER. NO.	2-ST-53613		FIELD LOC	BROUSSARD	
SF-CUST NO	645901		STA/MET ID	N/A	
MET MAKE	NUFLO 2" ST		OTHER ID	ATTN: BROUSSARD	
* MIN. RATE	40 GPM	* PRV TYPE	LOOP-PIPE 4 IN - 1 BBL CERT #748		
* MAX RATE	400 GPM	* GR-OBS @ Deg-F	43.1@71	* GRAV - API @ 60-F	42.1
* REG UNITS	PULSES	* MET ATG --- :	NO	* PRV RATES:	1

5 RUN AVG/RATE-LOOP		200 GPM	
*PROVER DATA		RATE #1	
GROSS TOTAL	PROVER VOLUME	0.905333	
TEMP-DEG F		71.40	
PRESSURE-PSIG		33.0	
CTLP FACTOR		0.99431	
CTSP FACTOR		1.00021	
CPSP FACTOR		1.00002	
CPLP FACTOR		1.00019	
COMB FACTOR		0.99473	
NET TOTAL	GSVP	0.900562	
*METER DATA		RATE #1	
TOTAL PULSES		2139	
K-FACTOR		2363	
TEMP-DEG F		70.96	
PRESSURE-PSIG		23.0	
GROSS TOTAL	IVMM	0.905375	
CPLM FACTOR		1.00013	
CTLM FACTOR		0.99453	
COMB FACTOR		0.99466	
NET TOTAL	ISVMM	0.900540	
MECH MET FACTOR		1.0000	
CORRECTED PULSES		2128	
K-FACTOR-CORR		2363	

29-Jul-2011	PROVE-MET/FCT/bbl	Met-Fct-var R/R	PROVE-K-FCT/BBL	Corr-K-FCT/bbl	Corr-MET/FCT/bbl
200 GPM	1.0000	0.0000	2363.000	2363	1.0000
13-Apr-2010	Prev MET-FCT	MET-FCT CHANGE	Prev K-FCT/BBL	K-FCT CHANGE	%-F-FCT CHG
200 GPM	1.0001	-0.0001	2330.000	33	1.40%

METER INSPECTED & CLEANED - NEW FACTOR ESTABLISHED

PAUL ARDENEAUX

TESTER: SOUTHERN FLOW COMPANIES

WITNESS: _____

LOOP PROVING RUN DATA INPUT

29-Jul-2011

2-ST-53613 WEATHERFORD PIPELINE N/A BROUSSARD

COPIES ROW-9 to ROWS 10..13 > | T-5 | P 5 | T | P

	RATE	DATA RATE #1				
INP>	200 GPM	METER DATA			PROVER	
	PULSES	RUN/RUN	TEMP	PRES	TEMP	PRES
1	2139		70.90	23.00	71.40	33.00
2	2140	0.0005	70.90	23.00	71.40	33.00
3	2139	-0.0005	71.00	23.00	71.40	33.00
4	2140	0.0005	71.00	23.00	71.40	33.00
5	2139	-0.0005	71.00	23.00	71.40	33.00
	AVG-PULSES		TEMP	PRES	TEMP	PRES
AVG>	2139		70.96	23.0	71.40	33.0
RUNS	5		5	5	5	5

COPIES ROW-9 to ROWS 10..13 > | T 5 | P 5 | T | P

RATE	DATA RATE #2				
	METER DATA			PROVER	
PULSES	RUN/RUN	TEMP	PRES	TEMP	PRES
AVG-PULSES		TEMP	PRES	TEMP	PRES

COPIES ROW-22 to ROWS 23..26 > | T-5 | P-5 | T | P

RATE	DATA RATE #3				
	METER DATA			PROVER	
PULSES	RUN/RUN	TEMP	PRES	TEMP	PRES
1					
2					
3					
4					
5					
AVG-PULSES		TEMP	PRES	TEMP	PRES
AVG>					
RUNS					

COPIES ROW-22 to ROWS 23..26 > | T-5 | P-5 | T | P

RATE	DATA RATE #4				
	METER DATA			PROVER	
PULSES	RUN/RUN	TEMP	PRES	TEMP	PRES
AVG-PULSES		TEMP	PRES	TEMP	PRES

SOUTHERN FLOW COMPANIES METER PROVING REPORT

107 ROW 3,CANEBRAKE-LAFAYETTE,LA-70508		PHONE- (337) - 234-7017 FAX (337)-232-0136			
PROVE-DATE	29-Jul-2011	PROVE FOR	WEATHERFORD PIPELINE		
MET SER. NO.	2-ST-41035	FIELD LOC	BROUSSARD		
SF-CUST NO	645901	STA/MET ID	N/A		
MET MAKE	NUFLO 2" ST	OTHER ID	ATTN: BROUSSARD		
* MIN. RATE	40 GPM	* PRV TYPE	LOOP-PIPE 4 IN - 1 BBL CERT #748		
* MAX RATE	400 GPM	* GR-OBS @ Deg-F	43.1@71.	* GRAV - API @ 60-F	42.1
* REG UNITS	PULSES	* MET ATG --- :	NO	* PRV RATES:	1

5 RUN AVG/RATE-LOOP		200 GPM	
*PROVER DATA		RATE #1	
GROSS TOTAL	PROVER VOLUME	0.905333	
TEMP-DEG F		71.60	
PRESSURE-PSIG		33.0	
CTLP FACTOR		0.99421	
CTSP FACTOR		1.00022	
CPSP FACTOR		1.00002	
CPLP FACTOR		1.00019	
COMB FACTOR		0.99464	
NET TOTAL	GSVP	0.900480	
*METER DATA		RATE #1	
TOTAL PULSES		2149	
K-FACTOR		2373	
TEMP-DEG F		71.32	
PRESSURE-PSIG		23.0	
GROSS TOTAL	IVMM	0.905436	
CPLM FACTOR		1.00013	
CTLM FACTOR		0.99435	
COMB FACTOR		0.99448	
NET TOTAL	ISVMM	0.900438	
MECH MET FACTOR		1.0000	
CORRECTED PULSES		2137	
K-FACTOR-CORR		2373	

29-Jul-2011	PROVE-MET/FCT/bbl	Met-Fct-var R/R	PROVE-K-FCT/BBL	Corr-K-FCT/bbl	Corr-MET/FCT/bbl
200 GPM	1.0000	0.0000	2373.000	2373	1.0000
13-Apr-2010	Prev MET-FCT	MET-FCT CHANGE	Prev K-FCT/BBL.	K-FCT CHANGE	%-F-FCT CHG.
200 GPM	0.9999	0.0001	2339.000	34	1.43%

METER INSPECTED & CLEANED - NEW FACTOR ESTABLISHED

PAUL ARDENEAUX

TESTER: SOUTHERN FLOW COMPANIES WITNESS: _____

LOOP PROVING RUN DATA INPUT

29-Jul-2011

2-ST-41035 WEATHERFORD PIPELINE N/A BROUSSARD

COPIES ROW-9 to ROWS 10..13 > T-5 P 5 T P

	RATE	DATA RATE #1				
INP>	200 GPM	METER DATA			PROVER	
	PULSES	RUN/RUN	TEMP	PRES	TEMP	PRES
1	2149		71.30	23.00	71.60	33.00
2	2148	-0.0005	71.30	23.00	71.60	33.00
3	2148	0.0000	71.30	23.00	71.60	33.00
4	2149	0.0005	71.30	23.00	71.60	33.00
5	2149	0.0000	71.40	23.00	71.60	33.00
	AVG-PULSES		TEMP	PRES	TEMP	PRES
AVG>	2149		71.32	23.0	71.60	33.0
RUNS	5		5	5	5	5

COPIES ROW-9 to ROWS 10..13 > T 5 P 5 T P

	RATE	DATA RATE #2				
		METER DATA			PROVER	
	PULSES	RUN/RUN	TEMP	PRES	TEMP	PRES
	AVG-PULSES		TEMP	PRES	TEMP	PRES

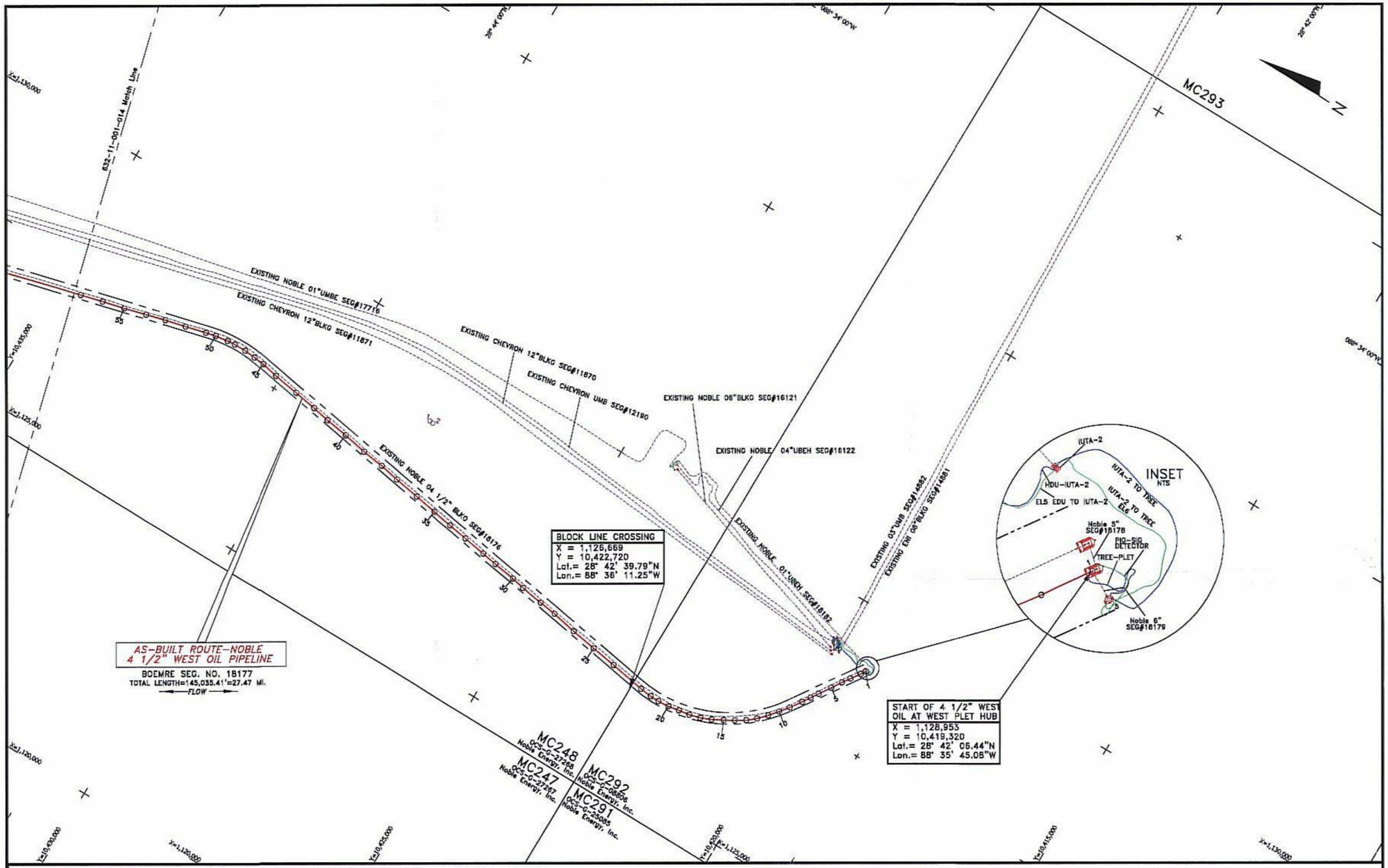
COPIES ROW-22 to ROWS 23..26 > T-5 P-5 T P

	RATE	DATA RATE #3				
		METER DATA			PROVER	
	PULSES	RUN/RUN	TEMP	PRES	TEMP	PRES
1						
2						
3						
4						
5						
	AVG-PULSES		TEMP	PRES	TEMP	PRES
AVG>						
RUNS						

COPIES ROW-22 to ROWS 23..26 > T-5 P-5 T P

	RATE	DATA RATE #4				
		METER DATA			PROVER	
	PULSES	RUN/RUN	TEMP	PRES	TEMP	PRES
	AVG-PULSES		TEMP	PRES	TEMP	PRES

PLAN VIEW



AS-BUILT NOBLE 4 1/2' WEST OIL PIPELINE SEGMENT# 18177

POINT	X-COORDINATE	Y-COORDINATE	DESCRIPTION
1	1,128,953	10,419,320	WEST PLET HUB
2	1,128,870	10,419,375	FIELD JOINT
3	1,128,708	10,419,490	FIELD JOINT
4	1,128,573	10,419,585	FIELD JOINT
5	1,128,397	10,419,695	FIELD JOINT
6	1,128,195	10,419,833	FIELD JOINT
7	1,128,065	10,419,919	FIELD JOINT
8	1,127,927	10,420,010	FIELD JOINT
9	1,127,729	10,420,145	FIELD JOINT
10	1,127,570	10,420,267	FIELD JOINT
11	1,127,412	10,420,398	FIELD JOINT
12	1,127,266	10,420,535	FIELD JOINT
13	1,127,141	10,420,683	FIELD JOINT
14	1,127,033	10,420,853	FIELD JOINT
15	1,126,935	10,421,025	FIELD JOINT
16	1,126,833	10,421,212	FIELD JOINT
17	1,126,756	10,421,397	FIELD JOINT
18	1,126,701	10,421,592	FIELD JOINT
19	1,126,671	10,421,788	FIELD JOINT
20	1,126,636	10,421,984	FIELD JOINT
21	1,126,621	10,422,181	FIELD JOINT
22	1,126,624	10,422,342	FIELD JOINT
23	1,126,642	10,422,551	FIELD JOINT
24	1,126,742	10,423,179	ROV FIX
25	1,126,812	10,423,633	ROV FIX
26	1,126,885	10,424,089	ROV FIX
27	1,126,969	10,424,536	ROV FIX
28	1,127,009	10,424,845	FIELD JOINT
29	1,127,070	10,425,243	FIELD JOINT
30	1,127,119	10,425,487	FIELD JOINT
31	1,127,181	10,425,881	ROV FIX
32	1,127,225	10,426,160	FIELD JOINT
33	1,127,290	10,426,567	FIELD JOINT
34	1,127,345	10,426,916	FIELD JOINT
35	1,127,406	10,427,277	FIELD JOINT
36	1,127,471	10,427,680	FIELD JOINT
37	1,127,542	10,428,131	ROV FIX
38	1,127,607	10,428,485	FIELD JOINT
39	1,127,658	10,428,877	FIELD JOINT
40	1,127,733	10,429,302	FIELD JOINT
41	1,127,791	10,429,713	FIELD JOINT
42	1,127,850	10,430,025	FIELD JOINT
43	1,127,916	10,430,432	ROV FIX
44	1,127,963	10,430,887	ROV FIX
45	1,128,041	10,431,187	FIELD JOINT
46	1,128,066	10,431,382	FIELD JOINT
47	1,128,081	10,431,583	FIELD JOINT
48	1,128,050	10,431,795	ANODE
49	1,128,069	10,431,938	FIELD JOINT
50	1,128,033	10,432,163	ROV FIX
51	1,127,992	10,432,339	FIELD JOINT
52	1,127,897	10,432,702	FIELD JOINT
53	1,127,807	10,433,065	ROV FIX
54	1,127,712	10,433,405	FIELD JOINT
55	1,127,607	10,433,793	FIELD JOINT
56	1,127,510	10,434,180	FIELD JOINT
57	1,127,407	10,434,570	FIELD JOINT

NOTES

1) PIPELINE COORDINATES ARE THE POSITIONS OF THE R.O.V. (REMOTELY OPERATED VEHICLE) LOCATED AT THE POINTS USING BOTH VERIPOS LD2 ULTRA DGPS RECEIVING SPOTBEAM CORRECTIONS, VERIPOS ULTRA DGPS RECEIVING INMARSAT CORRECTIONS, SONARDYNE FUSION LBL (LONG BASELINE) ACOUSTIC POSITIONING, KONGSBERG HIPAP USBL(ULTRA SHORT BASELINE) ACOUSTIC POSITIONING AND RDI WORKHORSE DVL POSITIONING.
2) SURVEYED COORDINATES TRANSFORMED FROM NAD83 (GPS DATUM) NADCON VERSION 2.1.
3) THIS DRAWING IS NOT FOR NAVIGATION. PIPELINES AND FEATURES IN THE IMMEDIATE VICINITY ARE OBTAINED FROM BOEMRE (BUREAU OF OCEAN ENERGY MANAGEMENT, REGULATION AND ENFORCEMENT) DATABASE AND CLIENT PROVIDED DATA.
4) AS-BUILT SURVEY DATE: AUGUST 1ST THROUGH AUGUST 8TH, 2011.
5) CLIENT DRAWING REFERENCE: 16172-BASEMAP.DWG AND 24105013ENG.DWG.

LEGEND

- AS-BUILT NOBLE 4 1/2" WEST OIL PIPELINE SEG#18177
- AS-FOUND PIPELINE OR UMBILICAL
- RIGHT-OF-WAY (PROVIDED BY CLIENT)
- BOEMRE EXISTING PIPELINES/UMBILICALS/FLYING LEADS/JUMPERS
- AS-INSTALLED HFL
- AS-INSTALLED EFL
- BOEMRE PROPOSED PIPELINES/UMBILICALS/FLYING LEADS/JUMPERS
- MC292 — BOEMRE LEASE BLOCK BOUNDARIES
- MATCHLINE WITH ADJOINING CHART
- PROPOSED STRUCTURES
- EXISTING STRUCTURES
- GEOGRAPHICAL TICKS
- UTM TICKS
- BOEMRE WELLS

GEODESY

Survey Datum: NAD 27
Ellipsoid: Clarke 1866
Projection: Universal Transverse Mercator ZONE 16N
Longitude of Central Meridian: 87°W
False Easting (m): 500 000
False Northing (m): 0
Scale Factor at Central Meridian: 0.99960
Units: US Survey Feet

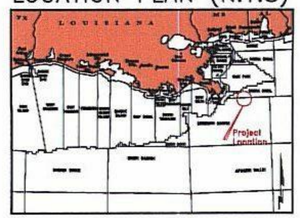
CERTIFIED CORRECT AS TO THE HORIZONTAL POSITION OF THE AS-BUILT PIPELINE BASED ON THE SURVEY METHODS NOTED.

STATE OF TEXAS REGISTERED NATHAN J. EBY 6198 PROFESSIONAL LAND SURVEYOR

10/3/11

NATHAN EBY, R.P.L.S.
TEXAS REG #6198

LOCATION PLAN (N.T.S)



noble energy

HELIX SUBSEA CONSTRUCTION

UTEC

7240 BRITTMOORE RD. SUITE 110
HOUSTON, TEXAS 77041
Tel 713-984-8688
Fax 713-984-8683
Website www.utecsurvey.com

RATON SOUTH FIELD DEVELOPMENT PROJECT
AS-BUILT 04 1/2" BLKO WEST PIPELINE
FROM MISSISSIPPI CANYON AREA BLOCK 292
TO VIOSCA KNOLL AREA BLOCK 900
SEGMENT#18177 GULF OF MEXICO

Scale 1 : 1000

1000 0 1000 2000 3000 4000 5000

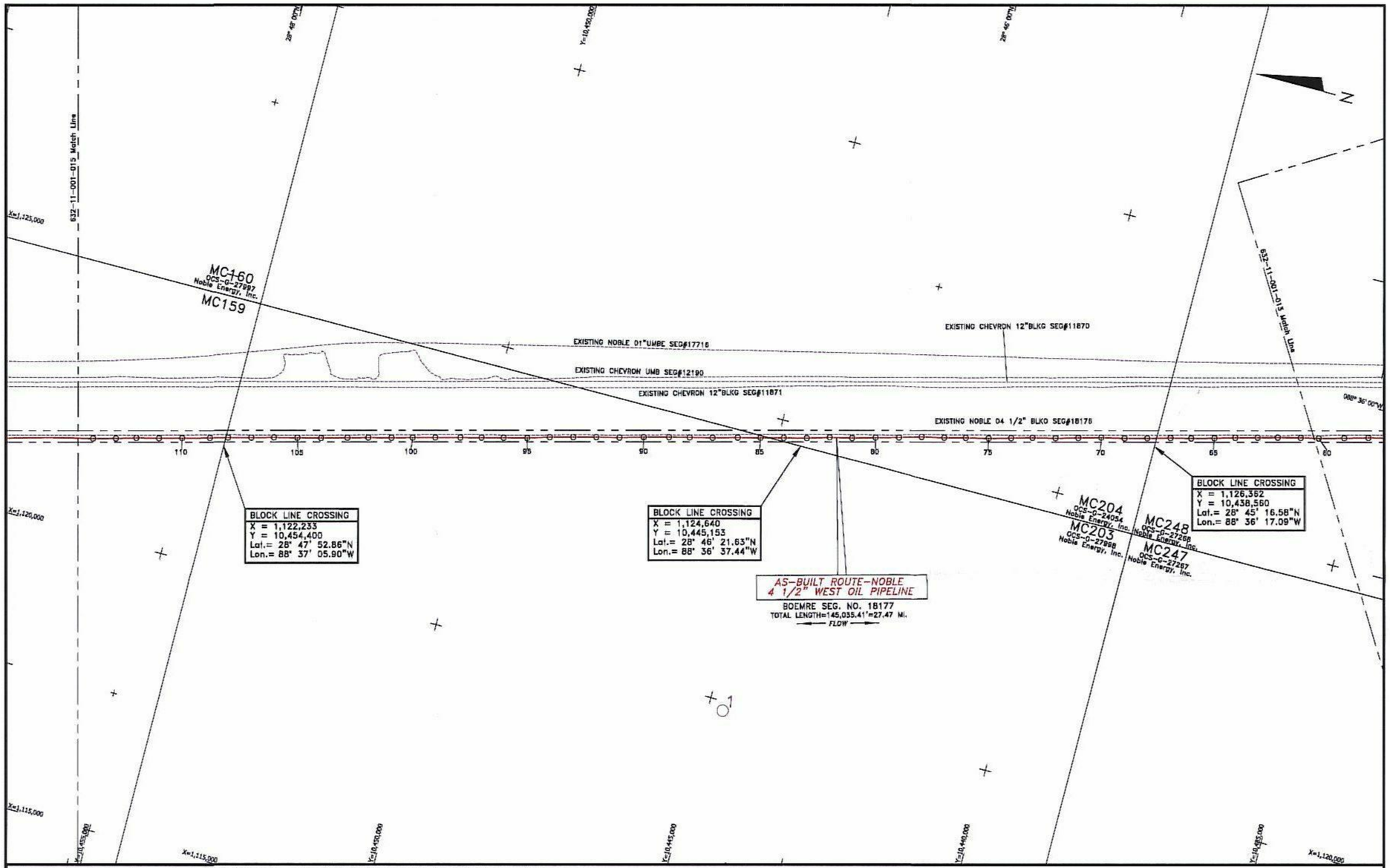
US SURVEY FEET

Rev. No.	Date	Comment	Drawn	Checked	Appr.
0	09/29/11	ISSUED AS FINAL	VR	SW	RG
A2	09/20/11	ISSUED FOR CLIENT COMMENTS	VR	SW	RG
A1	08/24/11	ISSUED FOR CLIENT COMMENTS	VR	SW	SF

Survey Dates: AUG 1st through AUG 8th, 2011 | Survey Vessel: HELIX EXPRESS

UTEC Ref. No. 632C-11-001	UTEC Drawing No. 632C-11-001-013	Sheet 001 Of 007
Plot Size ANSI D		

PLAN VIEW



AS-BUILT NOBLE 4 1/2' WEST OIL PIPELINE SEGMENT# 18177

POINT	X-COORDINATE	Y-COORDINATE	DESCRIPTION
58	1,127,307	10,434,958	FIELD JOINT
59	1,127,195	10,435,367	ROV FIX
60	1,127,078	10,435,799	ROV FIX
61	1,127,007	10,436,108	FIELD JOINT
62	1,126,910	10,436,500	FIELD JOINT
63	1,126,818	10,436,841	FIELD JOINT
64	1,126,718	10,437,223	FIELD JOINT
65	1,126,618	10,437,577	FIELD JOINT
66	1,126,512	10,437,970	ROV FIX
67	1,126,428	10,438,323	FIELD JOINT
68	1,126,319	10,438,716	FIELD JOINT
69	1,126,216	10,439,103	FIELD JOINT
70	1,126,125	10,439,502	FIELD JOINT
71	1,126,018	10,439,890	FIELD JOINT
72	1,125,913	10,440,274	FIELD JOINT
73	1,125,817	10,440,670	FIELD JOINT
74	1,125,717	10,441,031	FIELD JOINT
75	1,125,611	10,441,410	FIELD JOINT
76	1,125,520	10,441,801	FIELD JOINT
77	1,125,426	10,442,166	FIELD JOINT
78	1,125,340	10,442,553	FIELD JOINT
79	1,125,224	10,442,946	FIELD JOINT
80	1,125,116	10,443,343	FIELD JOINT
81	1,125,006	10,443,740	ROV FIX
82	1,124,919	10,444,124	FIELD JOINT
83	1,124,803	10,444,512	FIELD JOINT
84	1,124,705	10,444,904	FIELD JOINT
85	1,124,602	10,445,300	FIELD JOINT
86	1,124,504	10,445,689	FIELD JOINT
87	1,124,390	10,446,118	FIELD JOINT
88	1,124,294	10,446,509	FIELD JOINT
89	1,124,205	10,446,860	FIELD JOINT
90	1,124,093	10,447,291	ANODE
91	1,123,980	10,447,702	ROV FIX
92	1,123,884	10,448,099	FIELD JOINT
93	1,123,781	10,448,490	FIELD JOINT
94	1,123,677	10,448,890	FIELD JOINT
95	1,123,563	10,449,270	FIELD JOINT
96	1,123,462	10,449,672	FIELD JOINT
97	1,123,365	10,450,048	FIELD JOINT
98	1,123,274	10,450,410	FIELD JOINT
99	1,123,164	10,450,839	FIELD JOINT
100	1,123,080	10,451,225	ROV FIX
101	1,122,964	10,451,584	FIELD JOINT
102	1,122,864	10,451,981	FIELD JOINT
103	1,122,769	10,452,333	FIELD JOINT
104	1,122,648	10,452,781	FIELD JOINT
105	1,122,547	10,453,184	FIELD JOINT
106	1,122,450	10,453,584	FIELD JOINT
107	1,122,345	10,453,968	FIELD JOINT
108	1,122,243	10,454,361	FIELD JOINT
109	1,122,163	10,454,673	FIELD JOINT
110	1,122,037	10,455,145	FIELD JOINT
111	1,121,932	10,455,539	UNCHARTED CROSSING/CABLE DEBRIS
112	1,121,835	10,455,926	FIELD JOINT
113	1,121,736	10,456,273	FIELD JOINT
114	1,121,633	10,456,663	FIELD JOINT

NOTES

1) PIPELINE COORDINATES ARE THE POSITIONS OF THE R.O.V. (REMOTELY OPERATED VEHICLE) LOCATED AT THE POINTS USING BOTH VERIPOS LD2 ULTRA DGPS RECEIVING SPOTBEAM CORRECTIONS, VERIPOS ULTRA DGPS RECEIVING INMARSAT CORRECTIONS, SONARDYNE FUSION LBL (LONG BASELINE) ACOUSTIC POSITIONING, KONGSBERG HIPAP USBL(ULTRA SHORT BASELINE) ACOUSTIC POSITIONING AND RDI WORKHORSE DVL POSITIONING.
2) SURVEYED COORDINATES TRANSFORMED FROM NAD83 (GPS DATUM) NADCON VERSION 2.1.
3) THIS DRAWING IS NOT FOR NAVIGATION. PIPELINES AND FEATURES IN THE IMMEDIATE VICINITY ARE OBTAINED FROM BOEMRE (BUREAU OF OCEAN ENERGY MANAGEMENT, REGULATION AND ENFORCEMENT) DATABASE AND CLIENT PROVIDED DATA.
4) AS-BUILT SURVEY DATE: AUGUST 1ST THROUGH AUGUST 8TH, 2011.
5) CLIENT DRAWING REFERENCE: 18172-BASEMAP.DWG AND 24105013ENG.DWG.

LEGEND

- AS-BUILT NOBLE 4 1/2" WEST OIL PIPELINE SEG#18177
- AS-FOUND PIPELINE OR UMBILICAL
- RIGHT-OF-WAY (PROVIDED BY CLIENT)
- BOEMRE EXISTING PIPELINES/UMBILICALS/FLYING LEADS/JUMPERS
- AS-INSTALLED HFL
- AS-INSTALLED EFL
- BOEMRE PROPOSED PIPELINES/UMBILICALS/FLYING LEADS/JUMPERS
- MC292 — BOEMRE LEASE BLOCK BOUNDARIES
- MATCHLINE WITH ADJOINING CHART
- PROPOSED STRUCTURES
- EXISTING STRUCTURES
- GEOGRAPHICAL TICKS
- UTM TICKS
- BOEMRE WELLS

GEODESY

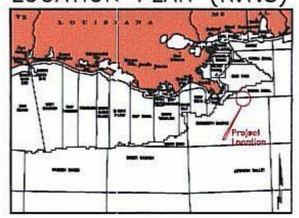
Survey Datum: NAD 27
Ellipsoid: Clarke 1866
Projection: Universal Transverse Mercator ZONE 16N
Longitude of Central Meridian: 87°W
False Easting (m): 500 000
False Northing (m): 0
Scale Factor at Central Meridian: 0.99960
Units: US Survey Feet

CERTIFIED CORRECT AS TO THE HORIZONTAL POSITION OF THE AS-BUILT PIPELINE BASED ON THE SURVEY METHODS NOTED.

STATE OF TEXAS · REGISTERED · NATHAN J. EBY · 6198 · PROFESSIONAL LAND SURVEYOR

NATHAN EBY, R.P.L.S.
TEXAS REG #6198

LOCATION PLAN (N.T.S)



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UTEC

HELIX SUBSEA CONSTRUCTION

7240 BRITTMOORE RD. SUITE 110
HOUSTON, TEXAS 77041
Tel 713-984-8688
Fax 713-984-8683
Website www.utecsurvey.com

RATON SOUTH FIELD DEVELOPMENT PROJECT
AS-BUILT 04 1/2" BLKO WEST PIPELINE
FROM MISSISSIPPI CANYON AREA BLOCK 292
TO VIOSCA KNOLL AREA BLOCK 900
SEGMENT#18177 GULF OF MEXICO

Scale 1 : 1000

1000 0 1000 2000 3000 4000 5000

US SURVEY FEET

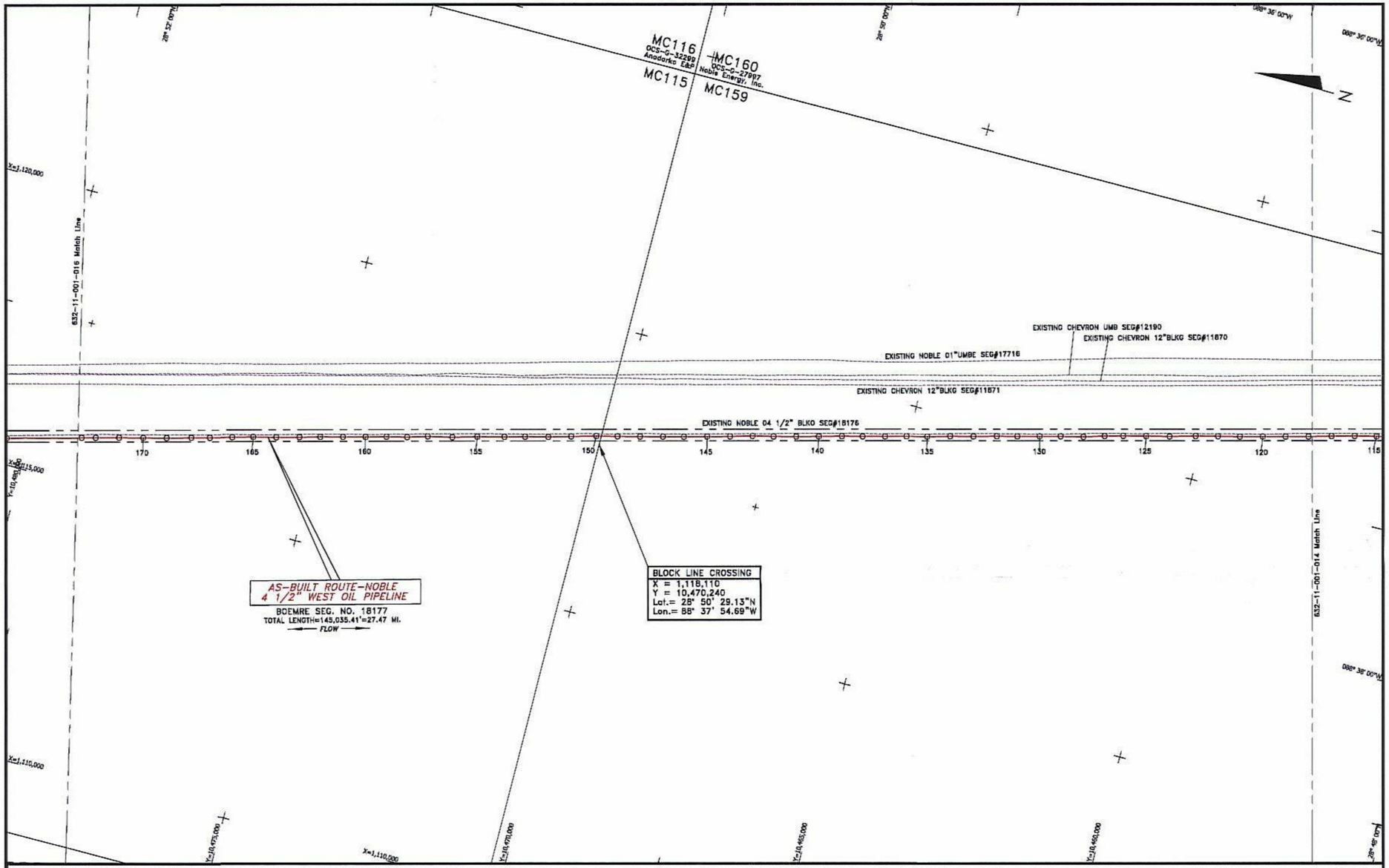
Rev. No.	Date	Comment	Drawn	Checked	Appr.
0	09/29/11	ISSUED AS FINAL	VR	SW	RG
A2	09/20/11	ISSUED FOR CLIENT COMMENTS	VR	SW	RG
A1	08/24/11	ISSUED FOR CLIENT COMMENTS	VR	SW	SF

Survey Dates: AUG 1st through AUG 8th, 2011 | Survey Vessel: HELIX EXPRESS

UTEC Ref. No. 632C-11-001 | UTEC Drawing No. 632C-11-001-014 | Sheet 002 Of 007

Plot Size ANSI D

PLAN VIEW



AS-BUILT NOBLE 4 1/2' WEST OIL PIPELINE SEGMENT# 18177

POINT	X-COORDINATE	Y-COORDINATE	DESCRIPTION	POINT	X-COORDINATE	Y-COORDINATE	DESCRIPTION	POINT	X-COORDINATE	Y-COORDINATE	DESCRIPTION
115	1,121,544	10,457,037	ROV FIX	140	1,119,068	10,466,532	FIELD JOINT	165	1,116,559	10,476,167	FIELD JOINT
116	1,121,454	10,457,411	FIELD JOINT	141	1,118,966	10,466,917	FIELD JOINT	166	1,116,460	10,476,524	FIELD JOINT
117	1,121,350	10,457,803	FIELD JOINT	142	1,118,867	10,467,303	FIELD JOINT	167	1,116,359	10,476,903	ROV FIX
118	1,121,239	10,458,194	FIELD JOINT	143	1,118,782	10,467,662	FIELD JOINT	168	1,116,278	10,477,218	FIELD JOINT
119	1,121,136	10,458,584	FIELD JOINT	144	1,118,674	10,468,044	FIELD JOINT	169	1,116,163	10,477,639	FIELD JOINT
120	1,121,037	10,458,973	FIELD JOINT	145	1,118,589	10,468,434	FIELD JOINT	170	1,116,064	10,478,041	FIELD JOINT
121	1,120,935	10,459,361	FIELD JOINT	146	1,118,464	10,468,829	FIELD JOINT	171	1,115,959	10,478,454	FIELD JOINT
122	1,120,844	10,459,735	FIELD JOINT	147	1,118,374	10,469,186	FIELD JOINT	172	1,115,854	10,478,854	FIELD JOINT
123	1,120,748	10,460,117	ROV FIX	148	1,118,274	10,469,577	FIELD JOINT	173	1,115,791	10,479,095	ROV FIX
124	1,120,626	10,460,559	ANODE	149	1,118,177	10,469,962	FIELD JOINT				
125	1,120,527	10,460,960	FIELD JOINT	150	1,118,089	10,470,325	FIELD JOINT				
126	1,120,429	10,461,350	FIELD JOINT	151	1,117,971	10,470,751	FIELD JOINT				
127	1,120,343	10,461,665	FIELD JOINT	152	1,117,861	10,471,139	FIELD JOINT				
128	1,120,236	10,462,024	FIELD JOINT	153	1,117,763	10,471,536	FIELD JOINT				
129	1,120,143	10,462,412	FIELD JOINT	154	1,117,668	10,471,888	ROV FIX				
130	1,120,050	10,462,770	ANODE	155	1,117,551	10,472,352	ROV FIX				
131	1,119,952	10,463,148	FIELD JOINT	156	1,117,432	10,472,774	FIELD JOINT				
132	1,119,864	10,463,498	FIELD JOINT	157	1,117,336	10,473,199	FIELD JOINT				
133	1,119,756	10,463,895	FIELD JOINT	158	1,117,234	10,473,547	FIELD JOINT				
134	1,119,657	10,464,290	FIELD JOINT	159	1,117,149	10,473,901	FIELD JOINT				
135	1,119,548	10,464,680	FIELD JOINT	160	1,117,053	10,474,255	FIELD JOINT				
136	1,119,459	10,465,039	FIELD JOINT	161	1,116,954	10,474,640	FIELD JOINT				
137	1,119,361	10,465,403	ROV FIX	162	1,116,854	10,475,029	FIELD JOINT				
138	1,119,262	10,465,785	FIELD JOINT	163	1,116,758	10,475,362	FIELD JOINT				
139	1,119,174	10,466,139	FIELD JOINT	164	1,116,653	10,475,773	FIELD JOINT				

NOTES

1) PIPELINE COORDINATES ARE THE POSITIONS OF THE R.O.V. (REMOTELY OPERATED VEHICLE) LOCATED AT THE POINTS USING BOTH VERIPOS LD2 ULTRA DGPS RECEIVING SPOTBEAM CORRECTIONS, VERIPOS ULTRA DGPS RECEIVING INMARSAT CORRECTIONS, SONARDYNE FUSION LBL (LONG BASELINE) ACOUSTIC POSITIONING, KONGSBERG HIPAP USBL(ULTRA SHORT BASELINE) ACOUSTIC POSITIONING AND RDI WORKHORSE DVL POSITIONING.
2) SURVEYED COORDINATES TRANSFORMED FROM NAD83 (GPS DATUM) NADCON VERSION 2.1.
3) THIS DRAWING IS NOT FOR NAVIGATION. PIPELINES AND FEATURES IN THE IMMEDIATE VICINITY ARE OBTAINED FROM BOEMRE (BUREAU OF OCEAN ENERGY MANAGEMENT, REGULATION AND ENFORCEMENT) DATABASE AND CLIENT PROVIDED DATA.
4) AS-BUILT SURVEY DATE: AUGUST 1ST THROUGH AUGUST 8TH, 2011.
5) CLIENT DRAWING REFERENCE: 16172-BASEMAP.DWG AND 24105013ENG.DWG.

LEGEND

- AS-BUILT NOBLE 4 1/2" WEST OIL PIPELINE SEG#18177
- AS-FOUND PIPELINE OR UMBILICAL
- RIGHT-OF-WAY (PROVIDED BY CLIENT)
- BOEMRE EXISTING PIPELINES/UMBILICALS/FLYING LEADS/JUMPERS
- AS-INSTALLED HFL
- AS-INSTALLED EFL
- BOEMRE PROPOSED PIPELINES/UMBILICALS/FLYING LEADS/JUMPERS
- MC292 — BOEMRE LEASE BLOCK BOUNDARIES
- MATCHLINE WITH ADJOINING CHART
- PROPOSED STRUCTURES
- EXISTING STRUCTURES
- GEOGRAPHICAL TICKS
- UTM TICKS
- BOEMRE WELLS

GEODESY

Survey Datum: NAD 27
Ellipsoid: Clarke 1866
Projection: Universal Transverse Mercator ZONE 16N
Longitude of Central Meridian: 87°W
False Easting (m): 500 000
False Northing (m): 0
Scale Factor at Central Meridian: 0.99960
Units: US Survey Feet

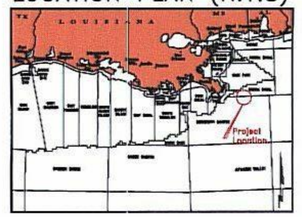
CERTIFIED CORRECT AS TO THE HORIZONTAL POSITION OF THE AS-BUILT PIPELINE BASED ON THE SURVEY METHODS NOTED.

STATE OF TEXAS REGISTERED NATHAN J. EBY 6198 PROFESSIONAL LAND SURVEYOR

10/3/11

NATHAN EBY, R.P.L.S.
TEXAS REG #6198

LOCATION PLAN (N.T.S)



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HELIX SUBSEA CONSTRUCTION

UTEC

7240 BRITTMOORE RD. SUITE 110
HOUSTON, TEXAS 77041
Tel 713-984-8688
Fax 713-984-8683
Website www.utecsurvey.com

RATON SOUTH FIELD DEVELOPMENT PROJECT
AS-BUILT 04 1/2" BLKO WEST PIPELINE
FROM MISSISSIPPI CANYON AREA BLOCK 292
TO VIOSCA KNOLL AREA BLOCK 900
SEGMENT#18177 GULF OF MEXICO

Scale 1 : 1000

1000 0 1000 2000 3000 4000 5000

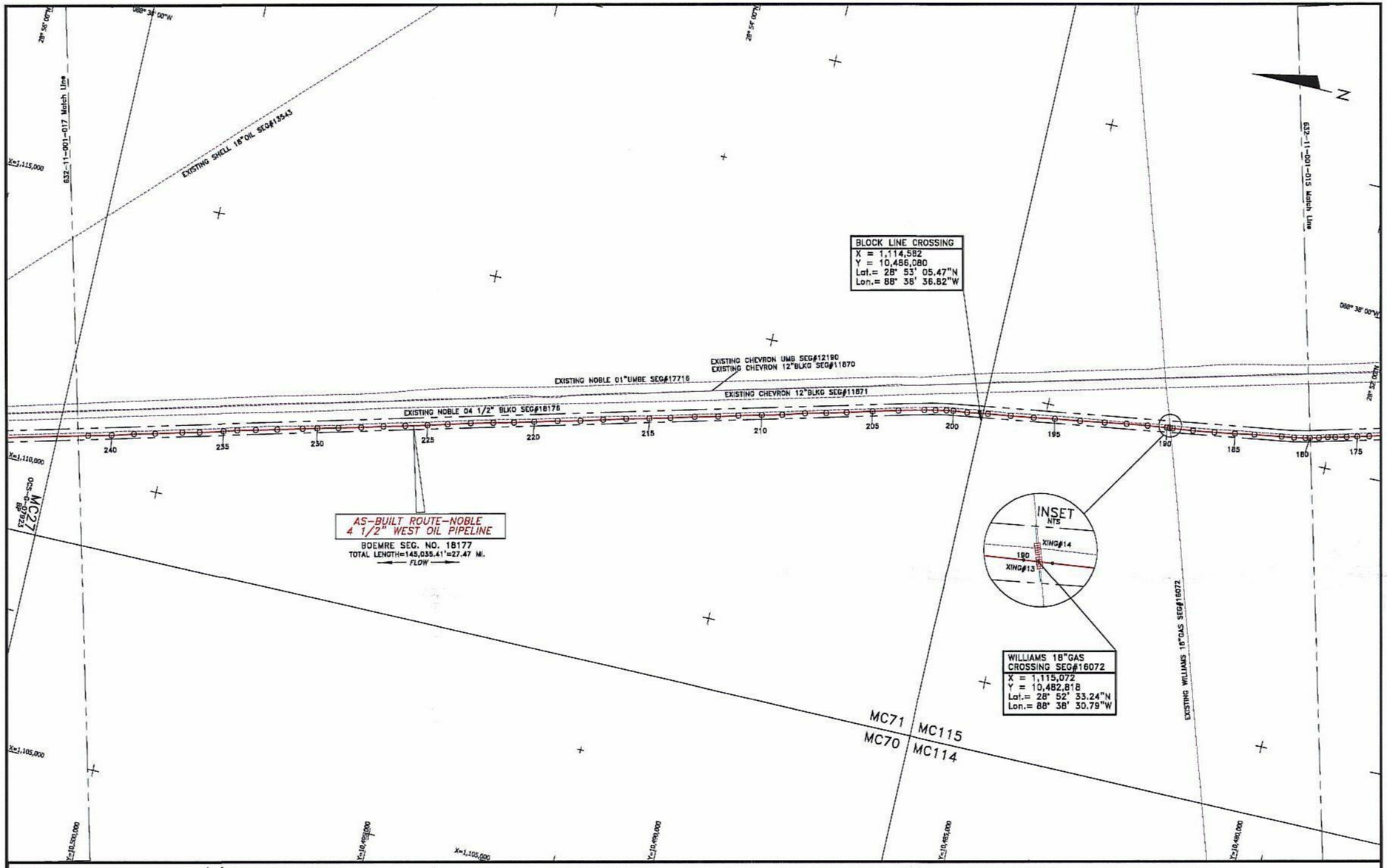
US SURVEY FEET

Rev. No.	Date	Comment	Drawn	Checked	Appr.
0	09/29/11	ISSUED AS FINAL	VR	SW	RG
A2	09/20/11	ISSUED FOR CLIENT COMMENTS	VR	SW	RG
A1	08/24/11	ISSUED FOR CLIENT COMMENTS	VR	SW	SF

Survey Dates: AUG 1st through AUG 8th, 2011 | Survey Vessel: HELIX EXPRESS

UTEC Ref. No. 632C-11-001	UTEC Drawing No. 632C-11-001-015	Sheet 003 Of 007
Plot Size ANSI D		

PLAN VIEW



AS-BUILT NOBLE 4 1/2' WEST OIL PIPELINE SEGMENT# 18177

POINT	X-COORDINATE	Y-COORDINATE	DESCRIPTION
174	1,115,716	10,479,361	FIELD JOINT
175	1,115,665	10,479,564	ROV FIX
176	1,115,615	10,479,744	FIELD JOINT
177	1,115,567	10,479,938	ROV FIX
178	1,115,537	10,480,067	FIELD JOINT
179	1,115,491	10,480,218	FIELD JOINT
180	1,115,451	10,480,371	FIELD JOINT
181	1,115,436	10,480,449	ANODE
182	1,115,398	10,480,646	ROV FIX
183	1,115,366	10,480,862	ROV FIX
184	1,115,294	10,481,337	ROV FIX
185	1,115,232	10,481,677	FIELD JOINT
186	1,115,174	10,482,035	FIELD JOINT
187	1,115,118	10,482,409	FIELD JOINT
188	1,115,078	10,482,768	TOUCHDOWN
189	1,115,072	10,482,818	WILLIAMS 18"GAS CROSSING
190	1,115,067	10,482,870	TOUCHDOWN
191	1,115,026	10,483,208	FIELD JOINT
192	1,114,974	10,483,574	FIELD JOINT
193	1,114,908	10,483,956	FIELD JOINT
194	1,114,837	10,484,366	ANODE
195	1,114,773	10,484,826	ROV FIX
196	1,114,712	10,485,194	FIELD JOINT
197	1,114,653	10,485,594	FIELD JOINT
198	1,114,596	10,485,995	FIELD JOINT
199	1,114,538	10,486,356	FIELD JOINT
200	1,114,510	10,486,598	FIELD JOINT
201	1,114,492	10,486,718	FIELD JOINT
202	1,114,452	10,486,907	FIELD JOINT
203	1,114,413	10,487,100	ROV FIX
204	1,114,296	10,487,548	ROV FIX
205	1,114,181	10,487,991	ROV FIX
206	1,114,060	10,488,430	FIELD JOINT
207	1,113,971	10,488,780	FIELD JOINT
208	1,113,882	10,489,147	FIELD JOINT
209	1,113,767	10,489,530	FIELD JOINT
210	1,113,681	10,489,860	FIELD JOINT
211	1,113,580	10,490,280	FIELD JOINT
212	1,113,484	10,490,626	ROV FIX
213	1,113,389	10,491,027	FIELD JOINT
214	1,113,275	10,491,442	FIELD JOINT
215	1,113,182	10,491,803	FIELD JOINT
216	1,113,084	10,492,198	FIELD JOINT
217	1,112,978	10,492,589	FIELD JOINT
218	1,112,872	10,492,976	FIELD JOINT
219	1,112,776	10,493,367	FIELD JOINT
220	1,112,672	10,493,768	FIELD JOINT
221	1,112,581	10,494,111	FIELD JOINT
222	1,112,495	10,494,466	FIELD JOINT
223	1,112,398	10,494,853	FIELD JOINT
224	1,112,291	10,495,244	FIELD JOINT
225	1,112,197	10,495,592	FIELD JOINT
226	1,112,097	10,495,971	FIELD JOINT
227	1,112,002	10,496,344	FIELD JOINT
228	1,111,898	10,496,724	FIELD JOINT
229	1,111,801	10,497,113	FIELD JOINT
230	1,111,711	10,497,473	FIELD JOINT
231	1,111,648	10,497,722	ANODE
232	1,111,535	10,498,154	FIELD JOINT
233	1,111,441	10,498,523	FIELD JOINT
234	1,111,365	10,498,840	FIELD JOINT
235	1,111,296	10,499,073	FIELD JOINT
236	1,111,188	10,499,483	ROV FIX
237	1,111,118	10,499,780	FIELD JOINT
238	1,110,993	10,500,242	FIELD JOINT
239	1,110,902	10,500,605	FIELD JOINT
240	1,110,792	10,500,986	FIELD JOINT
241	1,110,693	10,501,391	FIELD JOINT

NOTES

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4) AS-BUILT SURVEY DATE: AUGUST 1ST THROUGH AUGUST 8TH, 2011.
5) CLIENT DRAWING REFERENCE: 16172-BASEMAP.DWG AND 24105013ENG.DWG.

LEGEND

- AS-BUILT NOBLE 4 1/2" WEST OIL PIPELINE SEG#18177
- AS-FOUND PIPELINE OR UMBILICAL
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GEODESY

Survey Datum: NAD 27
Ellipsoid: Clarke 1866
Projection: Universal Transverse Mercator ZONE 16N
Longitude of Central Meridian: 87°W
False Easting (m): 500 000
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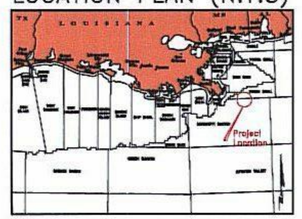
STATE OF TEXAS REGISTERED NATHAN J. EBY 6198 PROFESSIONAL LAND SURVEYOR

10/5/11

NATHAN EBY, R.P.L.S.
TEXAS REG #6198

LOCATION PLAN (N.T.S)



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AS-BUILT 04 1/2" BLKO WEST PIPELINE
FROM MISSISSIPPI CANYON AREA BLOCK 292
TO VIOSCA KNOLL AREA BLOCK 900
SEGMENT#18177 GULF OF MEXICO

Scale 1 : 1000

1000 0 1000 2000 3000 4000 5000

US SURVEY FEET

Rev. No.	Date	Comment	Drawn	Checked	Appr.
0	09/29/11	ISSUED AS FINAL	VR	SW	RG
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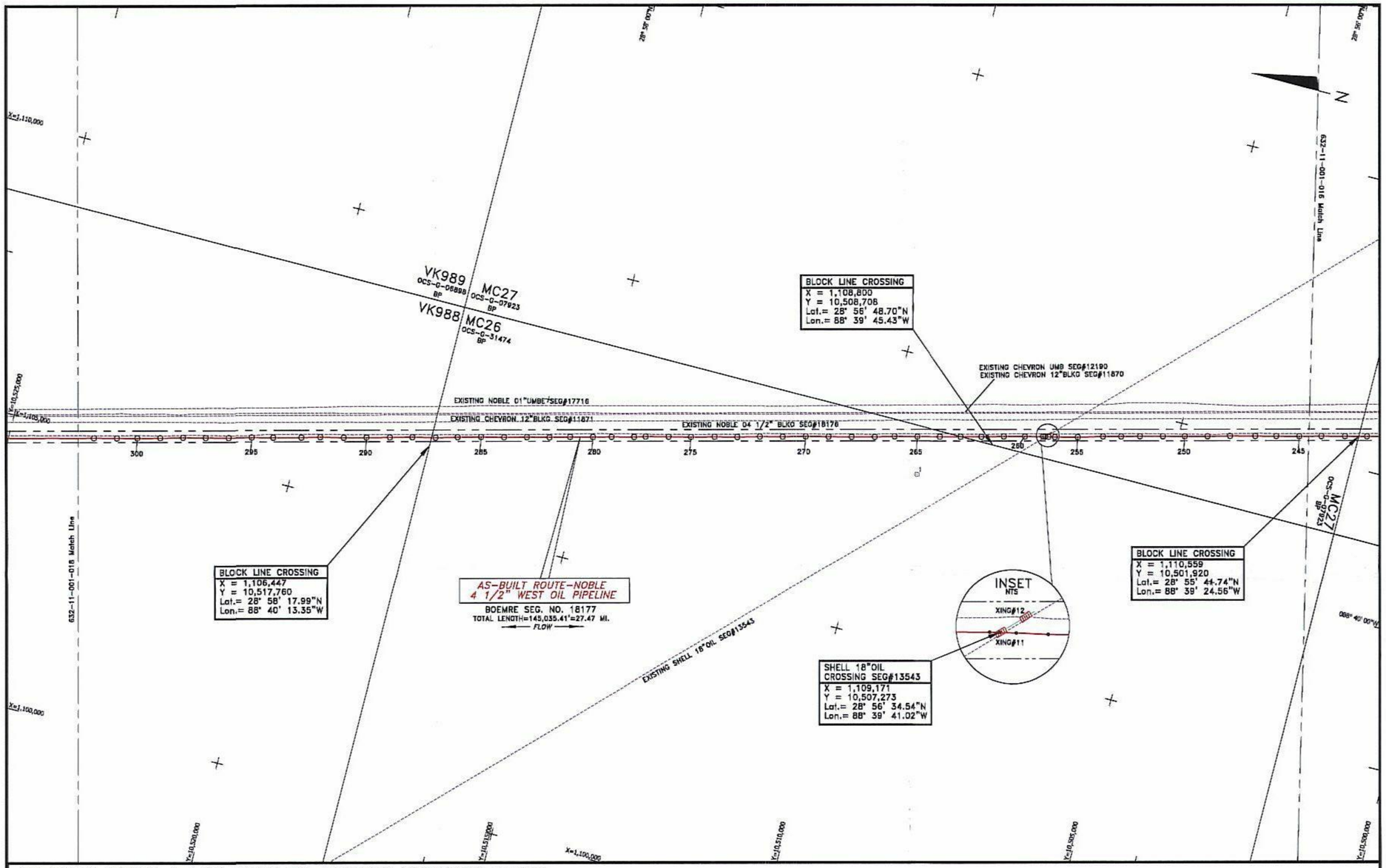
Survey Dates: AUG 1st through AUG 8th, 2011 | Survey Vessel: HELIX EXPRESS

UTEC Ref. No. 632C-11-001	UTEC Drawing No. 632C-11-001-016	Sheet 004 Of 007
Plot Size ANSI D		

PLAN VIEW



AS-BUILT NOBLE 4 1/2' WEST OIL PIPELINE SEGMENT# 18177

POINT	X-COORDINATE	Y-COORDINATE	DESCRIPTION
242	1,110,595	10,501,779	FIELD JOINT
243	1,110,500	10,502,155	FIELD JOINT
244	1,110,398	10,502,558	FIELD JOINT
245	1,110,297	10,502,936	FIELD JOINT
246	1,110,199	10,503,330	FIELD JOINT
247	1,110,108	10,503,690	FIELD JOINT
248	1,109,998	10,504,123	FIELD JOINT
249	1,109,894	10,504,504	FIELD JOINT
250	1,109,793	10,504,892	FIELD JOINT
251	1,109,699	10,505,266	FIELD JOINT
252	1,109,597	10,505,656	FIELD JOINT
253	1,109,510	10,505,977	FIELD JOINT
254	1,109,429	10,506,288	FIELD JOINT
255	1,109,306	10,506,715	FIELD JOINT
256	1,109,207	10,507,106	FIELD JOINT
257	1,109,184	10,507,215	TOUCHDOWN
258	1,109,171	10,507,273	SHELL 18"OIL CROSSING
259	1,109,164	10,507,307	TOUCHDOWN
260	1,109,085	10,507,617	FIELD JOINT
261	1,108,994	10,507,977	FIELD JOINT
262	1,108,890	10,508,360	FIELD JOINT
263	1,108,798	10,508,715	FIELD JOINT
264	1,108,707	10,509,067	FIELD JOINT
265	1,108,606	10,509,455	FIELD JOINT
266	1,108,508	10,509,848	FIELD JOINT
267	1,108,413	10,510,184	FIELD JOINT
268	1,108,310	10,510,581	FIELD JOINT
269	1,108,212	10,510,976	FIELD JOINT
270	1,108,115	10,511,368	FIELD JOINT
271	1,108,009	10,511,759	FIELD JOINT
272	1,107,910	10,512,151	FIELD JOINT
273	1,107,803	10,512,536	FIELD JOINT
274	1,107,708	10,512,924	ANODE
275	1,107,600	10,513,326	FIELD JOINT
276	1,107,505	10,513,710	FIELD JOINT
277	1,107,408	10,514,103	FIELD JOINT
278	1,107,351	10,514,298	FIELD JOINT
279	1,107,253	10,514,684	ROV FIX
280	1,107,166	10,515,002	FIELD JOINT
281	1,107,068	10,515,391	FIELD JOINT
282	1,106,971	10,515,743	FIELD JOINT
283	1,106,874	10,516,129	FIELD JOINT
284	1,106,773	10,516,517	FIELD JOINT
285	1,106,675	10,516,913	FIELD JOINT
286	1,106,570	10,517,313	FIELD JOINT
287	1,106,464	10,517,689	FIELD JOINT
288	1,106,369	10,518,090	FIELD JOINT
289	1,106,269	10,518,472	ROV FIX
290	1,106,162	10,518,873	FIELD JOINT
291	1,106,059	10,519,262	FIELD JOINT
292	1,105,967	10,519,661	FIELD JOINT
293	1,105,876	10,519,983	ROV FIX
294	1,105,751	10,520,465	FIELD JOINT
295	1,105,660	10,520,832	FIELD JOINT
296	1,105,555	10,521,224	FIELD JOINT
297	1,105,455	10,521,619	FIELD JOINT
298	1,105,360	10,522,006	FIELD JOINT
299	1,105,252	10,522,396	FIELD JOINT
300	1,105,147	10,522,788	FIELD JOINT
301	1,105,057	10,523,139	FIELD JOINT
302	1,104,958	10,523,533	ROV FIX
303	1,104,854	10,523,923	FIELD JOINT
304	1,104,777	10,524,238	FIELD JOINT
305	1,104,662	10,524,662	FIELD JOINT
306	1,104,563	10,525,059	FIELD JOINT
307	1,104,463	10,525,449	FIELD JOINT

NOTES

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5) CLIENT DRAWING REFERENCE: 16172-BASEMAP.DWG AND 24105013ENG.DWG.

LEGEND

- AS-BUILT NOBLE 4 1/2" WEST OIL PIPELINE SEG#18177
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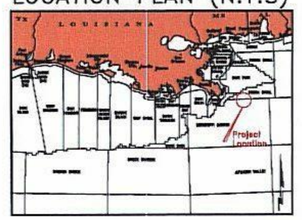
STATE OF TEXAS REGISTERED NATHAN J. EBY 6198 PROFESSIONAL LAND SURVEYOR

10/3/11

NATHAN EBY, R.P.L.S.
TEXAS REG #6198

LOCATION PLAN (N.T.S)



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SEGMENT#18177 GULF OF MEXICO

Scale 1 : 1000

1000 0 1000 2000 3000 4000 5000

US SURVEY FEET

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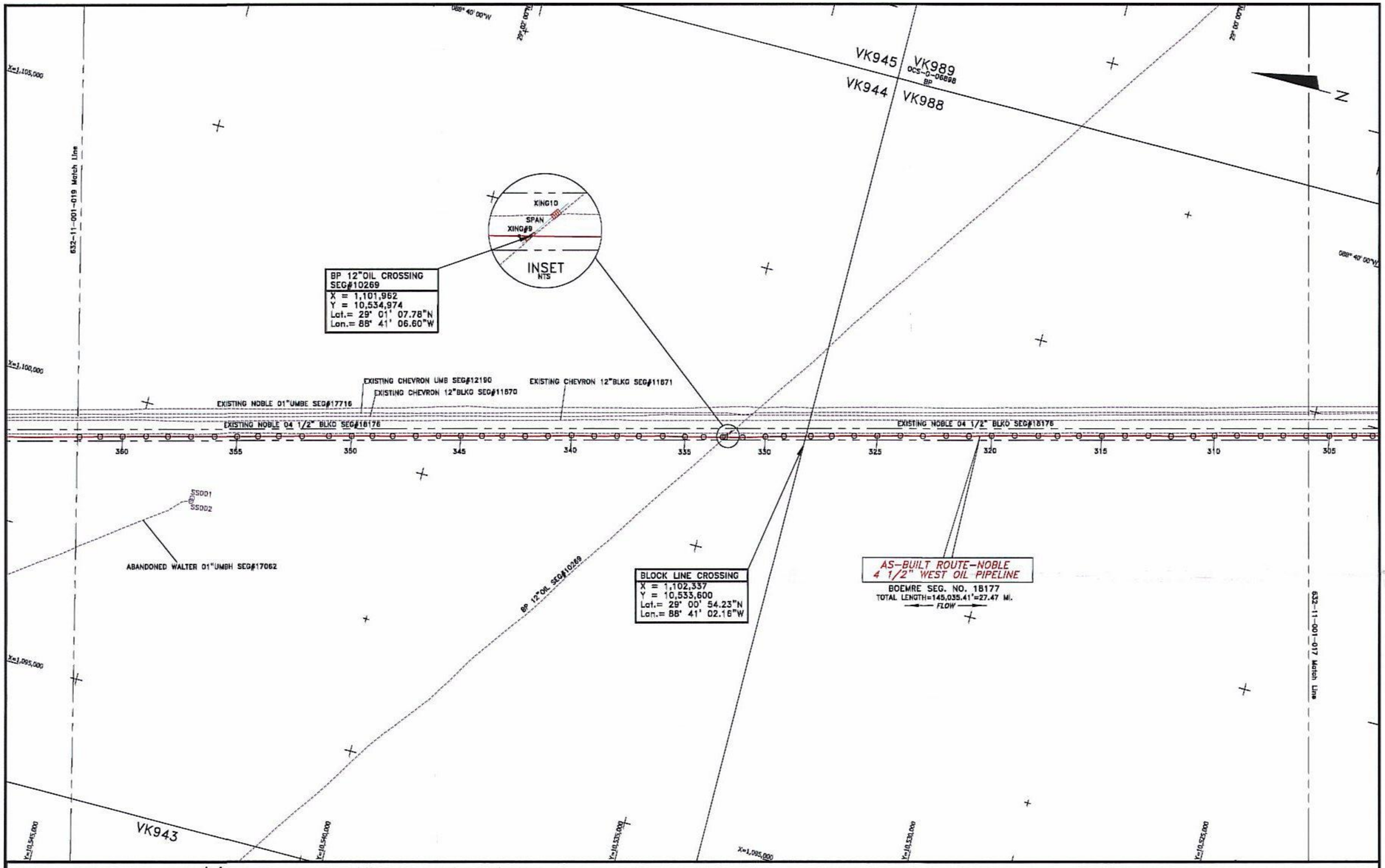
Survey Dates: AUG 1st through AUG 8th, 2011 | Survey Vessel: HELIX EXPRESS

UTEC Ref. No. 632C-11-001 | UTEC Drawing No. 632C-11-001-017 | Sheet 005 Of 007

Plot Size ANSI D

PLAN VIEW



AS-BUILT NOBLE 4 1/2' WEST OIL PIPELINE SEGMENT# 18177

POINT	X-COORDINATE	Y-COORDINATE	DESCRIPTION	POINT	X-COORDINATE	Y-COORDINATE	DESCRIPTION	POINT	X-COORDINATE	Y-COORDINATE	DESCRIPTION
303	1,104,854	10,523,923	FIELD JOINT	328	1,102,359	10,533,514	FIELD JOINT	353	1,100,008	10,542,605	FIELD JOINT
304	1,104,777	10,524,238	FIELD JOINT	329	1,102,240	10,533,973	FIELD JOINT	354	1,099,916	10,542,959	FIELD JOINT
305	1,104,662	10,524,662	FIELD JOINT	330	1,102,150	10,534,288	ROV FIX	355	1,099,821	10,543,314	FIELD JOINT
306	1,104,563	10,525,059	FIELD JOINT	331	1,102,037	10,534,671	FIELD JOINT	356	1,099,725	10,543,703	FIELD JOINT
307	1,104,463	10,525,449	FIELD JOINT	332	1,101,952	10,534,974	BP 12"OIL CROSSING	357	1,099,620	10,544,106	FIELD JOINT
308	1,104,358	10,525,835	FIELD JOINT	333	1,101,953	10,535,013	ANODE	358	1,099,519	10,544,497	FIELD JOINT
309	1,104,259	10,526,239	FIELD JOINT	334	1,101,872	10,535,341	FIELD JOINT	359	1,099,428	10,544,876	FIELD JOINT
310	1,104,158	10,526,623	FIELD JOINT	335	1,101,792	10,535,658	FIELD JOINT	360	1,099,318	10,545,276	FIELD JOINT
311	1,104,059	10,526,984	FIELD JOINT	336	1,101,707	10,536,044	FIELD JOINT	361	1,099,218	10,545,662	FIELD JOINT
312	1,103,955	10,527,363	FIELD JOINT	337	1,101,600	10,536,450	FIELD JOINT	362	1,099,122	10,546,013	FIELD JOINT
313	1,103,867	10,527,754	FIELD JOINT	338	1,101,507	10,536,825	FIELD JOINT				
314	1,103,760	10,528,149	FIELD JOINT	339	1,101,403	10,537,215	FIELD JOINT				
315	1,103,656	10,528,544	FIELD JOINT	340	1,101,315	10,537,604	FIELD JOINT				
316	1,103,556	10,528,934	FIELD JOINT	341	1,101,200	10,538,001	FIELD JOINT				
317	1,103,459	10,529,299	FIELD JOINT	342	1,101,097	10,538,393	FIELD JOINT				
318	1,103,376	10,529,629	FIELD JOINT	343	1,101,001	10,538,767	ROV FIX				
319	1,103,277	10,530,030	FIELD JOINT	344	1,100,908	10,539,133	FIELD JOINT				
320	1,103,172	10,530,421	FIELD JOINT	345	1,100,817	10,539,495	FIELD JOINT				
321	1,103,066	10,530,807	FIELD JOINT	346	1,100,718	10,539,878	FIELD JOINT				
322	1,102,971	10,531,200	FIELD JOINT	347	1,100,614	10,540,269	FIELD JOINT				
323	1,102,863	10,531,595	FIELD JOINT	348	1,100,512	10,540,662	FIELD JOINT				
324	1,102,766	10,531,985	FIELD JOINT	349	1,100,426	10,541,009	FIELD JOINT				
325	1,102,660	10,532,378	FIELD JOINT	350	1,100,332	10,541,361	FIELD JOINT				
326	1,102,559	10,532,773	FIELD JOINT	351	1,100,233	10,541,750	ROV FIX				
327	1,102,454	10,533,155	FIELD JOINT	352	1,100,112	10,542,210	FIELD JOINT				

NOTES

1) PIPELINE COORDINATES ARE THE POSITIONS OF THE R.O.V. (REMOTELY OPERATED VEHICLE) LOCATED AT THE POINTS USING BOTH VERIPOS LD2 ULTRA DGPS RECEIVING SPOTBEAM CORRECTIONS, VERIPOS ULTRA DGPS RECEIVING INMARSAT CORRECTIONS, SONARDYNE FUSION LBL (LONG BASELINE) ACOUSTIC POSITIONING, KONGSBERG HIPAP USBL(ULTRA SHORT BASELINE) ACOUSTIC POSITIONING AND RDI WORKHORSE DVL POSITIONING.
2) SURVEYED COORDINATES TRANSFORMED FROM NAD83 (GPS DATUM) NADCON VERSION 2.1.
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4) AS-BUILT SURVEY DATE: AUGUST 1ST THROUGH AUGUST 8TH, 2011.
5) CLIENT DRAWING REFERENCE: 18172-BASEMAP.DWG AND 24105013ENG.DWG.

LEGEND

- AS-BUILT NOBLE 4 1/2" WEST OIL PIPELINE SEG#18177
- AS-FOUND PIPELINE OR UMBILICAL
- RIGHT-OF-WAY (PROVIDED BY CLIENT)
- BOEMRE EXISTING PIPELINES/UMBILICALS/FLYING LEADS/JUMPERS
- AS-INSTALLED HFL
- AS-INSTALLED EFL
- BOEMRE PROPOSED PIPELINES/UMBILICALS/FLYING LEADS/JUMPERS
- MC292 — BOEMRE LEASE BLOCK BOUNDARIES
- MATCHLINE WITH ADJOINING CHART
- PROPOSED STRUCTURES
- EXISTING STRUCTURES
- GEOGRAPHICAL TICKS
- UTM TICKS
- BOEMRE WELLS

GEODESY

Survey Datum: NAD 27
Ellipsoid: Clarke 1866
Projection: Universal Transverse Mercator ZONE 15N
Longitude of Central Meridian: 87°W
False Easting (m): 500 000
False Northing (m): 0
Scale Factor at Central Meridian: 0.99960
Units: US Survey Feet

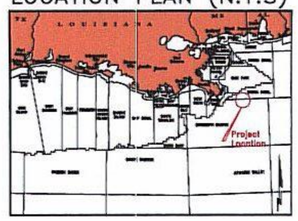
CERTIFIED CORRECT AS TO THE HORIZONTAL POSITION OF THE AS-BUILT PIPELINE BASED ON THE SURVEY METHODS NOTED.

STATE OF TEXAS REGISTERED NATHAN J. EBY 6198 PROFESSIONAL LAND SURVEYOR

10/3/11

NATHAN EBY, R.P.L.S.
TEXAS REG #6198

LOCATION PLAN (N.T.S)



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HELIX SUBSEA CONSTRUCTION

UTEC

7240 BRITTMOORE RD. SUITE 110
HOUSTON, TEXAS 77041
Tel 713-984-8698
Fax 713-984-8683
Website www.utecsurvey.com

RATON SOUTH FIELD DEVELOPMENT PROJECT
AS-BUILT 04 1/2" BLKO WEST PIPELINE
FROM MISSISSIPPI CANYON AREA BLOCK 292
TO VIOSCA KNOLL AREA BLOCK 900
SEGMENT#18177 GULF OF MEXICO

Scale 1 : 1000

1000 0 1000 2000 3000 4000 5000

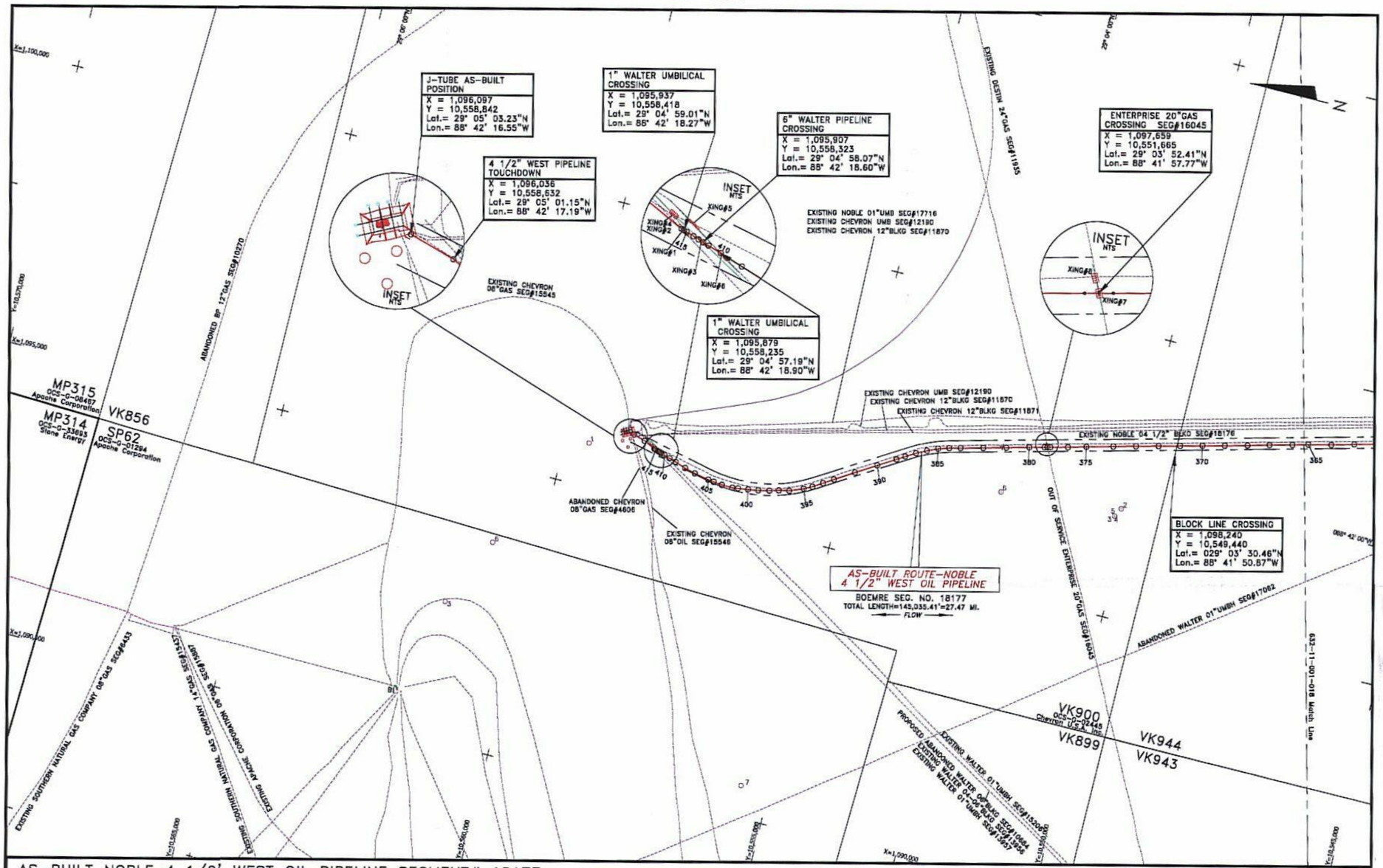
US SURVEY FEET

Rev. No.	Date	Comment	Drawn	Checked	Appr.
0	09/29/11	ISSUED AS FINAL	VR	SW	RG
A2	09/20/11	ISSUED FOR CLIENT COMMENTS	VR	SW	RG
A1	08/24/11	ISSUED FOR CLIENT COMMENTS	VR	SW	SF

Survey Dates: AUG 1st through AUG 8th, 2011 | Survey Vessel: HELIX EXPRESS

UTEC Ref. No. 632C-11-001	UTEC Drawing No. 632C-11-001-018	Sheet 006 Of 007
Plot Size ANSI D		

PLAN VIEW



AS-BUILT NOBLE 4 1/2' WEST OIL PIPELINE SEGMENT# 18177

POINT	X-COORDINATE	Y-COORDINATE	DESCRIPTION
363	1,099,023	10,546,397	FIELD JOINT
364	1,098,917	10,546,790	FIELD JOINT
365	1,098,822	10,547,187	ANODE
366	1,098,749	10,547,459	FIELD JOINT
367	1,098,650	10,547,854	FIELD JOINT
368	1,098,546	10,548,229	FIELD JOINT
369	1,098,446	10,548,620	FIELD JOINT
370	1,098,349	10,549,004	FIELD JOINT
371	1,098,254	10,549,388	ANODE
372	1,098,156	10,549,757	FIELD JOINT
373	1,098,057	10,550,146	FIELD JOINT
374	1,097,955	10,550,534	FIELD JOINT
375	1,097,834	10,550,997	FIELD JOINT
376	1,097,748	10,551,312	FIELD JOINT
377	1,097,672	10,551,615	TOUCHDOWN
378	1,097,659	10,551,665	ENTERPRISE 20"GAS CROSSING
379	1,097,647	10,551,714	TOUCHDOWN
380	1,097,582	10,551,975	FIELD JOINT
381	1,097,476	10,552,368	FIELD JOINT
382	1,097,373	10,552,763	FIELD JOINT
383	1,097,274	10,553,154	FIELD JOINT
384	1,097,225	10,553,349	FIELD JOINT
385	1,097,167	10,553,557	FIELD JOINT
386	1,097,086	10,553,720	FIELD JOINT
387	1,096,992	10,553,903	FIELD JOINT
388	1,096,890	10,554,078	FIELD JOINT
389	1,096,803	10,554,216	FIELD JOINT
390	1,096,616	10,554,519	FIELD JOINT
391	1,096,399	10,554,874	FIELD JOINT
392	1,096,189	10,555,208	FIELD JOINT
393	1,096,079	10,555,380	FIELD JOINT
394	1,095,973	10,555,548	FIELD JOINT
395	1,095,902	10,555,690	ROV FIX
396	1,095,806	10,555,930	ROV FIX
397	1,095,766	10,556,111	FIELD JOINT
398	1,095,724	10,556,271	FIELD JOINT
399	1,095,679	10,556,464	FIELD JOINT
400	1,095,648	10,556,642	ROV FIX
401	1,095,627	10,556,820	FIELD JOINT
402	1,095,613	10,556,922	FIELD JOINT
403	1,095,616	10,557,115	FIELD JOINT
404	1,095,632	10,557,270	FIELD JOINT
405	1,095,645	10,557,373	FIELD JOINT
406	1,095,694	10,557,631	FIELD JOINT
407	1,095,744	10,557,821	FIELD JOINT
408	1,095,807	10,558,010	FIELD JOINT
409	1,095,845	10,558,129	FIELD JOINT
410	1,095,879	10,558,235	1" WALTER UMBILICAL CROSSING
411	1,095,886	10,558,295	TOUCHDOWN
412	1,095,907	10,558,323	6" WALTER PIPELINE CROSSING

POINT	X-COORDINATE	Y-COORDINATE	DESCRIPTION
413	1,095,914	10,558,345	ROV FIX
414	1,095,922	10,558,370	TOUCHDOWN
415	1,095,933	10,558,404	TOUCHDOWN
416	1,095,937	10,558,418	1" WALTER UMBILICAL CROSSING
417	1,095,941	10,558,429	ROV FIX
418	1,096,036	10,558,632	TOUCHDOWN
419	1,096,097	10,558,842	J-TUBE AS-BUILT POSITION

LENGTH OF SURVEY POINTS 1 THROUGH 419:
145,035' = 27.47 MILES

NOTES

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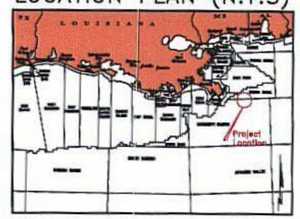
NATHAN EBY, R.P.L.S.
TEXAS REG #6198
10/3/11

LOCATION PLAN (N.T.S)



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AS-BUILT 04 1/2" BLKO WEST PIPELINE
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SEGMENT#18177 GULF OF MEXICO

Scale 1 : 1000

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Survey Dates: AUG 1st through AUG 8th, 2011 | Survey Vessel: HELIX EXPRESS

UTEC Ref. No. 632C-11-001	UTEC Drawing No. 632C-11-001-019	Sheet 007 Of 007
Plot Size ANSI D		