Oil & Natural Gas Technology

DOE Award No.: DE-FE0023919

Quarterly Research Performance Progress Report (Period Ending 03/31/2016)

Deepwater Methane Hydrate Characterization and Scientific Assessment

Project Period 10/01/2014 – 09/30/2020

Submitted by:
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Signature

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Office of Fossil Energy

1. ACCOMPLISHMENTS:

A. What are the major goals of the project?

The goals of this project are to plan and execute a state of the art field program in the Gulf of Mexico to characterize methane hydrates. The project team will acquire conventional core, pressure core, and downhole logs, and perform in situ testing and measure physical properties in methane hydrate reservoirs in the Gulf of Mexico (GOM) to meet this goal.

Previous Phase Milestones

Milestone Description	Status
M1A: Project Management Plan	Complete: 03/18/2015
M1B: Project Kick-off Meeting	Complete: 12/11/2014
M1C: Site Location and Ranking Report	Complete: 9/30/2015
M1D: Preliminary Field Program Operational Plan Report	Complete: 9/30/2015
M1E: Updated CPP Proposal Submitted	Complete: 10/1/2015
M1F: Demonstration of a viable PCS Tool	Complete: 9/30/2015

Table 1: Milestones BP1

Current Phase Milestones

Milestone Description	Status	Verification Method	Comments
M1G: Document results of BP1/Phase 1 Activities	Submitted	Phase 1 Report	
M2A: Complete Updated CPP Proposal Submitted	Complete: Nov 2015 (BP3, Q1)	Quarterly Report	Update given in Y2Q1 report
M2B: Scheduling of Hydrate Drilling Leg by IODP	Delayed, new expected date: May 2017 (BP2, Q7)	report status immediately to DOE PM	Delay has no expected impact on schedule of field program
M2C: Demonstration of a viable PCS tool for hydrate drilling through completion of land-based testing	Complete: Dec 2015 (BP2, Q5)	PCTB Land Test Report, in Quarterly Report	Update given in Y2Q1 report
M2D: Demonstration of a viable PCS tool for hydrate drilling through completion of a deepwater marine field test	Edited planned date: May 2017 (BP2, Q7)	Marine Field Test Report, in Quarterly Report	Date to be set in next quarter
M2E: Complete Refined Field Program Operation Plan	Planned Sept 2017 (BP2, Q8)	Quarterly Report	

Table 2: Milestones BP2

Future Phase Milestones

Milestone Description	**Planned Completion**	**Verification Method**
M2F: Document results of BP2/Phase 2 Activities	12/29/2017 (BP3A, Q1)	Phase 2 Report
M3A: Field Program Operational Plan report	12/18/2018 (BP3A, Q5)	Quarterly Report
M3B: Completion of Field Program Permit	12/9/2018 (BP3A, Q5)	Quarterly Report
M3C: Completion of Hazards Analysis	10/9/2018 (BP3A, Q5)	Field Program Hazards Report, in Quarterly Report
M3D: Demonstration of a viable PCS tool for hydrate drilling through completion of field operations	4/4/2019 (BP3A, Q7)	Quarterly Report
M3E: Complete IODP Preliminary Expedition Report	6/27/2019 (BP3A, Q7)	Send directly to DOE PM
M3F: Complete Project Sample and Data Distribution Plan	8/8/2019 (BP3A, Q8)	Send directly to DOE PM
M3G: Initiate Expedition Scientific Results Volume	4/3/2020 (BP3B, Q3)	Send directly to DOE PM
M3H:Complete IODP Proceedings Expedition Volume	8/24/2020 (BP3B, Q4)	Send directly to DOE PM

Table 3: Milestones BP3A, and BP3B

B. What was accomplished under these goals?

PREVIOUS – BUDGET PERIOD 1:

Task	**Status**	**Quarterly Report with Task Information**
Task 2.0 Site Analysis and Selection	Complete	Y1Q1, Y1Q2, Y1Q3, Y1Q4
Task 3.0 Develop Pre-Expedition Drilling/Logging/Coring/Sampling Operational Plan	Complete	Y1Q3, Y1Q4
Task 4.0 Complete and Update IODP CPP Proposal	Complete	Y1Q2, Y1Q3, Y1Q4
Task 5.0 Pressure Coring and Core Analysis System Modification and Testing	Complete	Y1Q2, Y1Q3, Y1Q4

CURRENT - BUDGET PERIOD 2:

Task 1.0 Project Management and Planning

Status: On Schedule

Objectives and Achievements

Objective 1: Assemble teams according to project needs.

- No new hires this period

Objective 2: Coordinate the overall scientific progress, administration and finances of the project

- Managed current tasks see details in tasks below
- Monitored costs

Objective 3: Communicate with project team and sponsors

- Organized regular team meetings
- Managed SharePoint sites, email list, and archive/website

Objective 4: Coordinate and supervise all subcontractors and service agreements to realize deliverables and milestones according to the work plan

- Actively managed subcontractors and service agreements.

Objective 5: Compare identified risks with project risks to ensure all risks are identified and monitored. Communicate risks and possible outcomes to project team and stakeholders.

- Actively monitored project risks and as needed reported to project team and stakeholders.

Task 6.0: Technical and Operational Support of Complimentary Project Proposal (CPP)

Status: On Schedule

Apr 1, 2015:	First Submittal of CPP
May 1, 2015:	Upload data to IODP SSDB
Oct 1, 2015:	Revised Submittal of CPP
Jan 8, 2016:	Upload data to IODP SSDB
Jan 12-14, 2016:	SEP Review Meeting
Apr 1, 2016:	CPP Addendum Submittal
May 2, 2016:	Upload data to IODP SSDB
May 13, 2016:	Proponent Response Letter
Jun 21-23, 2016:	SEP Review Meeting
May 2017:	Scheduling of Hydrate Drilling Leg by IODP (JR Facility Board Meeting)
Spring 2019:	IODP Expedition

Table 4: Timing of Complimentary Project Proposal submission

Activity this period:

1. Data Analysis
    a. Mapped new horizons in the extend Orca dataset, and selected six new drilling sites in the Orca Basin.
    b. Research efforts involved completion of reprocessing of USGS 2D seismic lines near GC and WR sites.
    c. Selected 2 new drilling sites at Mad Dog, mapped two existing drilling targets in Exploration Dataset to compare previous maps generated from WAZ Dataset, identified and mapped possible third drilling target at Mad Dog in Exploration Dataset, and began tying well log data from three nearby wells to seismic traces.

    d. At Terrebonne, selected four new alternate drill sites. Created a depositional model of the Terrebonne basin to explain the occurrence of reservoir quality channelized sands. Created a synthetic seismic trace of WR313-G and WR313-H and correlated the traces to the actual seismic data. Created a 1D synthetic seismic model of the orange unit across the base of hydrate stability. Mapped the top of the blue unit.
    e. At Sigsbee, completed a remapping of the target horizon and selected three sites for the marine test.
2. SEP Review Meeting (Jan 2016)
    a. Laptop with 3D seismic data was shipped to the SEPs meeting at Scripps.
3. CPP Reviews Received
    a. Reviews were generally positive and proposal was advanced to 'External Review'
    b. Web conference held Feb 25 to begin CPP Addendum
4. CPP Addendum
    a. Developed revised objectives and technical plans with project team members. Considered potential changes in scientific goals, additional/revised site locations, target depths, and measurement plans for the IODP---CPP drilling campaign. Prepared revised text and figures for the IODP---CPP Addendum 1 to be submitted to IODP by 1 April 2016.

Task 7.0: Continued Pressure Coring and Core Analysis System Modifications and Testing

Status: On Schedule

Subtask 7.1: Review and Complete NEPA Requirements (PCTB Land Test)

Status: Complete Submitted and received approval for PCTB Land Test NEPA Requirements Y2Q1.

Subtask 7.2: Pressure Coring Tool with Ball (PCTB) Land Test

Status: Complete see Y2Q1 report (Flemings, 2016)

Subtask 7.3: PCTB Land Test Report

Status: Complete reported in
Submitted GOM^2 PRESSURE CORING TOOL WITH BALL VALVE (PCTB) LAND TEST INITIAL REPORT in Y2 Q1 report (Flemings, 2016)

See Appendix A: GEOTEK CORING, HYBRID PRESSURE CORING TOOL WITH BALL VALVE (PCTB) 2015 LAND TEST PROGRAM

Subtask 7.4: PCTB Tool Modification

Status: On Schedule

The PCTB Tool Modification team continued to refine modification goals and reviewed proposed modifications to the PCTB. The following outlines the team study outcomes and path forward in preparation for the marine test.

1. Flow rate v. pressure drop
    a. During the land test, the increased bit Total Flow Area (TFA) showed no marked difference in the flow rates v. pressure drop. This suggests overriding pressure drop occurs higher up in the Outer Core Barrel assembly (OCB) before the circulating fluid gets to the bit.
    b. To further study this issue a flow test will be performed during the marine test to measure the pressure drops at several strategic points within the OCB and PCTB using fish pills.
    c. The recommendation is to move forward with the following:
        i. Explore interchangeable nozzles for bit to optimize jetting and cleansing action.
        ii. Perform an additional vertical flow test using fish pills to characterize pressure drop through OCB and PCTB.
2. PCTB internal closure stroke space out issue resulting in observed late boost
    a. Reviewed test results from land test to determine what was and was not related to late boost. Reviewed DST data and clarified which tests had late boost issues or slow boost/human error. Determined that 1 of the 4 closure tests had a late boost, and 1 of the 8 coring tests had a late boost. In 5 of the 8 coring tests, the timing of the boost is uncertain due to the failed closure of the ball valve or failure of the DST
    b. Reviewed PCTB internal space out and determined there is a closure stroke timing issue that could result in a late boost occurring as well as release of the PCTB from the OCB prior to the ball valve closing completely.
    c. PCTB design was modified to eliminate the closure stroke timing issue.
    d. The recommendation is to move forward with the following:
        i. Fabricate new parts to modify the PCTB. These modifications are intended to eliminate the internal closure stroke timing issue.
        ii. Set up bench test in Salt Lake City, Utah. This test will determine force required to drive autoclave seal sub into the seal sleeve (autoclave upper seal mechanism) using multiple seal sub seal and seal sleeve configurations. This test will use only the seal sub and seal sleeve, not the complete PCTB assembly, to determine the optimum seal sub seal and seal sleeve configurations.
        iii. Set up vertical full function pressure test in SLC, Utah (using actual PCTB pressure autoclave sections) to verify proper mechanical function of modified parts.
        iv. Set up horizontal latch in test using complete OCB and PCTB assemblies to verify proper mechanical function during latch in and release.
3. The team continued to review options and come up with a solution to eliminate issue of delayed pressure boost.
    a. Main bit diameter to core diameter ratio
        i. We determined core quality/quantity is improved the smaller the main bit diameter is to core diameter ratio. The original PCTB system was designed for a 10-5/8 bit. The smallest bit that can be used with the existing PCTB is 9-7/8. By going to a 9-7/8 bit, the annular velocity passed the drill collars is increased by ~60%, which will improve hole cleaning.
    b. Cutting shoe extension

        i. Based on the face bit configuration results from the land test, it is now believed that spacing out the cutting shoe to near flush may produce the best core recovery. Extending the cutting shoe further ahead of the main bit is still an option, however our recommendation for the marine test is to deploy the PCTB with the cutting shoe spaced out near flush to the main bit.
    c. Number and placement of stabilizers
        i. Discussions regarding the number and placement of stabilizers in the Bottom Hole Assembly (BHA) resulted in the plan to deploy 2 stabilizers, in conjunction with the stabilized bit sub, during the marine test. One stabilizer will be place immediately on top of the OCB and the other stabilizer will be placed onto of the drill collar string.
        ii. This will require purchasing additional stabilizers for the marine test.
    d. Core catcher configuration and combinations
        i. The current stable of catchers include basket, wedge and flapper types adequate for the marine test. No modifications are recommended.
    e. Main bit configuration, tapered, piloted, etc.
        i. After extensive discussions, the decision was made to continue with the conventional bit shape. We will continue to explore changing the location of the jets and adding interchangeable nozzles to improve bit and hole cleaning.
    f. Composition of drilling fluids
        i. After discussions and reviews, it was determined that a cost effective and environmentally friendly magic pill probably does not exist. It was decided that properly sized filtrates should be used for soft core. This exists and could either be run throughout or at specific intervals within the hole.
        ii. It is important in preparations for the marine test that we work closely with the vessel vendor mud engineer to design a proper mud program for the marine test and explore using “sized filtrates.”
    g. Bumper subs
        i. After discussing the use of bumper subs, the decision was made to drop them from further consideration for the following reasons.
            1. Bumper subs are expensive to purchase and maintain.
            2. Bumper subs make for a weak point in the BHA.
            3. Bumper subs cannot be used in conjunction with a heave compensator.
            4. Off-the-shelf bumper subs with a 4-1/4 bore do not exist.
4. Other modifications/upgrades
    a. To reduce contamination, the use of bottom up circulation before running the wireline was discussed. Time permitting, this technique will be employed during the marine test.
    b. If core liner collapse is an issue, the option is to strengthen the lower part of the core liner (below the inner tube) with aluminum or steel and coordinate engineering with PCATS. However the current belief is the high pressure drop that previously collapsed the core liner was generated near the top of the PCTB and migrated down inside the tool to the liner. To prevent this from occurring the following design modification has been undertaken. Incorporate improved sealing to prevent a high pressure drop from being applied to the core

liner and to prevent the introduction of detritus inside the tool which may prevent the ball valve from closing. The PCTB design has been modified to add seals to some of the internal components as well as eliminating the long open slot in the middle barrel.

c. The question of modifying the flapper valve came about due to the chance the ball valve housing may hang up on the flapper valve while retrieving the tool. After discussion, it was decided the best path is to add a lead in chamfer to the ball valve housing, in lieu of modifying the flapper. This should prevent any future hang ups.

Task 8.0: Pressure Coring Tool with Ball (PCTB) Marine Field Test

Status: On Schedule
Target dates: March 2017 – May 2017

Activity this period:

Subtask 8.1: Review and Complete NEPA Requirements

Status: On Schedule
Began process of collecting information for NEPA paperwork.

Subtask 8.2: Marine Field Test Detailed Drilling / Logging / Coring / Sampling Operational Plan

Status: On schedule
Evaluated proposals for vessel selection for marine test.

- Met with vessel contractors to clarify proposals and request additional information.
- Compared proposed-vessel specifications to project requirements.
- Prepared preliminary commercial comparison.
- Developed scorecard for comparing vessel contractors in the areas of technical capability, efficiency, cost control, and overall ability to deliver the project.

Prepared draft drilling & coring operational plan.

Subtask 8.3: Marine Field Test Documentation and Permitting

Status: On schedule
Created Marine Test Permitting Team.
Reviewed BOEM & BSEE permitting requirements.
Begin preparation of BOEM-0327 Application for Permit to Conduct Scientific Research on the OCS.
Prepared preliminary maps required for BOEM-0327.

Decision Point 2: Marine Field Test Stage Gate

Subtask 8.4: Marine Field Test of Pressure Coring System

Status: Future Task

Subtask 8.5: Marine Field Test Report

Status: Future Task

Task 9.0: Pressure Core Transport, Storage, and Manipulation

Status: On Schedule

Subtask 9.1: Review and Complete NEPA Requirements (Core Storage and Manipulation)

Status: Complete Submitted and received approval for NEPA Requirements Y2Q2.

Subtask 9.2: Hydrate Core Transport

Status: Future Task

Established a contract for the transport of ten 1.2 m long cores, acquired during the Marine Field Test, using overpacks and a reefer truck that meet required U.S. regulations to allow for transport. The cores will be brought to U.T. for subsequent analysis.

Subtask 9.3: Storage of Hydrate Pressure Cores

Status: Future Task

Subtask 9.4: Refrigerated Container for Storage of Hydrate Pressure Cores

Status: On Schedule

Worked with U.T. Facilities, Architects including MEP and Environmental Chamber experts, and Lab Staff to establish a 95% design plan for the design and location of the container. The walk-in container will be capable of storing, moving, and monitoring the pressure cores. Storage capability includes the ability to maintain conditions necessary to keep twenty 1.2 m pressure cores for the duration of the project.

Subtask 9.5 – 9.7: Hydrate Core Manipulator and Cutter Tool, Hydrate Core Effective Stress Chamber, Hydrate Core Depressurization Chamber

Status: On Schedule

Purchase Order signed for the design, build, and installation of a Pressure Core Manipulator and Cutting Tool, a Hydrate Core Effective Stress Chamber, and a Depressurization Chamber.

1. Pressure Core Manipulator and Cutting Tool
    a. This is a smaller version (length-wise) of the Geotek PCATS. I will handle up to 1.2 m core and is compatible with PCTB processed cores and any PCATS compatible equipment
2. Hydrate Core Effective Stress Chamber
    a. This chamber will couple with the Manipulator and Cutting Tool to receive samples cut from the storage 1.2 m core.
    b. The chamber will be capable of measuring effective stress, permeability, and extracting liquids for pore fluid analysis.
3. Depressurization Chamber

a. The chamber will analyze up to 30 cm length pressure core and will include a high pressure gas manifold and gas sampling equipment

Task 10.0 Pressure Core Analysis

Status: On Schedule
Continued planning for acquisition of pressure cores and petrophysical and seismic data integration efforts for the PCTB Marine Field Test. We envision the establishment of a technical advisory council to provide guidance on the analysis and distribution of routine and pressure cores.

Subtask 10.1: Routine Core Analysis

Status: Future Task

Subtask 10.2: Pressure Core Analysis

Status: Future Task

Subtask 10.3: Hydrate Core-Log-Seismic Synthesis

Status: Future Task

Task 11.0: Update Pre-Expedition Drilling / Logging / Coring / Sampling Operational Plan (Field Program / Research Expedition)

Status: On Schedule
Revised Operational Plan for the IODP---CPP drilling campaign, which includes drill site sequence, coring and pressure coring, LWD and wireline measurements, and rig time estimates in response to the SEP review.

Task 12.0: Field Program / Research Expedition Vessel Access

Status: Future Task

Decision Point 3: Budget Period Continuation

FUTURE – BUDGET PERIOD 3, & 3A: Not Started

C. What do you plan to do during the next reporting period to accomplish the goals?

Task 1.0: Project Management and Planning (continued from prior phase)

Will continue to execute the project in accordance with the approved PMP, manage and control project activities in accordance with their established processes and procedures to ensure subtasks and tasks are completed within schedule and budget constraints defined by the PMP.

A key goal of the next quarter is to finish analysis of three potential offshore drilling companies for drilling for the Marine Test. At the conclusion of our analysis, the leadership team will review the potential contractors to select the most appropriate one.

Task 6.0: Technical and Operational Support of Complimentary Project Proposal (CPP)

Goal to keep CPP on target:

Apr 1, 2016:	CPP Addendum Submittal
May 2, 2016:	Upload data to IODP SSDB
May 13, 2016:	Proponent Response Letter

Task 7.0: Continued Pressure Coring and Core Analysis System Modifications and Testing

Continue investigation of modifications and move forward with preparations for marine test.

Task 8.0: Pressure Coring Tool with Ball (PCTB) Marine Field Test

Work to finalize rig operator, set date of Marine Field Test, and complete requirements for Decision Point 2.

Task 9.0: Pressure Core Transport, Storage, and Manipulation

Continue design and purchase equipment and storage at UT Austin.

Task 10.0 Pressure Core Analysis

Continue planning for acquisition of pressure cores and petrophysical and seismic data integration efforts for the PCTB Marine Field Test.

2. PRODUCTS:

A. Publications, conference papers, and presentations

Cook, A., & Sawyer, D., 2015, Methane migration in the Terrebonne Basin gas hydrate system, Gulf of Mexico, presented at 2015, Fall Meeting, AGU, San Francisco, CA, 14-18 Dec.

Cook, A., & Sawyer, D., 2015, The mud-sand crossover on marine seismic data: Geophysics, v. 80, no. 6, p. A109-A114, 10.1190/geo2015-0291.1.

Cook, A., Hillman, J., & Sawyer, D., 2015, Gas migration in the Terrebonne Basin gas hydrate system, Abstract OS23D-05 presented at 2015, Fall Meeting, AGU, San Francisco, CA, 14-18 Dec.

Cook, A.E., and Waite, 2016, Archie's saturation exponent for natural gas hydrate in coarse-grained reservoir, presented at 2016 Gordon Research Conference from Feb28 to Mar04 in Galveston, TX, United States.

Hillman, H., Cook, A. & Sawyer, D., 2016, Mapping and characterizing bottom-simulating reflectors in 2D and 3D seismic data to investigate connections to lithology and frequency dependence, presented at 2016 Gordon Research Conference from Feb28 to Mar04 in Galveston, TX, United States.

Meazell, K., & Flemings, P.B., 2016, New insights into hydrate-bearing clastic sediments in the Terrebonne basin, northern Gulf of Mexico. Gordon Research Conference on Natural Gas Hydrate Systems.

Meazell, K., & Flemings, P.B., 2016, The depositional evolution of the Terrebonne basin, northern Gulf of Mexico. 5th Annual Jackson School Research Symposium.

Meazell, K., 2015, Methane hydrate-bearing sediments in the Terrebonne basin, northern Gulf of Mexico, Abstract OS23B-2012 presented at 2015 Fall Meeting, AGU, San Francisco, CA. 14-18 Dec.

Phillips, S.C., Flemings, P.B., Meyer, D.W., You, K., Kneafsey, T.J., Germaine, J.T., Solomon, E.A., & Kastner, M., 2016, Extraction of pore fluids at in situ pressures from methane hydrate experimental vessels, Poster presented at 2016 Gordon Research Conference from Feb28 to Mar04 in Galveston, TX, United States.

Treiber, K, Sawyer, D., & Cook, A., 2016, Dissociation of laboratory-synthesized methane hydrate by depressurization. Poster presented, poster presented at 2016 Gordon Research Conference from Feb28 to Mar04 in Galveston, TX, United States.

Worman, S. and, Flemings, P.B., 2016, Genesis of Methane Hydrate in Coarse-Grained Systems: Northern Gulf of Mexico Slope (GOM^2). Poster presented at UT GeoFluids Consortia Meeting from March 2nd-March 4th in Austin, TX, United States.

Yang, C., Cook, A., & Sawyer, D., 2016, Geophysical interpretation of the gas hydrate reservoir system at the Perdido Site, northern Gulf of Mexico, presented at 2016 Gordon Research Conference from Feb28 to Mar04 in Galveston, TX, United States

B. Website(s) or other Internet site(s)

Project Website: http://www.ig.utexas.edu/gom2/

Project SharePoint: https://sps.austin.utexas.edu/sites/GEOMech/doehd/teams/

C. Technologies or techniques

Nothing to Report.

D. Inventions, patent applications, and/or licenses

Nothing to Report.

E. Other products

Nothing to Report.

3. CHANGES/PROBLEMS:

A. Changes in approach and reasons for change

Nothing to report.

B. Actual or anticipated problems or delays and actions or plans to resolve them

The next possible date for the Complimentary Project Proposal to go before the JR Facility Board for scheduling of Hydrate Drilling Leg is May 2017. This is one year later than expected. However this delay in scheduling has no impact on the expected drilling leg date.

C. Changes that have a significant impact on expenditures

Nothing to report

D. Change of primary performance site location from that originally proposed

Nothing to Report.

4. SPECIAL REPORTING REQUIREMENTS:

A. CURRENT - BP2 / Phase 2

Task 1 – Revised Project Management Plan (Complete)
Subtask 7.03 – PCTB Land Test Report (Complete)
Subtask 8.05 – Pressure Core Marine Field Test Report
Task 11 – Refined Field Program Operational Plan Report

B. FUTURE - BP 3 / Phase 3

Phase 3A
A Phase 3A Report encompassing the refined Operational Plan, pressure coring team report, and permitting report
Task 14 - Field Program Operational Plan report
Task 15 – Field Program Hazards Report

Phase 3B
Task 16 – IODP Preliminary Expedition Report
Task 18 – Project Sample and Data Distribution Plan
Task 18 – IODP Proceedings Expedition Volume
Task 18 – Expedition Scientific Results Volume

5. BUDGETARY INFORMATION:

Budget Period 2 cost summary is outlined in Table 5 below.

Baseline Reporting Quarter	Budget Period 2							
	Year 1							
	Q1		Q2		Q3		Q4	
	10/01/15-12/31/15		01/01/16-03/31/16		04/01/16-06/30/16		07/01/16-09/30/16	
	Q1	Cumulative Total	Q2	Cumulative Total	Q3	Cumulative Total	Q4	Cumulative Total
Baseline Cost Plan								
Federal Share	$ 1,805,358	$ 1,805,358	$ 1,327,931	$ 3,133,289	$ 492,932	$ 3,626,221	$ 492,932	$ 4,119,153
Non-Federal Share	$ 471,771	$ 471,771	$ 471,771	$ 943,542	$ 471,771	$ 1,415,313	$ 471,771	$ 1,887,084
Total Planned	$ 2,277,129	$ 2,277,129	$ 1,799,702	$ 4,076,831	$ 964,703	$ 5,041,534	$ 964,703	$ 6,006,237
Actual Incurred Cost								
Federal Share	$ 790,502	$ 790,502	$ 799,626	$ 1,590,128				
Non-Federal Share	$ 267,114	$ 267,114						
Total Incurred Cost	$ 1,057,616	$ 1,057,616	$ 799,626	$ 1,590,128				
Variance								
Federal Share	$ (1,014,856)	$ (1,014,856)	$ (528,305)	$ (1,543,161)				
Non-Federal Share	$ (204,657)	$ (204,657)	$ (471,771)	$ (676,428)				
Total Variance	$ (1,219,513)	$ (1,219,513)	$ (1,000,076)	$ (2,219,589)				
Baseline Reporting Quarter	Budget Period 2							
	Year 2							
	Q1		Q2		Q3		Q4	
	10/01/16-12/31/16		01/01/17-03/31/17		04/01/17-06/30/17		07/01/17-09/30/17	
	Q1	Cumulative Total	Q2	Cumulative Total	Q3	Cumulative Total	Q4	Cumulative Total
Baseline Cost Plan								
Federal Share	$ 1,096,922	$ 5,216,075	$ 10,209,921	$ 15,425,996	$ 1,001,922	$ 16,427,918	$ 1,001,922	$ 17,429,840
Non-Federal Share	$ 848,570	$ 2,735,654	$ 848,569	$ 3,584,223	$ 848,569	$ 4,432,792	$ 848,569	$ 5,281,361
Total Planned	$ 1,945,492	$ 7,951,729	$ 11,058,490	$ 19,010,219	$ 1,850,491	$ 20,860,710	$ 1,850,491	$ 22,711,201
Actual Incurred Cost								
Federal Share								
Non-Federal Share								
Total Incurred Cost								
Variance								
Federal Share								
Non-Federal Share								
Total Variance								

Table 5

6. REFERENCES

Flemings, P. B., 2016, Y2Q1 Quarterly Research Performance Progress Report (Period ending 12/31/2015), Deepwater Methane Hydrate Characterization and Scientific Assessment, DOE Award No.: DE-FE0023919.

HYBRID PRESSURE CORING TOOL WITH BALL VALVE (PCTB)

2015 LAND TEST PROGRAM

GEOTEK LTD DOCUMENT NO. UT1-2016 (R1)

PREPARED FOR:

UNIVERSITY OF TEXAS

PREPARED BY:

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ISSUE	REPORT STATUS	PREPARED	APPROVED	DATE
R1	Final Report	SR/JA/JR	JA/PS	02-Feb-2016

TABLE OF CONTENTS

1. EXECUTIVE SUMMARY

The Pressure Coring Temperature Barrel (PCTB) is an improved version of the original PCTB core barrel that was developed by Aumann & Associates, Inc. This PCTB tool was developed in 2013 and tested that year in offshore coring in China. The next year it was again tested at the Catoosa Test Facility for the DoE. During further development the PCTB was utilized successfully to recover methane hydrate bearing cores during operations offshore Japan and China in 2015. The PCTB tool is a wireline retrievable system designed to recover a 2.00 in. diameter x 3.0 m long core at pressures up to 5000 psi. It is also compatible with, and can transfer pressurized cores to the Geotek Pressure Core Analysis and Transfer System (PCATS) for analysis of the core under pressure thereby preventing loss of pressure sensitive materials such as methane hydrate, expanding gas, oil or other fluids as well as changes in mechanical properties due to pressure reduction.

The PCTB Onshore Test Program at the Schlumberger Cameron Test and Training Facility (CTTF) was designed to test the effectiveness and efficiency of drilling and coring with the new PCTB pressure core barrel and as a qualification test prior to proposed 2017 offshore operations for the DoE-UT in the Gulf of Mexico. The CTTF test program did, in fact, fully confirm that the tools are “fit for purpose” for future offshore coring operations as detailed in this report. The test program ran according to the 9 day planned schedule, commencing December 9, 2015 with rig-up, December 10 with first core, and continued through final core on December 16 and rig-down, December 17. All equipment was shipped off site by December 18.

The tool testing proved full acceptability of the PCTB for future offshore coring work. A few minor challenges did arise but were overcome as described in this report. A clear risk mitigation plan is also presented.

2. PROJECT GOALS & RESULTS

Testing goals were all fully accomplished, included the following:

- <u>Prove recent tool improvements</u> – complete. New parts were run and found to be fit for purpose, including: a shorter inner tube, combination catcher (flapper-slip, basket-slip, etc.), skirted spring core catcher, smaller diameter bit, and stabilizer above bit.
- <u>Perform full function downhole land pressure test of the PCTB under controlled test conditions at Schlumberger Cameron Test Facility</u> - completed.
    - Eight cores were taken, two center bit intervals were drilled and two additional downhole operational tests were conducted. 60% of the tests brought back full pressure (five out of the last six runs had full pressure). One was retrieved with core in the ball valve and it was suggested that, due to core jamming, two others may have had core in the ball valve when they were activated.
    - One of the eight cores drilled failed to retrieve a sample due to the short length of core drilled. Of the other seven, they averaged recovery of 66%. This was not primarily related to core barrel functionality but to the formations cored. With the very hard sandstone and shale lithology and low ROP, the drillers tended to apply very high WOB possibly causing core jamming in the shoe. As discussed below, the cutting shoe bit design may have balled up with the shale also reducing ROP.

- Coring capability in formation lithology as similar as possible to what may be seen downhole in expected deep-water applications: sand, limestone, clay. Coring start depth selected at CTTF to match formations – completed. Coring started at depth-below-rotary of 1,948 ft. Based on visual inspection as well as lithology logs, the tests included coring through competent shale, limestone, and medium to hard sandstone. These formations will not be encountered in the Gulf of Mexico in gas hydrate coring but less competent sands are more likely.
    - Tim Collett stated in a memo dated 8/30/15 that "the failure mode of most concern to our plans in the GOM are the failures we observed in the Area-B sites where we experienced a significant drop in the core system performance in thick, relatively massive, sand units with high gas hydrate saturations. This is a reservoir type that we must be able to sample with a relatively high degree of success." During this test program at CTTF we proved good function of the PCTB coring system in thick, massive medium and hard sand and shale formations. Though no methane hydrate was present, and the penetration rates were much less than hoped for, the core barrel functioned as designed, recovering 94% core on the last three cores with the face bit and full pressure on five of the last six runs.
- Test new core catchers including basket catcher, slip (spring) catcher, and combination arrangements as needed – completed. Tested the following combinations of core catchers: basket + slip; basket alone; and slip alone. Skirted slip catchers were used except on Core #7 which used a non-skirted slip catcher. Although flapper catcher combinations were successful in the previous JOGMEC testing, it was decided to only test those catchers most appropriate for harder formation coring – hence the emphasis on slip catcher trials. Core was missing on some runs but the cause could not be determined: core falling out or being ground up after jamming in the barrel. Some cores were seen to be jammed in the shoe. No catcher problems were specifically identified in any cores with one exception.
    - On Core #5 there was no core recovery. This was likely due to only coring one ft., only six inches of which would have protruded above the catcher. In the sometimes fractured shale it is likely that the short length of core in/above the catcher disintegrated and was not held. That combination of circumstances (very short, possibly fractured core in a slip catcher) apparently led to the loss of core in this case. If used, a flapper or basket catcher may have retained parts of that core.
    - It was also observed that in the final test, the slip or spring catcher twisted from friction with the core and was carried a few feet into the liner. This did, in no way, affect the function of the catcher to prevent the full core from entering the barrel or allow it to fall out.

- Provide pressure vs. flow characterization of pressure core barrel through flow testing and determine pressure and flow rate required to collapse the liner – completed. In order to provide this characterization the core barrel was lowered below rig floor and circulation established. The prescribed flow rate was applied and the standpipe pressure (SPP) recorded. The core barrel was then raised above the rig floor far enough to insert an 11.5 ft. long probe into the bit. This was long enough to reach through the entire liner and verify whether it was collapsed or not. The results are tabulated below. The liner was suspected to partially collapse at 450 gpm and 972 psi standpipe pressure. Full collapse was documented at 500 gpm which created standpipe pressure of 1184 psi. So with this weight, viscosity and temperature of mud the liner was found to at least partially collapse at 450 gpm, which created standpipe pressure of 972 psi. This flow rate limit should be more than adequate for virtually all formations typically cored in the methane hydrate business.

FLOW RATE (GPM)	STANDPIPE PRESSURE (PSI)	COLLAPSE?
100	6	None
200	120	None
250	309	None
300	437	None
350	590	None
400	775	None
450	972	Partial
500	1184	Yes

Table 1. Results of 14 December flow test to liner collapse.

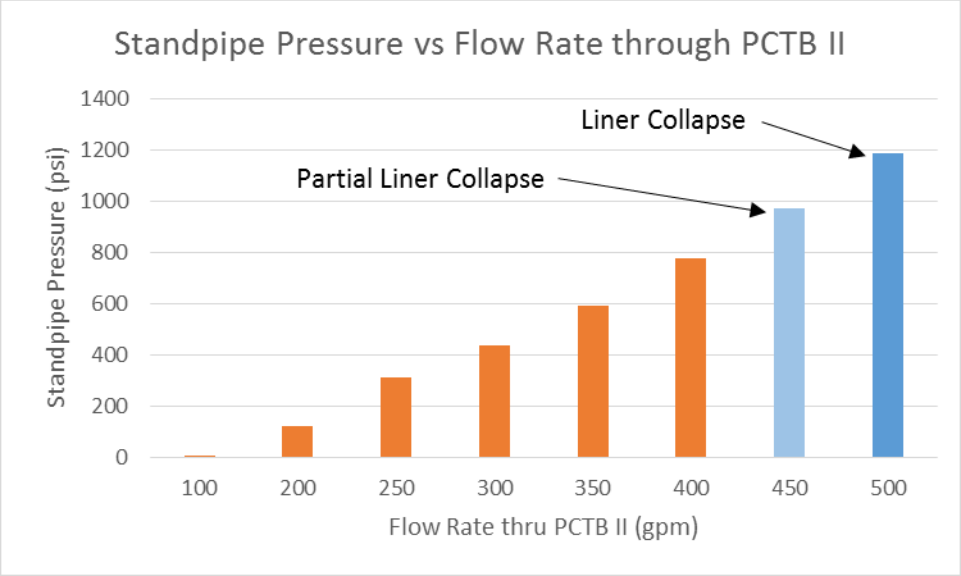


Figure 1. Plot of standpipe pressure vs. flow through PCTB.

- <u>Examine inconsistencies in the timing of the tool's pressure boost, as noted in the past</u> – See DST results in Appendix. The PCTB pressure core barrel is designed so that when the Retrieval Tool unlatches and pulls the inner assembly out of the BHA, the ball valve ball rotates, sealing the core, and almost simultaneously the pressure section sliding valve opens the communication between the core and the nitrogen backed accumulator, at a regulated pressure. This is called the boost and is designed to increase core barrel pressure to compensate for (1) decreasing temperature coming out of the hole, (2) expansion of the inner barrel as confining pressure reduces, and (3) minor pressure leaks in the core barrel. Secondly, the pressure boost also assists the ball valve spring in seating the seal carrier and ball valve seal against the ball to ensure pressure capture.

  - The DST only identified two tests to have a late pressure boost, indicative of a late activation of the pressure section. These two late boosts were on Closure Test #3 (first Water Core) and Core #1. DST data showed Closure Tests #1, 2, and 4 to be perfect runs, although #1 was a gradual boost reflective of a valve adjustment problem in the pressure section. The DST also showed Cores #5, 7, and 8 to be perfect runs. Obviously the DST didn't indicate a pressure boost on the cores which didn't seal: Cores #2, 3, 4 and 6.

- <u>Test different coring flow rates to attempt to optimize core recovery and quality, starting at 200 gpm, then moving lower and higher depending upon recovery results</u> – completed. Started first core run (Core 1) with 201 gpm and tested higher up to 300 gpm, settling later on 250 gpm for giving the best results and highest rate of penetration for these particular formations. The hard sandstone and shale lithology required as much flow as possible to clean the bit, along with using liquid soap additive to the mud suction. However, with the PCTB barrel the standpipe pressure needed to be limited to prevent liner collapse. The testing was conservative with average SPP of 346 psi, not close to collapse at 972 psi, documented above. When coring more typical gas hydrate zones with soft sand lithology, using lower flow rates have shown to be most successful. On this well, however, lower flow rates seemed to generally correlate with more bit balling and lower ROP. Exceptions to that rule, as in the lower relative ROP of Core 7 are probably related more to lithology, formation hardness, and shale content.

  - In fact, the previous test series for JOGMEC with the HPTC III pressure core barrel had average ROP of 21.6 fph over 6 cores compared to this tool with ROP of 2.5 fph over 8 cores. Why is that? Lithology may have been a cause, although it appeared similar. Primarily, the HPTC III barrel of JOGMEC had much lower pressure drop allowing higher flow rates and hence, better bit cleaning than the PCTB. The JOGMEC barrel runs averaged a flow rate of 485 gpm (only 295 psi SPP) compared to DoE-UT of half the flow rate, 241 gpm (and higher pressure of 346 psi).

- <u>Determine coring parameters which minimize core biscuiting/jamming</u> – completed. The rate of penetration (ROP) during coring was found to be so low and core jamming to be so prevalent that it was impossible to determine precise cause and effect of biscuiting and jamming. However, the four cores with the highest average WOB averaged 45% recovery whereas the 3 cores with the lowest average WOB averaged 94% recovery. This implies that lower bit weight results in higher core recovery – a conclusion likely applying to all coring, and not limited to pressure coring alone. What caused the low ROP and thus higher WOB? Probably a combination of hard and/or shale formation with the use of cutting shoe type bit. The cutting shoe bit seemed to be more prone to shale bit balling and lower ROP. This seems to warrant more study.

  - It was determined that the formation was very hard and contained shale which had a tendency to ball the bit at lower flow rates. One problem noted during drilling was the improper operation of the automatic driller on the rig. Traditionally the automatic driller software would provide for applying a constant WOB and attaining the resulting ROP – or controlling ROP and automatically applying the WOB required to attain that ROP. In our case at

CTTF there was an admitted failure of the automatic driller. A service technician was called and confirmed that the problem had existed for some time but was scheduled for repairs in the following weeks. The system seemed to apply WOB until the set WOB was reached, at which point the ROP would be locked until the WOB gradually drilled off. This caused serious troubleshooting problems with coring parameters as well as occasional load spikes and likely resultant bit balling.

12/16 13:23:31 ALM3071 Mudpumps Failed To Sync

CONTROL: Drillers Chair

Drawworks State: Stop

Drawworks Sub State: Release Brake

Mp Total Strokes: 203 stk

Hoist Lim: 0.0

Wob: 1.0

Td Torque: 1.0

Delta P: 2.0

Rop On / Off: Enabled

Wob On / Off: Enabled

Td Torque On / Off: Off

Delta P On / Off: Off

Rop PV 0 ft/hr, SP 10

Wob PV 9.8 klb, SP 8.0

Td Torque PV 1 kft.lb, SP 10

Delta P PV 46 psi, SP 300

Figure 2. Automatic Driller Display showing WOB and ROP spikes.

- <u>Compare coring results between face bit and cutting shoe bit and between 9 7/8” bits and 10 5/8” bits</u> – completed. Both a 9-7/8 in. cutting shoe bit (PN ABT0220 with TFA 1.7 sq. in.) and a 10-5/8 in. face bit (PN CBT0221 with TFA 1.2 sq. in.) were run on this test series. By differing bit type and size simultaneously on the same set of bits, the multiple variables could make it difficult to draw conclusions, depending on the results. For example, what attribute caused what improvement? And how did lithology figure into the results? All results turned out in favor of the face bit but the sample size is small and one wonders if the one face bit run with a very good ROP skewed the results.
    - A pressure vs. flow rate comparison of the core barrel with each of two bits yielded almost identical results. See chart and table below. This is because the choke point in the system is the core barrel, not the bit. With the same core barrel, changing bits gives insignificant pressure drop difference. For example, given the TFA of the cutting shoe bit of 1.7 sq. inches, then that would create a calculated pressure drop of only 19 psi with 250 gpm flow. That is a very small part of the total measured 290 psi pressure drop at that flow rate. Changing to the face bit, decreasing the TFA from 1.7 to 1.2 (for a 29% decrease) is seen below to give an insignificant and unnoticeable system pressure increase. Again, the bit is not the choke point – the core barrel internal flow path is. Having larger bit TFA through changeable nozzles would not be an improvement in reducing standpipe pressure of the system.

FLOW RATE THROUGH CORE BARREL (GPM)	STANDPIPE PRESSURE 12/11/15 BEFORE CORE 1	STANDPIPE PRESSURE 12/16/15 BEFORE CORE 6
	9-7/8" CUTTING SHOE BIT (TFA 1.7)	10-5/8" FACE BIT (TFA 1.2)
25	17	
50	27	26
75	24	
100	23	17
125	37	
150	73	77
175	134	
200	203	200
225	264	
240	291	
250		310

Table 2. Pressure vs. flow for cutting shoe and face bit options.

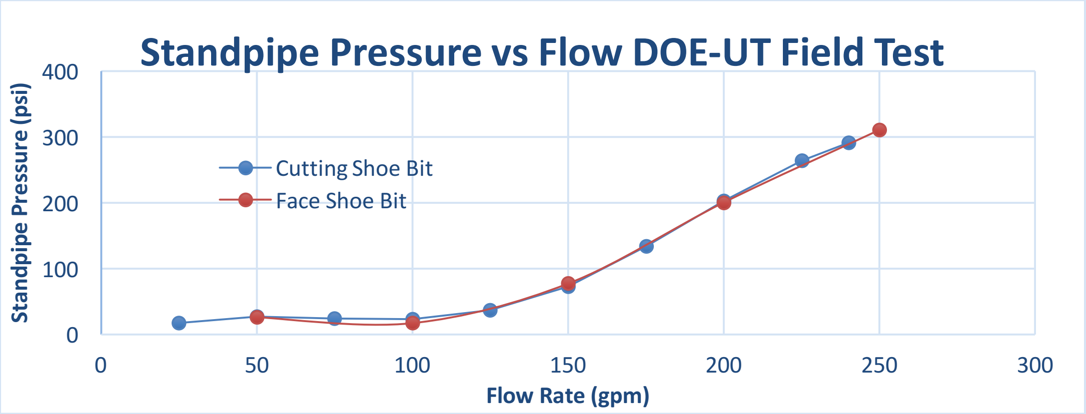


Figure 3. Plot of pressure vs. flow rate for the two bit types.

  - The smaller (9-7/8") cutting shoe bit required more weight (average 12.3 klb) to cut at the slower ROP of 2.0 ft. per hour while recovering less (36.2%) core recovery – probably due to core jamming from the higher WOB necessary. Also the cutting shoe bit runs had slightly lower mud flowrate (236 vs. 250 gpm) promoting less bit cleaning and lower ROP. It was seen that the cutting shoe, itself, tended to ball up with cuttings and plug the cutting shoe flow ports causing much lower cutting efficiency than the face bit. This cutting shoe bit cut most (71%) of the hole interval.
  - The larger (10-5/8") face bit required less weight (average 9.5 klb) to cut faster (3.4 fph) and recover more core (94.3%). This bit cut 29% of the hole interval.
  - Ignoring differences of lithology and flow rate which may have had an influence, it would be easy to conclude that the face bit performance is superior to the cutting shoe bit and would be even more superior if it was the same size. More study may be required.

- <u>Are modifications to the main bit profile design warranted?</u> – As mentioned above, ROP was not acceptable. If these hard to medium sandstone and shale rock sections are expected to be common drilling objectives in the future then a bit profile design change would be warranted. A bit with more cutter exposure and less depth-of-cut control feature would be desirable. If most future project coring will be in formations such as soft, unconsolidated water sands, then the current face bit profile will be successful. If a combination of formations are expected with harder and less consolidated rock then a redesigned bit would definitely be useful. It was noted that at the CTTF rig that the drilling to core point with a 12 ¼" PDC bit was done in excess of 100 ft. per hour. This particular drill bit had a more aggressive cutting structure and profile than ours.

- <u>Goals not accomplished were:</u>
  - <u>Follow a mud program utilizing filtrates and higher mud weights to reduce sand core loss and strengthen borehole</u> – not completed. We did utilize higher weights and filtrates but the lithology cored did not contain sand, therefore improvement could not be documented.
  - <u>Core with reduced flow rates to prevent sand core loss</u> – again, no weak sand was cored, leaving no opportunity to prove this theory.

3. RESULTS SUMMARY

- Drilling Parameters: ROP was a problem, but not due to the functionality of the PCTB pressure core barrel. The formation was significantly harder than expected or would typically be encountered drilling for methane hydrates. We adapted coring parameters beyond what would normally be called for and did prove that the core barrel functioned properly. A properly functioning automatic driller would have likely improved performance but it was found that lower weights and higher flow rates seemed to be key. As Peter Schultheiss wrote in a group email, dated 8/30/15, regarding a previous coring job, "the fundamental elements of the tool are working correctly … It is the sensitivity of the tool to drilling conditions/drilling protocols/formation type that should be the primary focus of attention for this group." This seems to apply here. Correct tool operation under unusual drilling conditions and formations was proven.
- Flow Rates and Standpipe Pressure: The PCTB coring system tested in this program proved to have a smaller system TFA (total flow area) than some other systems such as the HPTC III, thereby producing higher standpipe pressure and limiting the flow rate. The flow rate limit was set on the PCTB by the liner collapse pressure which was determined through experimentation on this job. The core barrel TFA was seen to be significantly lower than that of the bit and therefore choked the flow. It was found that higher flow rates tended to clean the bit better and produce higher coring ROP.
- Core Catchers: Different catchers were tested as described in the preceding paragraphs. Most of the catchers used were slip-type. This choice was related solely to the harder formations cored, not to any superior general performance of this core catcher. The choice of catcher type should always be based on formation drilled: basket for very soft; flapper for soft or fractured; and slip type for hard, competent formations. Combinations of catcher types are available for mixed or uncertain formations.

- Bit Type: As noted above, the face bit drilled at higher ROP with better core recovery than the cutting shoe bit. The sample size was very small with one very good run out of three which may have skewed the results. Also, as the test progressed, the engineers' drilling skills in this particular formation may have improved, reflecting better recovery for the later (face type) bit. For harder formations, such as was drilled in this test well, a redesigned, more aggressive PDC bit would likely have improved penetration rate with reduced weight on bit, reduced core jamming and improved recovery.
- Core Recovery: The first six cores recovered less than was cored. Respectively they recovered 43.3, 51.7, 72.9, 12.9%, and zero (average of 36%). It could not be determined by visual inspection if the missing core was lost by core jamming and grinding the core or by a failure of the core catcher. It could easily be concluded that, with the high WOB used, that core jamming was the problem. As mentioned before, Core 5 recovered no core due probably, to the short length cored. Thereafter, with a new face bit and lower weights on bit, recovery was improved with Cores 6, 7, and 8 recovering an average of 94%. Table 3 summarizes the results.

	DATE/ TIME	CORED SECTION	ROP (FPH)	CORE RECOVERED	PRESSURE RECOVERED (PSI)
CLOSURE TEST 1 W/CUTTING SHOE BIT	12/10 10:45	1871			1406
CLOSURE TEST 2	12/10 15:15	1869			1580
CORE 1	12/10 17:10	1948-1953	1.54	2.17 ft. (43%)	1490
CENTER BIT 1	12/11 11:20	1953-1992	7.0		
POOH CLEANED BALLED BIT	12/11 16:45				
CORE 2	12/11 18:20	1992-1998	2.45	3.0 ft. (52%)	Zero
CENTER BIT 2	12/12 00:15	1998-2060	12.4		
POOH CLEANED BIT (SOME BALLING)	12/12 05:15				
CORE 3	12/14 10:05	2060-2064	1.62	2.9ft. (73%)	Zero
FLOW TEST 1 CUTTING SHOE BIT	12/14 15:06				
CORE 4	12/14 20:15	2064-2069	3.27	0.7 ft. (13%)	Zero
CLOSURE TEST #3 (WATER CORE)	12/15 08:55	2051			1484
CLOSURE TEST #4 (WATER CORE)	12/15 10:41	2051			1486

CORE 5	12/15 12:45	2069-2070	1.05	Zero	1494
REAMING	12/15	1948-2070	100		
POOH BIT MINOR BALLING; P/U FACE BIT	12/15				
CORE 6	12/16 05:45	2070-2075	7.24	2.8 ft. (52%)	Zero
CORE 7	12/16 08:33	2075-2076	1.05	1.7 ft. (119%)	1710
CORE 8	12/16 12:58	2076-2078	1.85	2.4 ft. (111%)	1501
POOH W/MINOR BALLING ON FACE BIT	12/16 17:28				

Table 3. Chronology of Job for DoE-UT at CTTF, commencing December 9, 2015

4. CHALLENGES AND RESPONSES

- The automatic driller feature on the rig was not operating properly. This was minimized by very carefully directing controller input to force it to respond reasonably.
- Formations at CTTF were found to be harder sandstone and shale rather than the medium to soft sandstone expected. This was overcome by patiently drilling as fast as possible, which was typically very slow.
- The problem of low penetration rate was partly caused by shale bit balling. This was compounded by the flow limitation imposed by the pressure limit of the core barrel in preventing liner collapse. Higher flow was needed to properly clean the bit cutting structure. After running a liner collapse test the mud flow rate was increased in later tests, but they could have safely been increased further, further increasing ROP.
- Core jamming and biscuiting in the shoe or liner will always be a possibility and was seen in this test. Core recovery on the first five cores was unusually low, averaging 36% with one zero recovery. By changing to a face bit and reducing WOB the average recovery increased to 94% on the final 3 cores.
- Core pressure recovery is always a critical metric in pressure coring. Of all closure tests, including water cores, and rock cores, the core barrel brought back full pressure on eight of the twelve runs (67%). However, on those tests actually coring rock, that pressure recovery dropped to only four of eight (50%). One may conclude that the pressure barrel, itself, operates correctly since it closed without fail when tested only with drilling mud. However, all four failures occurred when rock was involved. This suggests that drill cuttings or crumbling rock from the core interfered with the ball closing.
    - One scenario that may explain what the problem was follows. After coring is completed the core barrel is lifted a small distance off bottom. The retrieval tool is circulated into the hole on wireline with 50 gpm flow. After latching in,

the pumps are shut down for a short time and the wireline pulls to rotate the ball and retrieve the inner assembly. After disengagement from the BHA is confirmed the pumps are restarted with 35 gpm. The problem could be that during the short time the pumps are off the flow immediately u-tubes, pulling cuttings through the bit ports and around the ball. As the ball rotates, these cuttings may wedge in the seal and prevent sealing.

- The <u>pressure boost</u> can be monitored by way of the DST record of pressure inside the inner barrel. The DST records attached in the Appendix indicate The DST only identified two tests to have a late pressure spike, indicative of a late activation of the pressure section. These two late boosts (Closure Test #3- first Water Core and Core #1) reflect a challenge to evaluate. The likely cause is not a design flaw but a result of one of or a combination of fine grit and cuttings in the drilling mud and seals getting hung up as the tool is operated by hauling on the wireline. The grit may accumulate through the bit ports during tripping in the hole and whenever the pumps are off (e.g., after coring). The static pressure outside the core barrel is higher than inside, caused by the weight of cuttings in the annulus. Therefore, when the pumps are off, the flow immediately reverses direction and u-tubes, carrying fines and coarse cuttings into the core barrel. These may interfere with the operation of the sliding valve or even with the ball valve sealing. It is possible that the seals at the top end of the autoclave can get hung up as they enter the seal bore. Some evidence of damaged seals was noted on tool disassembly however it is unclear at what time these seals were damaged.
- On Closure Test #2 the inner assembly would <u>not latch</u> into the BHA properly. This was the first attempt with #3 autoclave and #3 pressure section. After POOH and disassembling the tool in the service van, the problem was diagnosed to be a drain plug protruding. Assembly technicians were reminded to have redundant witnesses on assembly steps. No further problems of this sort were seen on the job.

5. CHALLENGE MITIGATION PLAN FOR FUTURE OPERATIONS

- Failure of an automatic driller feature cannot be anticipated or planned for. The results of the workaround were as positive as possible. The coring was slow and with patience allowed the job to proceed.
- Mitigation for hard formation and low penetration rate in coring is to understand the formation and utilize an appropriate bit and drilling program. If in the offshore work that DoE-UT is likely to be involved with, similar medium to hard formations are expected to be encountered, along with those prone to balling with shale, it should be possible to redesign the bit with a more aggressive cutting structure to increase penetration rates in harder formations and still be effective in more friable material.
- Higher flow rates could be utilized resulting in higher SPP while still not exceeding the core barrel limits. Less conservative flow rates could have been used, better cleaning the bit, increasing ROP and reducing shale balling. If sticky shale is encountered it is necessary to utilize a soap protocol in the mud, which was done at CTTF, such as adding one gallon of liquid soap at the pump suction every 700 strokes or 10 minutes. The soap tends to prevent cuttings agglomeration and bit balling. The soap may also lower friction and reduce core jamming inside the core

liner. It should have similar properties to that which we used for this purpose: DynaDet wetting agent manufactured by Newpark Drilling Fluids of Katy, Texas.

- The loss of core on some of the runs can be attributed to core jamming in the liner and/or bit balling. Bit balling seemed to occur in the cutting shoe which then stacked weight on the formation adjacent to the core and crushed the core into the shoe, causing a jam. Using a face bit seemed to eliminate core jamming in the last three cores. Going with the face bit rather than the cutting shoe bit seems to be one significant mitigation strategy that may be implemented.
- To improve core pressure recovery where the ball did not seal properly, a strategy may be implemented to maintain some flow throughout the inner barrel retrieval process. Possibly reducing the flow to 5 gpm when disengaging the inner barrel could prevent cuttings from u-tubing into the ball seal.
- To prevent a late pressure boost in the PCTB, one strategy would be to reduce fines and cuttings in the core barrel which, perhaps, interfere with proper operation of the sliding valve. This may be done by maintaining small mud flow at all times rather than totally shutting down the pumps. An evaluation of the operational procedure may be required to identify these times. The potential for seals hanging up in the seal bore on tool operation should be evaluated and if these can be damaged during tool operation on the wireline.

6. WELLSITE OPERATIONS

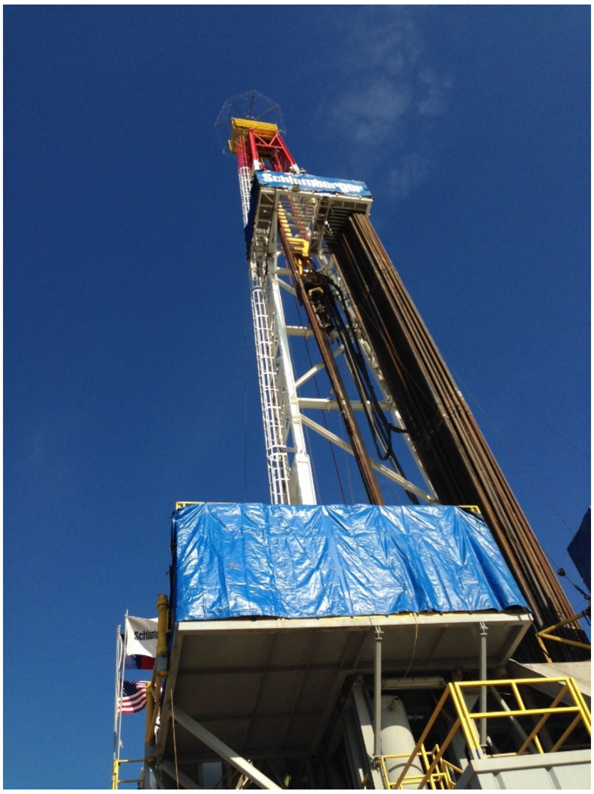


Figure 4. Schlumberger's Cameron Test and Training Facility (CTTF) near Cameron, TX.

- Survey: The first core was taken for DoE-UT starting at a depth below rig floor of 1948 ft. The last survey was taken at a depth of 1855 ft. The last survey found an inclination of 2.27 degrees with an azimuth of 241.25 degrees. The last reading showed a building trend of 0.13 degrees per 100 ft. This should not have any noticeable effect on the coring.

- BHA stack up:
    - Core bit (1.3 ft. length) started with a 9-7/8” cutting shoe bit and changed later to a 10-5/8” face bit
    - Stabilizer (4.7 ft. length)
    - Outer core barrel (31.85 ft. length)
    - Crossover (1.6 ft. length)
    - Stabilizer (3.32 ft. length)
    - Slick Sub (1.09 ft. length)
    - Slick Sub (3.32 ft. length)
    - Drill collars (120.13 ft. length)
    - Crossover (3.01 ft. length)
    - Drill pipe
- Latching and space out of each Autoclave assembly was completed prior to Core 1 and Core 2 with the BHA just below the rig floor (Closure Test #1 and #2). In each case the tool spaced out as designed with 1/16-1/8” of space between the bit and shoe.
- For reference, mud properties were measured at CTTF on 12/2/2015 after drilling to core point and before coring commenced for JOGMEC. They were recorded as:
    - Mud volume in system: 693 bbl. (pit volume 450 bbl.)
    - Mud weight: 9.4 ppg
    - Funnel viscosity: 46 sec/qt. at 120° F mud temperature
    - Viscometer: (600, 200, 100, 60, 6 rpm): 29, 15, 10, 7, 3 cP
    - Yield point: 9 lb /100 ft^2
    - Water/solids/sand % by volume: 94/6/0.1
    - pH at 120°F: 9.6
- Closure Test #1
    - Stack up and closure test was accomplished successfully recovering 1406 psi mud
    - DST showed that the pressure supply was choked allowing a slow pressure boost. This was repaired for future cores.
    - Depth 1871 ft.
- Closure Test #2

  - First attempt did not latch due to a drain plug improperly installed - resolved
  - Stack up and closure test was accomplished successfully recovering 1580 psi mud
  - DST showed perfect run.
  - Depth 1869 ft.
- Core #1:
  - 9-7/8” Cutting Shoe bit, PN ABT0220 with TFA 1.7 sq. in. (with cutting shoe)
  - Combination slip plus basket catcher
  - Input parameters: 201 gpm; 40-100 rpm; 5.3-17.1 k-lb. WOB
  - For this and all core runs, detergent was added to mud to prevent cuttings agglomeration. Detergent was added at approximately one gallon per 700 strokes pumped (one bottoms up in volume).
  - ROP: 5.0 ft. cored in 3.25 hours for ROP of 1.54 fph.
  - Slow coring attributed to shale bit balling
  - Variation in ROP was observed caused by faulty automatic driller controls: providing spurts of 30-40 fph with zero ROP between for average of 1.54 fph. This was observed on all runs throughout this job at CTTF.
  - Recovered 2.17 ft. of 5 ft. cored (43%) at 1490 psi.
  - DST showed late firing near surface.
  - Core jammed in shoe
- Center Bit #1:
  - Drilling down to find easier coring with less shale, more typical of gas hydrate formation drilling. This was not found.
  - Input parameters: 209-669 gpm; 100-135 rpm; 1-17.4 k-lb. WOB
  - ROP: Overall we drilled 39 ft. in 5.55 hours for average ROP of 7.0 fph.
  - After run, tripped BHA to surface to inspect bit. Found to be severely balled with shale. Cleaned bit and TIH
- Core #2:
  - Basket catcher. Bit seal removed prior to this run for balance of cores to allow more flow through the bit.
  - Input parameters: 200-226 gpm; 70-120 rpm; 5-17.2 k-lb. WOB
  - ROP: 5.8 ft. cored in 2.37 hours for ROP of 2.45 fph.
  - Wireline would not initially unlatch when retrieving core. Followed normal procedure to then achieve unlatching.

  - Recovered 3 ft. of 5.8 ft. cored (52%) at zero pressure. Ball valve seal was coated with angular debris and silt, resulting in no sealing. Flow was visible leaking from ball valve.
  - DST showed late pressure spike but no final pressure in autoclave.

Figure 5. PCTB ball valve coming out of hole after Core #2 – closed but not holding pressure.

- Center Bit #2
  - Drilled down again to find more representative core with less shale
  - ROP: Overall we drilled 62 ft. in 5 hours for average ROP of 12.4 fph.
  - After run, again tripped BHA to surface to inspect bit. Found to be partly balled with shale and partly clean. Cleaned bit and TIH
- Core #3:
  - Slip catcher
  - Input parameters: 200-209 gpm; 60-90 rpm; 7-15 k-lb. WOB
  - ROP: 4 ft. cored in 2.47 hours for ROP of 1.62 fph.
  - Recovered 2.92 ft. of the 4 ft. cored (73%) at zero pressure.
  - Ball was half open when retrieved on rig floor. It closed gradually while transporting it to service van. Small rock fragments were found in the ball valve seal.
  - No DST data was available as the DST was not readable on recovery.

Figure 6. Core #3 removed from liner.

- Flow Test to Collapse Liner
    - POOH and cleaned bit. Minor bit balling was noted. Tested one stand below rig floor. Used 11.5 ft. long probe into liner to detect collapse.
    - No collapse was seen until 450 gpm which created 972 psi SPP and partial collapse
    - Full collapse occurred with 500 gpm which created SPP of 1184 psi
- Core #4:
    - Slip catcher
    - Cutting shoe was modified to allow more flow for this and future runs.
    - Input parameters: 276-300 gpm; 61-120 rpm; 14.5-19.4 k-lb. WOB
    - ROP: 5.2 ft. cored in 1.58 hours for ROP of 3.27 fph.
    - Recovered 0.67 ft. of 5.2 ft. cored (13%) at zero pressure.
    - Core and cuttings were jammed in shoe and catcher. Broken liner above core catcher. Ball was open when retrieved to rig floor.
    - DST showed no pressure spike, indicative of open ball valve.
- Closure Test #3 (Water Core):
    - Core barrel was TIH to depth of 2050 ft. then activated
    - Operated as designed and recovered 1484 psi mud
    - DST showed late firing.
- Closure Test #4 (Water Core):
    - Core barrel was TIH to depth of 2050 ft. then activated
    - Operated as designed and recovered 1486 psi mud
    - DST showed perfect run.
- Core #5:
    - Slip catcher

  - Input parameters: 225-250 gpm; 50 rpm; 4.8-7 k-lb. WOB
  - Felt that perhaps lower bit weight could improve recovery and reduce core jamming
  - ROP: 1.1 ft. cored in 1.05 hours for ROP of 1.1 fph.
  - Recovered no core at 1494 psi pressure.
  - DST showed that a boost had occurred but it is unclear exactly when this happened due pressure data dropouts during tool recovery. Comparing the temperature profile to coring runs #6 & #7 one could infer that the pressure boost did occur on retrieval from the BHA.
  - This short core only protruded about 6 inches above the catcher. If it slipped in the catcher at all and/or fractured then that would have allowed it to pull out and be lost.
  - After this core, barrel was POOH to change bits. The cutting shoe bit was mostly clean.
- Core #6:
  - New face bit was made up to core barrel and TIH. 10-5.8" face bit, PN CBT0221 with TFA 1.2 sq. in.
  - Input parameters: 250 gpm; 60-100 rpm; 4.8-12.5 k-lb. WOB
  - ROP: 5.43 ft. cored in 0.75 hours for ROP of 7.24 fph.
  - Recovered 2.83 ft. of 5.43 ft. cored (52%) at zero pressure.
  - Piece of core was recovered projecting through catcher and ball, preventing ball from closing. Ball was open when retrieved to rig floor.
  - DST showed no pressure spike, indicative of open ball valve.
- Core #7:
  - Input parameters: 250 gpm; 60-90 rpm; 6-12.2 k-lb. WOB
  - ROP: 1.4 ft. cored in 1.3 hours for ROP of 1.05 fph.
  - Recovered 1.67 ft. of 1.4 ft. cored (119%) at 1710 psi pressure
  - DST showed perfect run.
- Core #8:
  - Input parameters: 250 gpm; 60-90 rpm; 6.7-11.3 k-lb. WOB
  - ROP: 2.17 ft. cored in 1.17 hours for ROP of 1.85 fph.
  - Recovered 2.4 ft. of 2.17 ft. cored (111%) at 1501 psi pressure
  - DST showed perfect run.
  - After this core run, we tripped the BHA and noted only minor BHA bit balling with shale but significant shale cuttings balled above bit and stabilizer on BHA. This may have occurred during trip out of hole. Indicative of quantity of cuttings circulating out of hole.

Figure 7. BHA with cuttings balling up after POOH after Core #8.

APPENDICES

1. JOB SUMMARY SHEET – DOE-UT FIELD TEST OF PCTB CORING SYSTEM

DOE-UT Onshore Test for PCTB II Pressure Coring System

		Rig Floor Report									
Core	Date	Time Deployed	WL RIH (ft/min)	WL RIH (gpm)	Time Start Coring	Time End Coring	Coring Time (hr)	Interval (ftbrf)	Cored (ft)	Rcvr'd (ft)	% Recovery
P1	12/10/15	17:10	175	50	17:30	20:45	3:15	1948	5.00	2.17	43.3%
P2	12/11/15	18:20	175	50	19:00	21:22	2:22	1992	5.8	3.00	51.7%
P3	12/14/15	10:05	175	50	10:35	13:03	2:28	2060	4	2.92	72.9%
P4	12/14/15	20:15	175	50	20:55	22:30	1:35	2064	5.20	0.67	12.9%
W1	12/15/15	8:55	175	50	9:10	9:10	0:00	2051			
W2	12/15/15	10:41	175	50	10:56	10:56	0:00	2051			
P5	12/15/15	12:45	175	50	13:10	14:13	1:03	2069	1.10	0.00	0.0%
P6	12/16/15	5:45	175	50	6:22	7:07	0:45	2070	5.43	2.83	52.2%
P7	12/16/15	8:33	175	50	8:55	10:15	1:20	2075	1.40	1.67	119.3%
P8	12/16/15	12:58	175	50	13:09	14:19	1:10	2076	2.17	2.42	111.4%

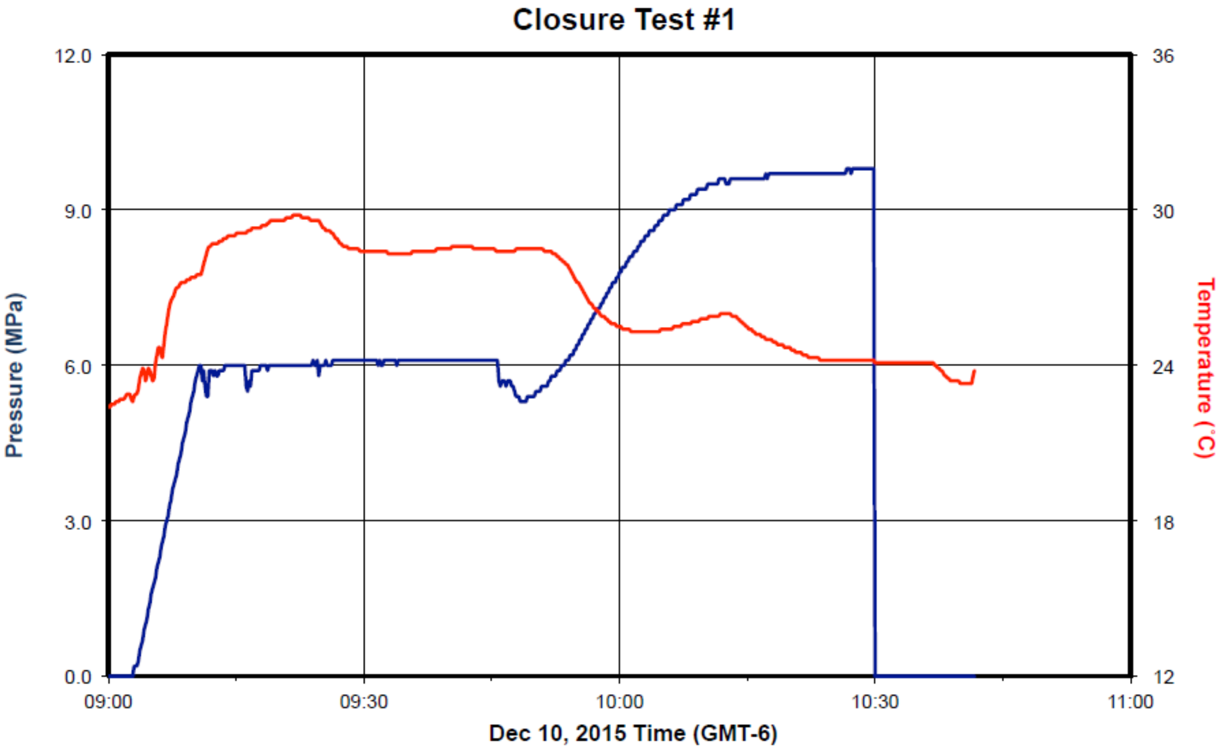
		Rig Floor Report									
Core	Date	WOB (avg*)	WOB (max*)	RPM (ave*)	GPM (ave*)	SPP (psi ave*)	ROP (ft/hr)	POOH on WL (ft/min)	POOH on WL (gpm)	Time On Deck	Ball Closed
P1	12/10/15	13.7	17.1	78.8	201.0	262.4	1.54	150	50	21:10	yes
P2	12/11/15	11.7	17.2	89.2	216.5	277.7	2.45	150	35	22:09	yes
P3	12/14/15	13.1	15.0	64.2	203.0	276.8	1.62	150	35	13:32	no
P4	12/14/15	17.5	19.4	105.9	297.0	568.9	3.27	150	35	22:58	no
W1	12/15/15							150	35	9:35	yes
W2	12/15/15							150	35	11:29	yes
P5	12/15/15	5.7	7.0	50	262.0	337.5	1.05	150	35	14:33	yes
P6	12/16/15	8.5	12.5	80	250.0	330.9	7.24	150	35	7:39	yes
P7	12/16/15	10.3	12.2	71.7	250.0	357.2	1.05	150	35	10:32	yes
P8	12/16/15	9.8	11.3	85.7	250.9	357.0	1.85	150	35	14:55	yes

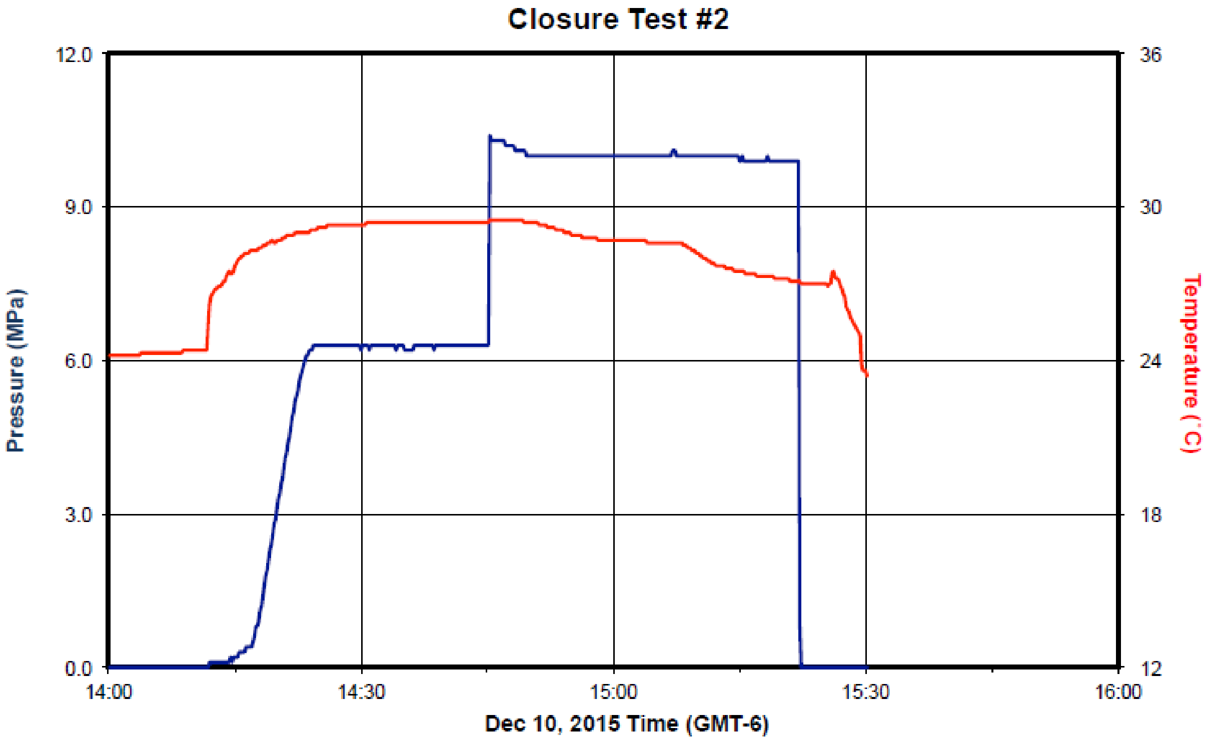
Notes:

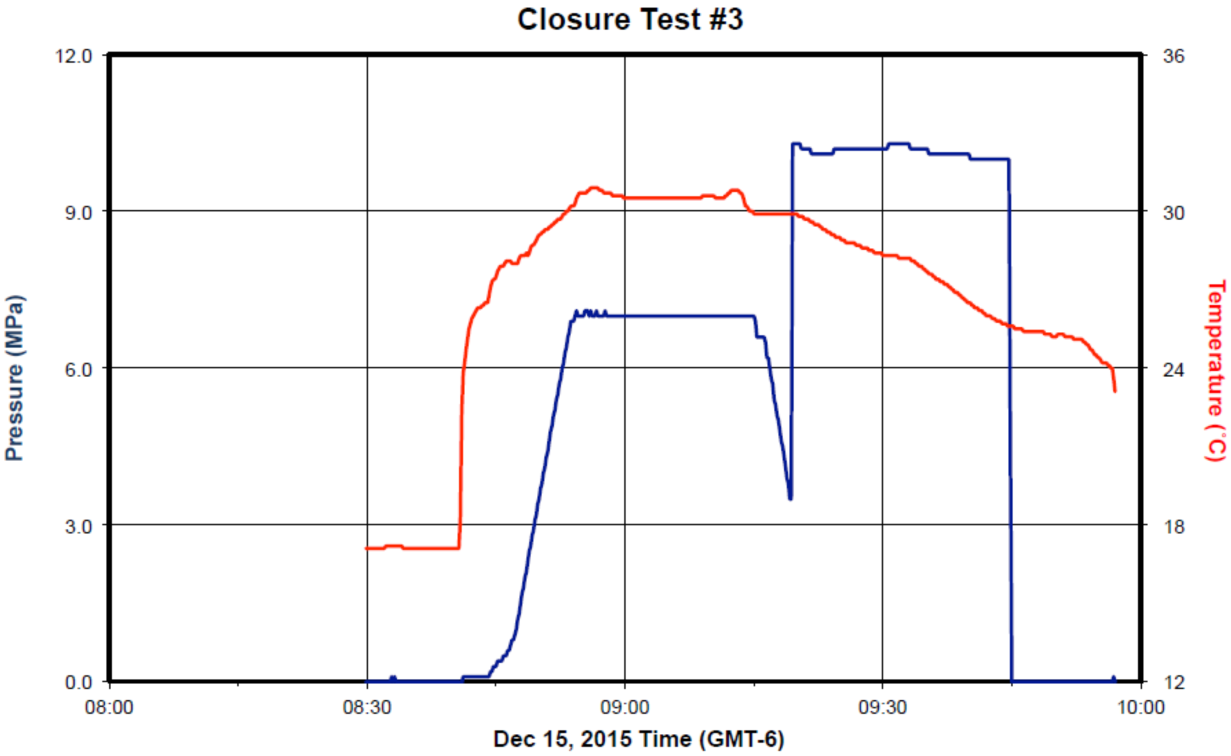
* These values are taken from a set of discreet data points manually recorded

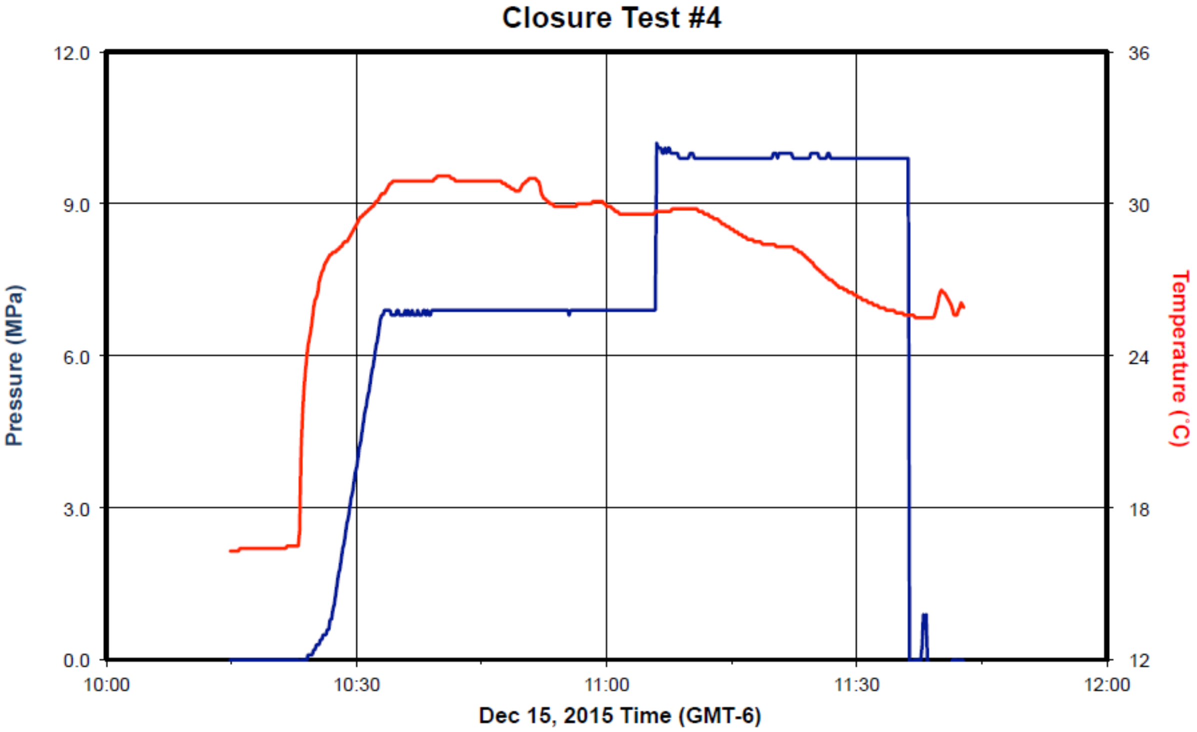
		Coring Run Report							Post-Run Status
Core	Date	PC Section	Autoclave	Core Catcher Kit	DST (Plug)	DST (Rabbit)	Set Pressure (psi)	Reservoir Pressure (psi)	Transducer Pressure (psi)
P1	12/10/15	4	4	slip+bsk	7055	N/A	1514	3807	1490
P2	12/11/15	3	3	bsk	7604	N/A	1542	3798	0
P3	12/14/15	4	4	slip	7064	N/A	1575	3864	0
P4	12/14/15	3	3	slip	7073	N/A	1542	3830	0
W1	12/15/15	4	4		7076	N/A	1541	3809	1484
W2	12/15/15	3	3		7073	N/A	1525	3832	1486
P5	12/15/15	4	4	slip	7072	N/A	1565	3886	1494
P6	12/16/15	4	4	slip	7073	N/A	1546	3802	0
P7	12/16/15	3	3	slip	7077	N/A	1542	3858	1710
P8	12/16/15	4	4	non-skrt. slip	7071	N/A	1558	3862	1501

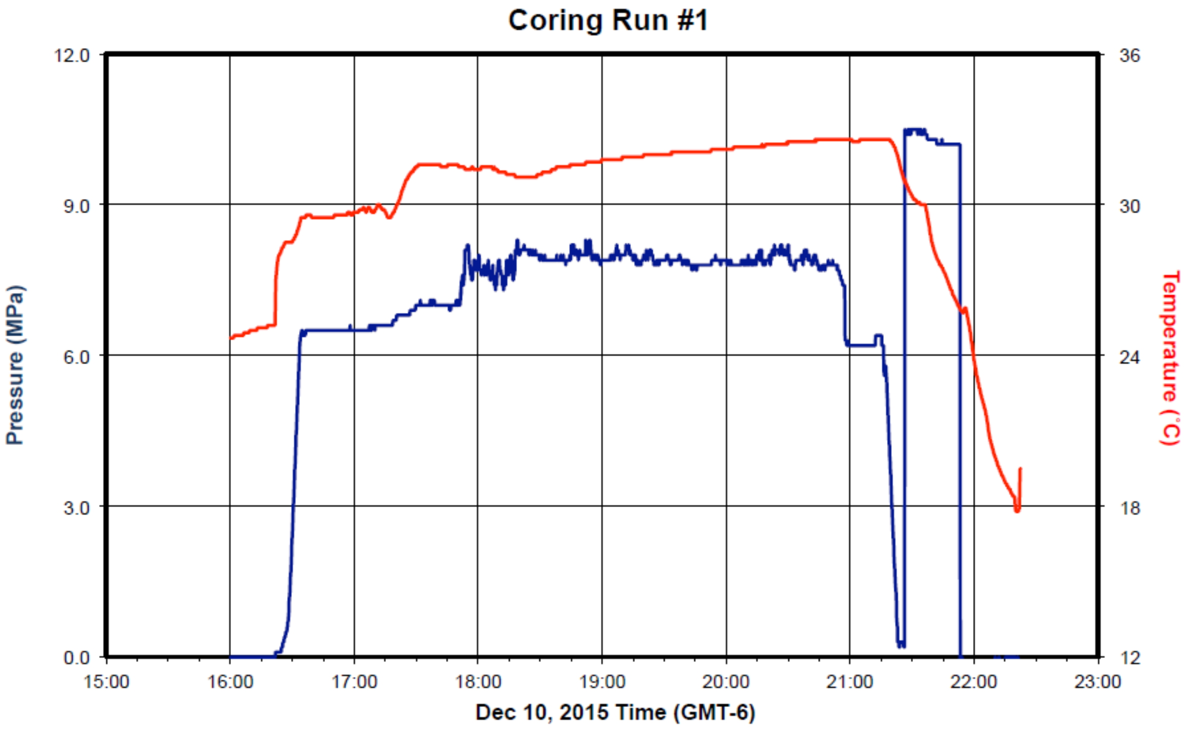
2. DST (FISH PILL) PLOTS FROM TOOL RUNS

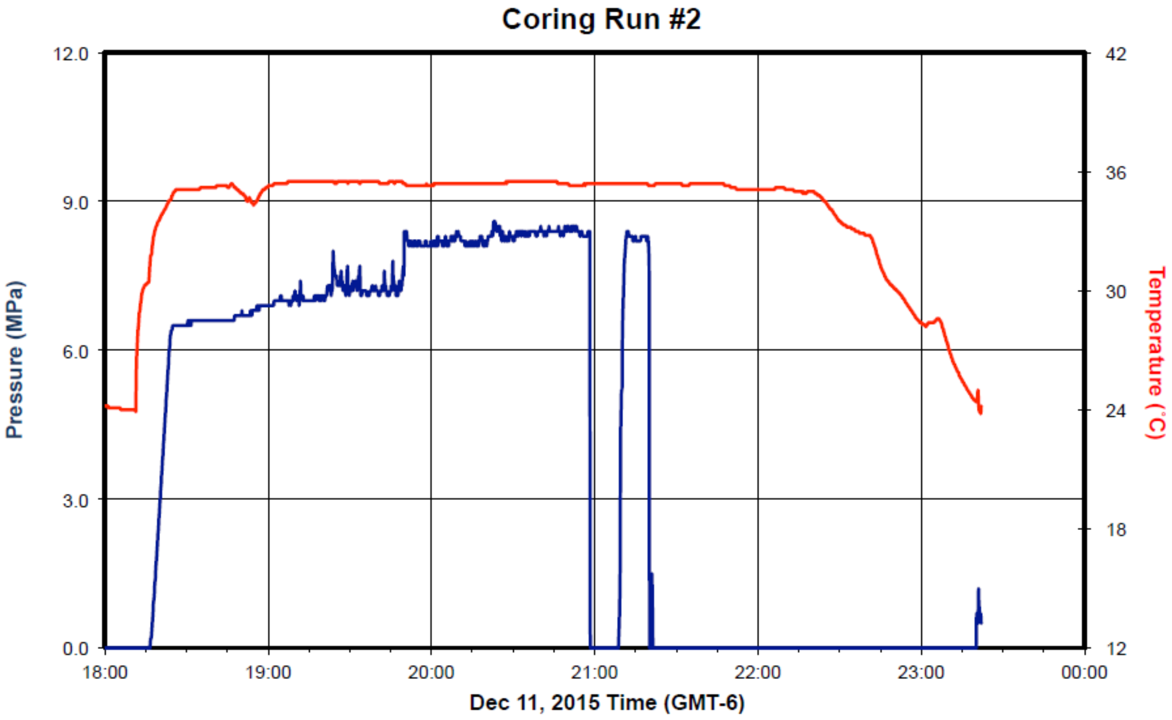


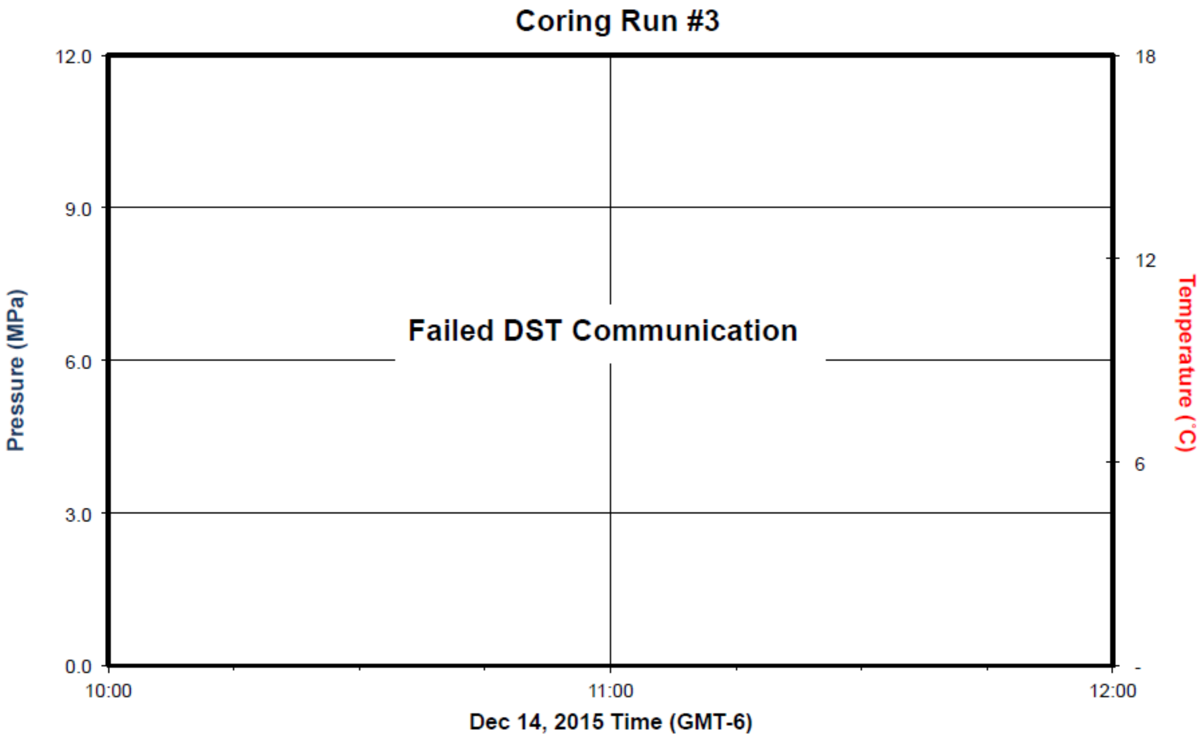


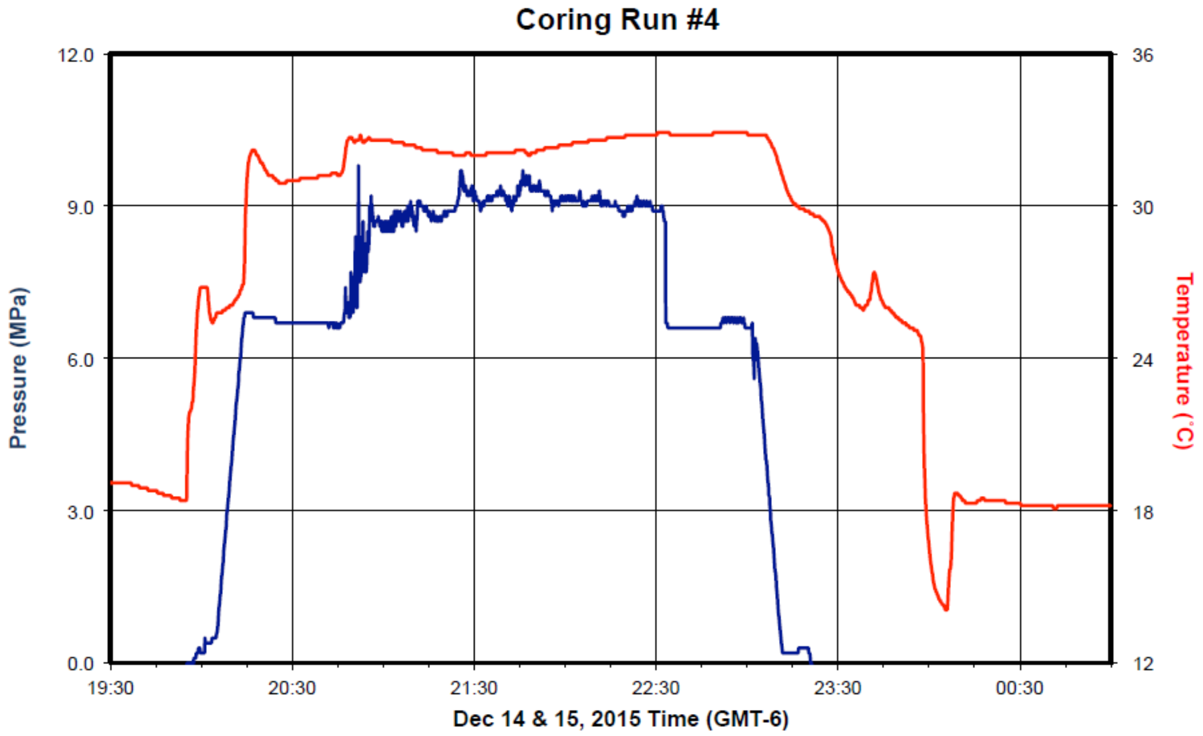

Closure Test #3
12.0
9.0
6.0
3.0
0.0
Pressure (MPa)
36
30
24
18
12
Temperature (°C)
08:00
08:30
09:00
09:30
10:00
Dec 15, 2015 Time (GMT-6)

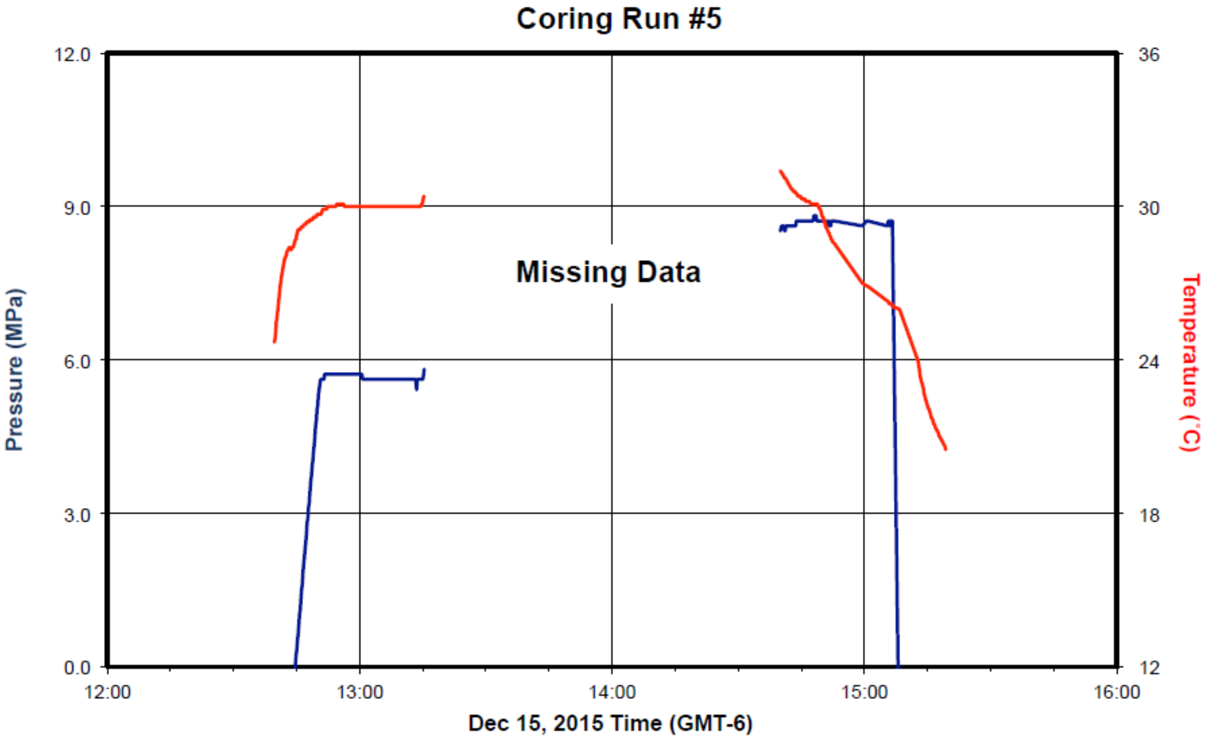

Closure Test #4
12.0
9.0
6.0
3.0
0.0
Pressure (MPa)
36
30
24
18
12
Temperature (°C)
10:00
10:30
11:00
11:30
12:00
Dec 15, 2015 Time (GMT-6)

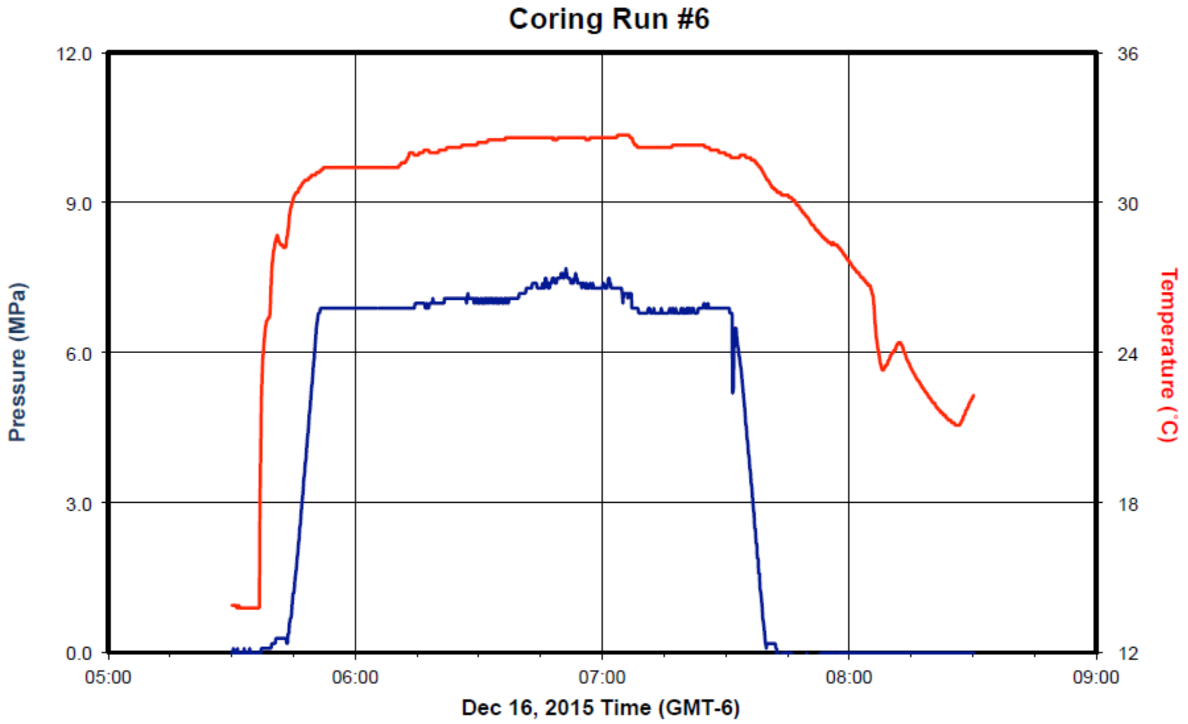

Coring Run #1
Pressure (MPa)
12.0
9.0
6.0
3.0
0.0
Temperature (˚C)
36
30
24
18
12
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
Dec 10, 2015 Time (GMT-6)

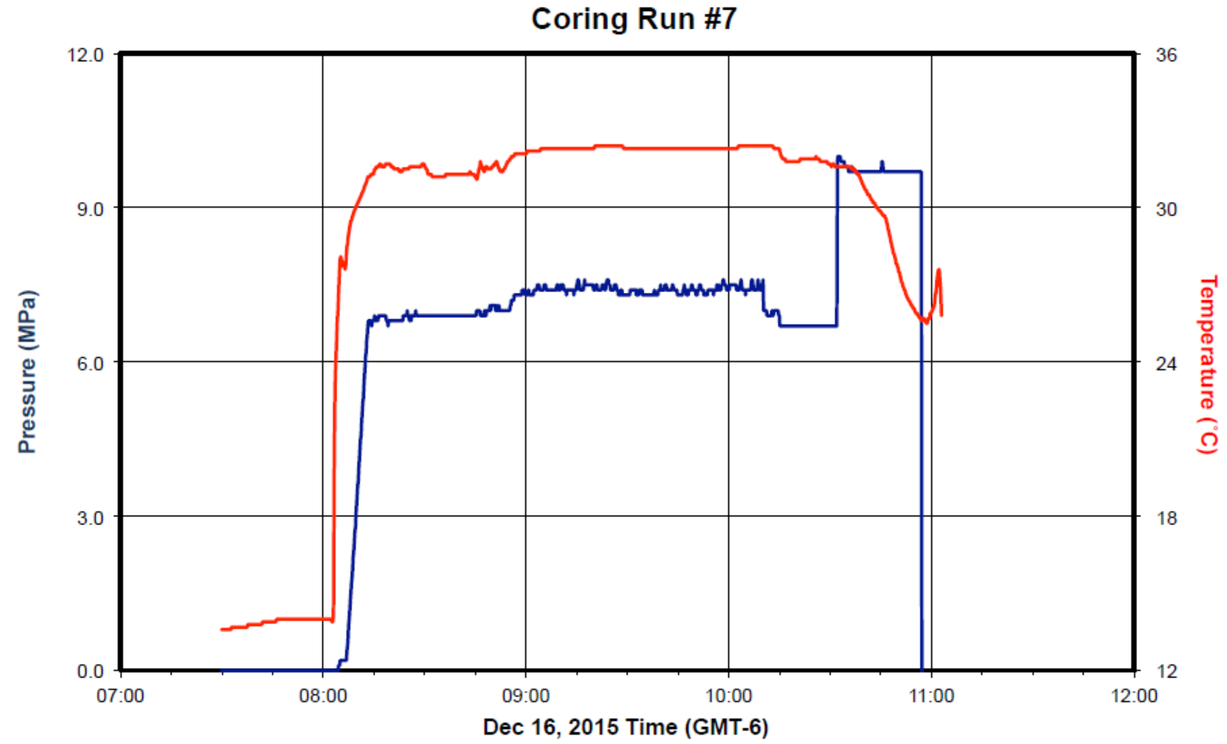

Coring Run #2
Pressure (MPa)
12.0
9.0
6.0
3.0
0.0
Temperature (˚C)
42
36
30
24
18
12
18:00
19:00
20:00
21:00
22:00
23:00
00:00
Dec 11, 2015 Time (GMT-6)

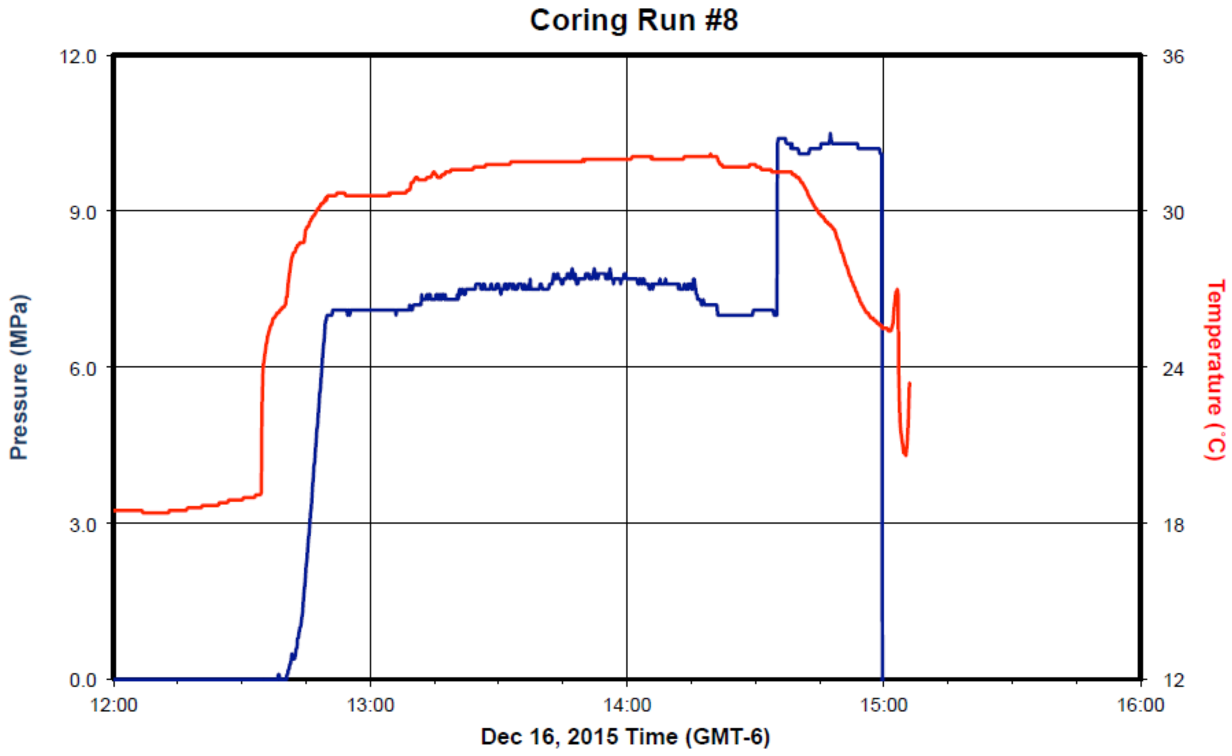

Coring Run #3
Failed DST Communication
Pressure (MPa)
12.0
9.0
6.0
3.0
0.0
Temperature (˚C)
18
12
6
-
10:00
11:00
12:00
Dec 14, 2015 Time (GMT-6)

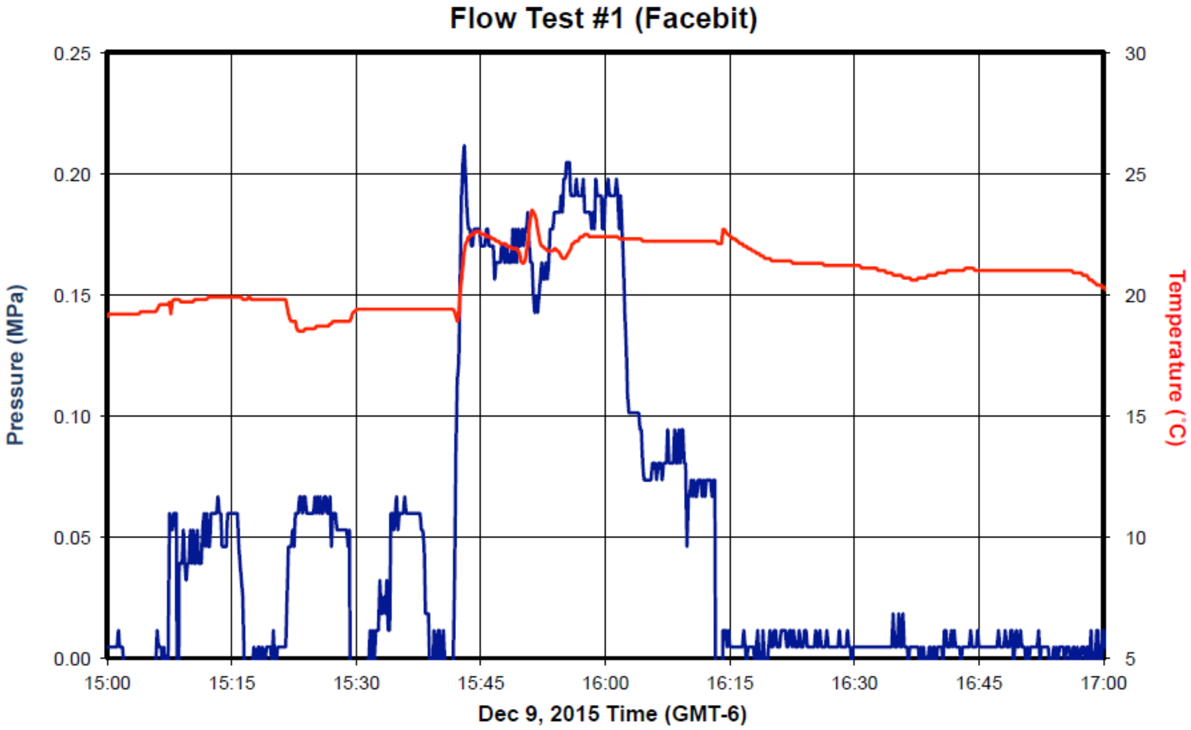

Coring Run #4
Pressure (MPa)
12.0
9.0
6.0
3.0
0.0
Temperature (˚C)
36
30
24
18
12
19:30
20:30
21:30
22:30
23:30
00:30
Dec 14 & 15, 2015 Time (GMT-6)

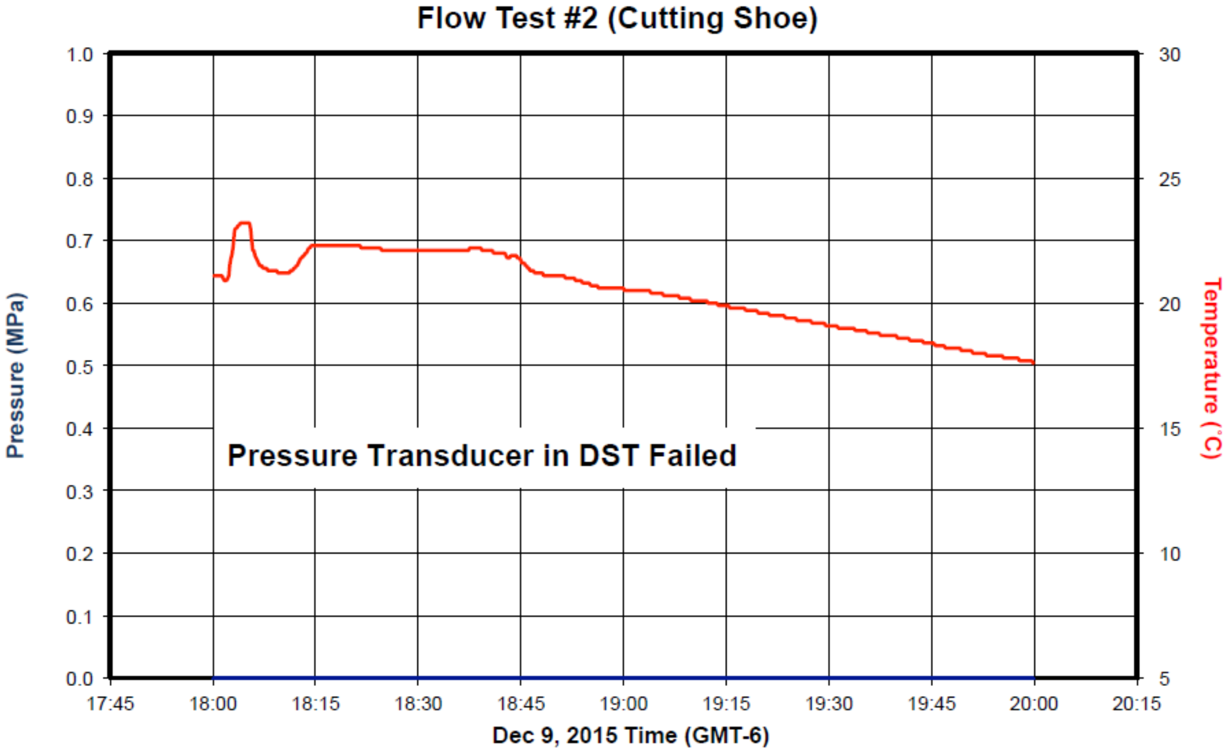

Coring Run #5
Pressure (MPa)
12.0
9.0
6.0
3.0
0.0
Temperature (°C)
36
30
24
18
12
Missing Data
12:00
13:00
14:00
15:00
16:00
Dec 15, 2015 Time (GMT-6)


Coring Run #6
Pressure (MPa)
12.0
9.0
6.0
3.0
0.0
Temperature (°C)
36
30
24
18
12
05:00
06:00
07:00
08:00
09:00
Dec 16, 2015 Time (GMT-6)

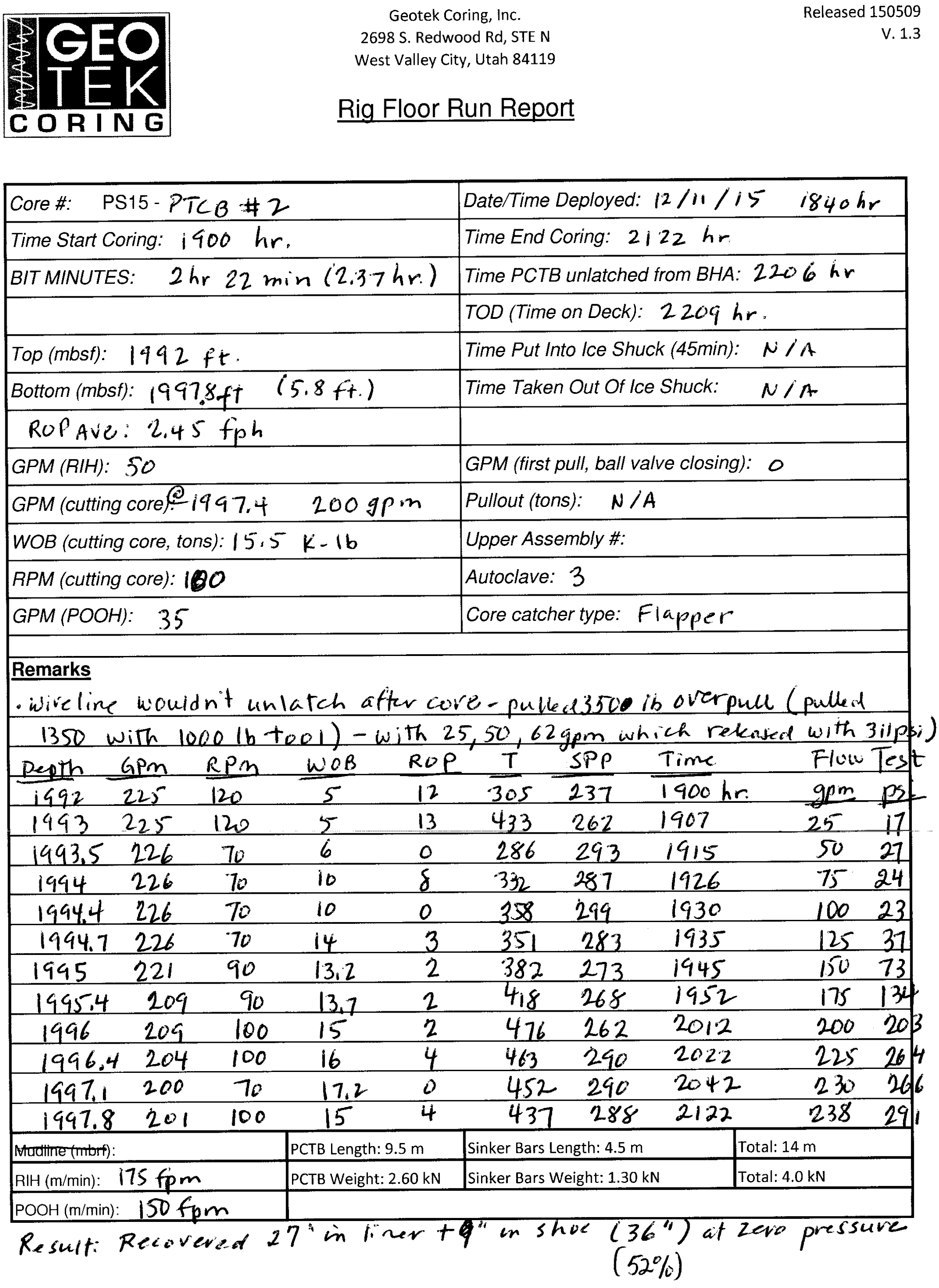

Coring Run #7
Pressure (MPa)
12.0
9.0
6.0
3.0
0.0
Temperature (°C)
36
30
24
18
12
07:00
08:00
09:00
10:00
11:00
12:00
Dec 16, 2015 Time (GMT-6)


Coring Run #8
Pressure (MPa)
12.0
9.0
6.0
3.0
0.0
Temperature (°C)
36
30
24
18
12
12:00
13:00
14:00
15:00
16:00
Dec 16, 2015 Time (GMT-6)


Flow Test #1 (Facebit)
Pressure (MPa)
0.25
0.20
0.15
0.10
0.05
0.00
Temperature (°C)
30
25
20
15
10
5
15:00
15:15
15:30
15:45
16:00
16:15
16:30
16:45
17:00
Dec 9, 2015 Time (GMT-6)


Flow Test #2 (Cutting Shoe)
Pressure (MPa)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Temperature (°C)
30
25
20
15
10
5
Pressure Transducer in DST Failed
17:45
18:00
18:15
18:30
18:45
19:00
19:15
19:30
19:45
20:00
20:15
Dec 9, 2015 Time (GMT-6)

3. COMPILATION OF SCANNED RIG FLOOR REPORTS



Geotek Coring, Inc.
2698 S. Redwood Rd, STE N
West Valley City, Utah 84119

Released 150509
V. 1.3

Rig Floor Run Report

Core #: PS15 - PTCB #2	Date/Time Deployed: 12/11/15 1840 hr
Time Start Coring: 1900 hr.	Time End Coring: 2122 hr
BIT MINUTES: 2 hr 22 min (2.37 hr.)	Time PCTB unlatched from BHA: 2206 hr
	TOD (Time on Deck): 2209 hr.
Top (mbsf): 1992 ft.	Time Put Into Ice Shuck (45min): N/A
Bottom (mbsf): 1997.8 ft (5.8 ft.)	Time Taken Out Of Ice Shuck: N/A
RoP Ave: 2.45 fph	
GPM (RIH): 50	GPM (first pull, ball valve closing): 0
GPM (cutting core): @ 1997.4 200 gpm	Pullout (tons): N/A
WOB (cutting core, tons): 15.5 K-lb	Upper Assembly #:
RPM (cutting core): 100	Autoclave: 3
GPM (POOH): 35	Core catcher type: Flapper

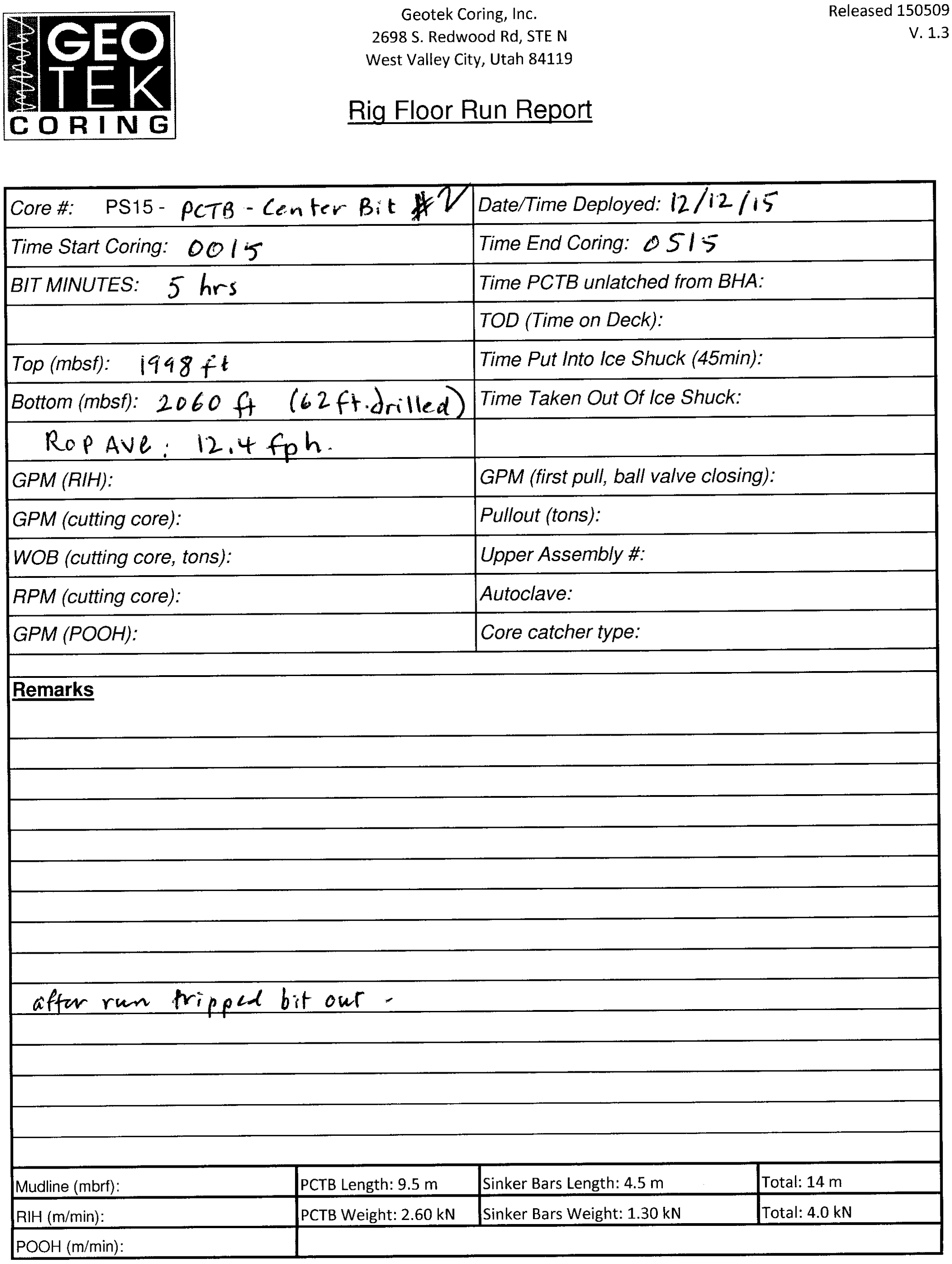
Remarks

- wireline wouldn't unlatch after core - pulled 3500 lb overpull (pulled 1350 with 1000 lb tool) - with 25, 50, 62 gpm which released with 311psi)

Depth	GPM	RPM	WOB	ROP	T	SPP	Time	Flow Test	
1992	225	120	5	12	305	237	1900 hr.	gpm	psi
1993	225	120	5	13	433	262	1907	25	17
1993.5	226	70	6	0	286	293	1915	50	27
1994	226	70	10	8	332	287	1926	75	24
1994.4	226	70	10	0	358	299	1930	100	23
1994.7	226	70	14	3	351	283	1935	125	37
1995	221	90	13.2	2	382	273	1945	150	73
1995.4	209	90	13.7	2	418	268	1952	175	134
1996	209	100	15	2	476	262	2012	200	203
1996.4	204	100	16	4	463	290	2022	225	264
1997.1	200	70	17.2	0	452	290	2042	230	266
1997.8	201	100	15	4	437	288	2122	238	291

~~Mudline (mbrf)~~:	PCTB Length: 9.5 m	Sinker Bars Length: 4.5 m	Total: 14 m
RIH (m/min): 175 fpm	PCTB Weight: 2.60 kN	Sinker Bars Weight: 1.30 kN	Total: 4.0 kN
POOH (m/min): 150 fpm			

Result: Recovered 27" in liner + 9" in shoe (36") at zero pressure (52%)



Geotek Coring, Inc.
2698 S. Redwood Rd, STE N
West Valley City, Utah 84119

Released 150509
V. 1.3

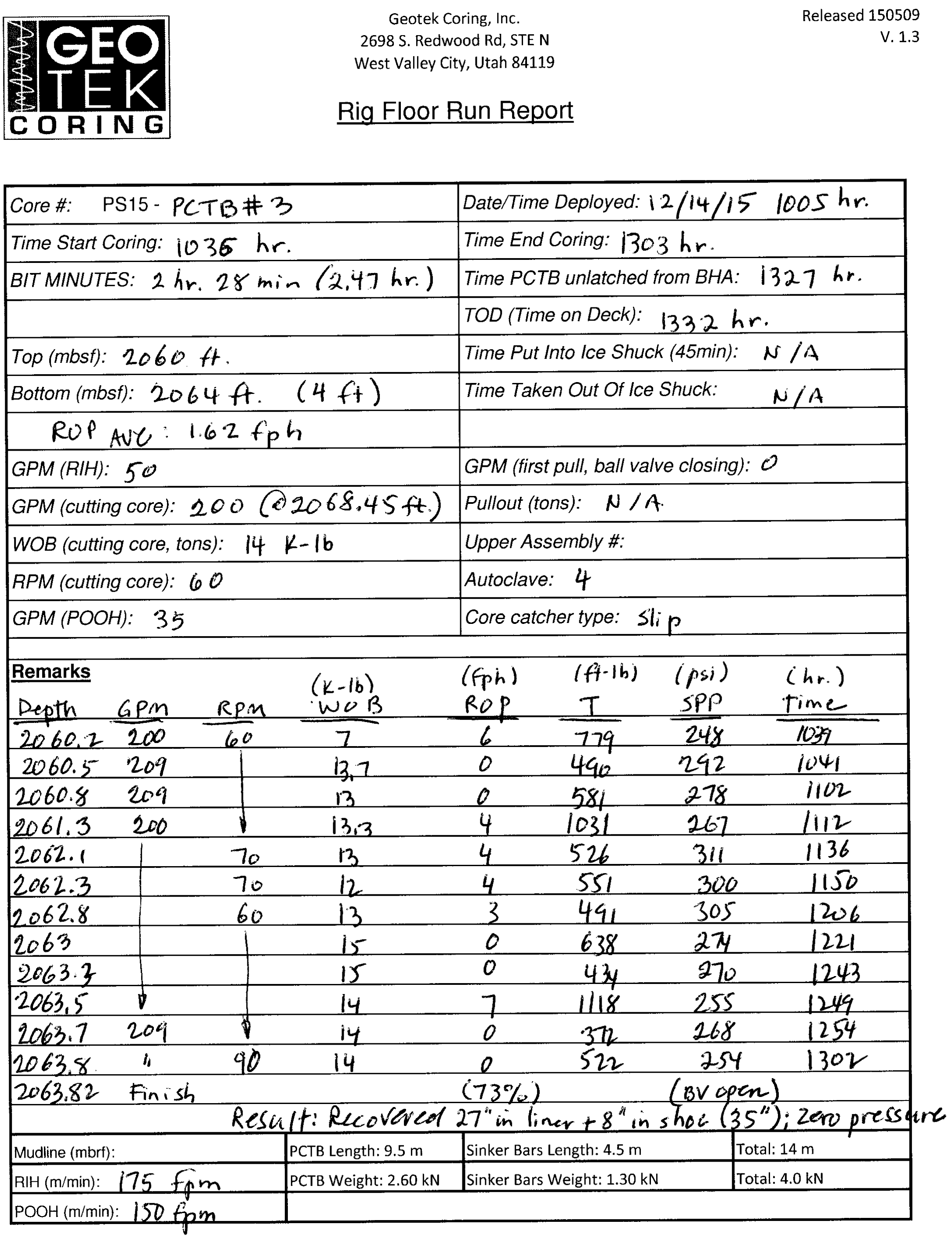
Rig Floor Run Report

Core #: PS15 - PCTB - Center Bit #V	Date/Time Deployed: 12/12/15
Time Start Coring: 0015	Time End Coring: 0515
BIT MINUTES: 5 hrs	Time PCTB unlatched from BHA:
	TOD (Time on Deck):
Top (mbsf): 1998 ft	Time Put Into Ice Shuck (45min):
Bottom (mbsf): 2060 ft (62 ft. drilled)	Time Taken Out Of Ice Shuck:
Rop Ave: 12.4 fph.	
GPM (RIH):	GPM (first pull, ball valve closing):
GPM (cutting core):	Pullout (tons):
WOB (cutting core, tons):	Upper Assembly #:
RPM (cutting core):	Autoclave:
GPM (POOH):	Core catcher type:

Remarks

after run tripped bit out -

Mudline (mbrf):	PCTB Length: 9.5 m	Sinker Bars Length: 4.5 m	Total: 14 m
RIH (m/min):	PCTB Weight: 2.60 kN	Sinker Bars Weight: 1.30 kN	Total: 4.0 kN
POOH (m/min):			



Geotek Coring, Inc.
2698 S. Redwood Rd, STE N
West Valley City, Utah 84119

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V. 1.3

Rig Floor Run Report

Core #: PS15 - PCTB#3	*Date/Time Deployed:* 12/14/15 1005 hr.
Time Start Coring: 1036 hr.	*Time End Coring:* 1303 hr.
BIT MINUTES: 2 hr. 28 min (2.47 hr.)	*Time PCTB unlatched from BHA:* 1327 hr.
	TOD (Time on Deck): 1332 hr.
Top (mbsf): 2060 ft.	*Time Put Into Ice Shuck (45min):* N/A
Bottom (mbsf): 2064 ft. (4 ft)	*Time Taken Out Of Ice Shuck:* N/A
ROP AVG: 1.62 fph	
GPM (RIH): 50	*GPM (first pull, ball valve closing):* 0
GPM (cutting core): 200 (@2068.45 ft.)	*Pullout (tons):* N/A.
WOB (cutting core, tons): 14 K-lb	*Upper Assembly #:*
RPM (cutting core): 60	*Autoclave:* 4
GPM (POOH): 35	*Core catcher type:* Slip

Remarks

Depth	GPM	RPM	(K-lb) WOB	(fph) ROP	(ft-lb) T	(psi) SPP	(hr.) Time
2060.2	200	60	7	6	779	248	1039
2060.5	209	↓	13.7	0	490	292	1041
2060.8	209	↓	13	0	581	278	1102
2061.3	200	↓	13.3	4	1031	267	1112
2062.1	↓	70	13	4	526	311	1136
2062.3	↓	70	12	4	551	300	1150
2062.8	↓	60	13	3	491	305	1206
2063	↓	↓	15	0	638	274	1221
2063.3	↓	↓	15	0	434	270	1243
2063.5	↓	↓	14	7	1118	255	1249
2063.7	209	↓	14	0	372	268	1254
2063.8	"	90	14	0	522	254	1302
2063.82	Finish			(73%)		(BV open)	

Result: Recovered 27" in liner + 8" in shoe (35"); zero pressure

Mudline (mbrf):	PCTB Length: 9.5 m	Sinker Bars Length: 4.5 m	Total: 14 m
RIH (m/min): 175 fpm	PCTB Weight: 2.60 kN	Sinker Bars Weight: 1.30 kN	Total: 4.0 kN
POOH (m/min): 150 fpm			

Geotek Coring, Inc.
2698 S. Redwood Rd, STE N
West Valley City, Utah 84119

Released 150509
V. 1.3

Rig Floor Run Report

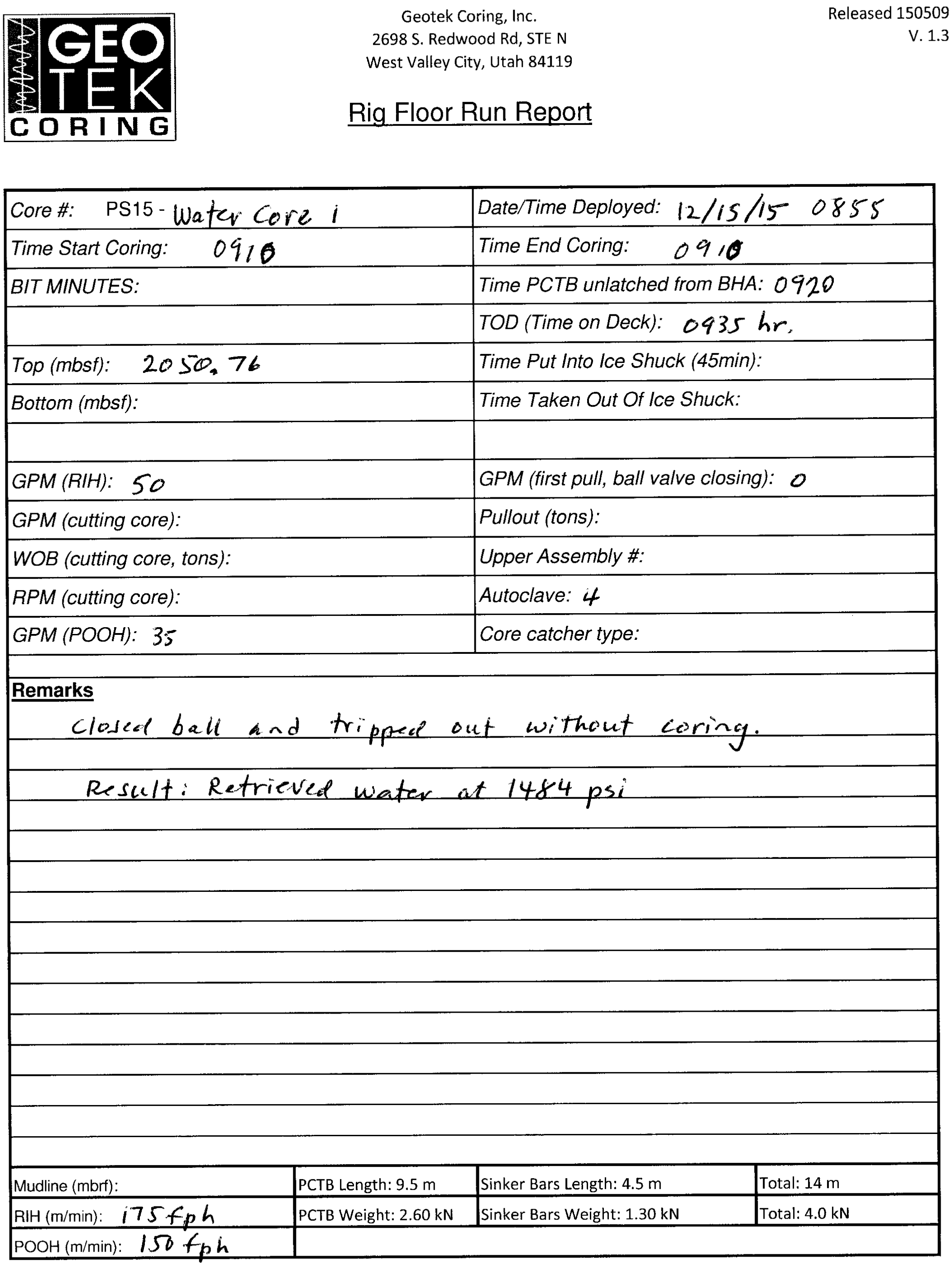
Core #: PS15 - PCTB #4	*Date/Time Deployed:* 12/14/15 2015 hr.
Time Start Coring: 2055 hr.	*Time End Coring:* 2230 hr
BIT MINUTES: 1 hr. 35 min (1.58 hr.)	*Time PCTB unlatched from BHA:* 2250 hr.
	TOD (Time on Deck): 2258 hr.
Top (mbsf): 2063.82	*Time Put Into Ice Shuck (45min):* N/A
Bottom (mbsf): 2069.0 (5.18 ft.)	*Time Taken Out Of Ice Shuck:* N/A
RoP Ave: 3.27 fph	
GPM (RIH): 50	*GPM (first pull, ball valve closing):* 0
GPM (cutting core): 300 @ 2066 ft.	*Pullout (tons):*
WOB (cutting core, tons): 18 K-lb.	*Upper Assembly #:*
RPM (cutting core): 100	*Autoclave:* 3
GPM (POOH): 35	*Core catcher type:* Slip.

Remarks

Depth	GPM	RPM	WoB	ROP	T	SPP	Time
2064.1	276	61	14.5	3	1218	455	2055
2065.5	300	100	16.4	5	820	629	2124
2066	↓	120	18.0	5	927	599	2134
2066.7	↓	120	18.1	5	681	603	2148
2067.7	↓	↓	19.4	0	1500	584	2206
2068.4	↓	↓	18.4	0	680	555	2215
2069	↓	↓	17.5	4	613	557	2230

Results: Recovered 8" in shoe (jammed) with broken liner (13%) with zero pressure - ball open

Mudline (mbrf): ~~175 fpm~~	PCTB Length: 9.5 m	Sinker Bars Length: 4.5 m	Total: 14 m
RIH (m/min): 175.0 fpm	PCTB Weight: 2.60 kN	Sinker Bars Weight: 1.30 kN	Total: 4.0 kN
POOH (m/min): 150 fpm			



Geotek Coring, Inc.
2698 S. Redwood Rd, STE N
West Valley City, Utah 84119

Released 150509
V. 1.3

Rig Floor Run Report

Core #: PS15 - Water Core i	*Date/Time Deployed:* 12/15/15 0855
Time Start Coring: 0910	*Time End Coring:* 0910
BIT MINUTES:	*Time PCTB unlatched from BHA:* 0920
	TOD (Time on Deck): 0935 hr.
Top (mbsf): 2050.76	*Time Put Into Ice Shuck (45min):*
Bottom (mbsf):	*Time Taken Out Of Ice Shuck:*
GPM (RIH): 50	*GPM (first pull, ball valve closing):* 0
GPM (cutting core):	*Pullout (tons):*
WOB (cutting core, tons):	*Upper Assembly #:*
RPM (cutting core):	*Autoclave:* 4
GPM (POOH): 35	*Core catcher type:*

Remarks

Closed ball and tripped out without coring.

Result: Retrieved water at 1484 psi

Mudline (mbrf):	PCTB Length: 9.5 m	Sinker Bars Length: 4.5 m	Total: 14 m
RIH (m/min): 175 fph	PCTB Weight: 2.60 kN	Sinker Bars Weight: 1.30 kN	Total: 4.0 kN
POOH (m/min): 150 fph			

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West Valley City, Utah 84119

Released 150509
V. 1.3

Rig Floor Run Report

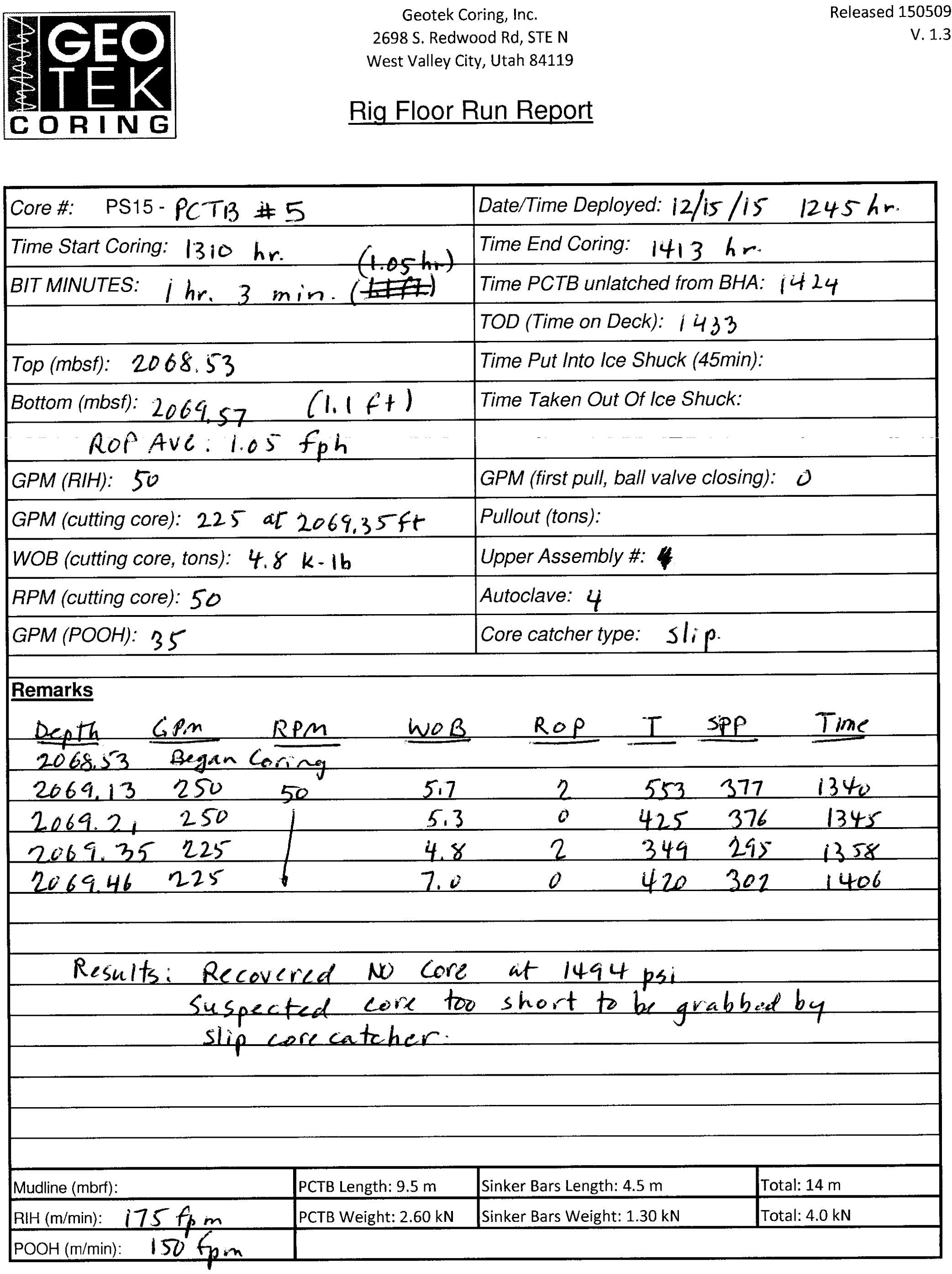
Core #: PS15 - Water core 2	*Date/Time Deployed:* 12/15/15 1041
Time Start Coring: 1056 hr.	*Time End Coring:* 1056 hr.
BIT MINUTES:	*Time PCTB unlatched from BHA:* 1114
	TOD (Time on Deck): 1129
Top (mbsf): 2050.76	*Time Put Into Ice Shuck (45min):*
Bottom (mbsf):	*Time Taken Out Of Ice Shuck:*
GPM (RIH): 50	*GPM (first pull, ball valve closing):* 0
GPM (cutting core):	*Pullout (tons):*
WOB (cutting core, tons):	*Upper Assembly #:*
RPM (cutting core):	*Autoclave:* 3
GPM (POOH): 35	*Core catcher type:*

Remarks

Pumped 5 minutes at 100 gpm prior to closing ball and tripping out.

Result: Retrieved water at 1486 psi.

Mudline (mbrf):	PCTB Length: 9.5 m	Sinker Bars Length: 4.5 m	Total: 14 m
RIH (m/min):	PCTB Weight: 2.60 kN	Sinker Bars Weight: 1.30 kN	Total: 4.0 kN
POOH (m/min):			



Geotek Coring, Inc.
2698 S. Redwood Rd, STE N
West Valley City, Utah 84119

Released 150509
V. 1.3

Rig Floor Run Report

Core #: PS15 - PCTB #5	*Date/Time Deployed:* 12/15/15 1245 hr.
Time Start Coring: 1310 hr. (1.05 hr)	*Time End Coring:* 1413 hr.
BIT MINUTES: 1 hr. 3 min. (~~1.1 ft~~)	*Time PCTB unlatched from BHA:* 1424
	TOD (Time on Deck): 1433
Top (mbsf): 2068.53	*Time Put Into Ice Shuck (45min):*
Bottom (mbsf): 2069.57 (1.1 ft)	*Time Taken Out Of Ice Shuck:*
RoP Ave: 1.05 fph	
GPM (RIH): 50	*GPM (first pull, ball valve closing):* 0
GPM (cutting core): 225 at 2069.35 ft	*Pullout (tons):*
WOB (cutting core, tons): 4.8 k-lb	*Upper Assembly #:* 4
RPM (cutting core): 50	*Autoclave:* 4
GPM (POOH): 35	*Core catcher type:* slip.

Remarks

Depth	GPm	RPM	WoB	RoP	T	SPP	Time
2068.53	Began Coring						
2069.13	250	50	5.7	2	553	377	1340
2069.21	250	↓	5.3	0	425	376	1345
2069.35	225	↓	4.8	2	349	295	1358
2069.46	225	↓	7.0	0	420	302	1406

Results: Recovered NO Core at 1494 psi
Suspected core too short to be grabbed by
slip core catcher.

Mudline (mbrf):	PCTB Length: 9.5 m	Sinker Bars Length: 4.5 m	Total: 14 m
RIH (m/min): 175 fpm	PCTB Weight: 2.60 kN	Sinker Bars Weight: 1.30 kN	Total: 4.0 kN
POOH (m/min): 150 fpm			

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Released 150509
V. 1.3

Rig Floor Run Report

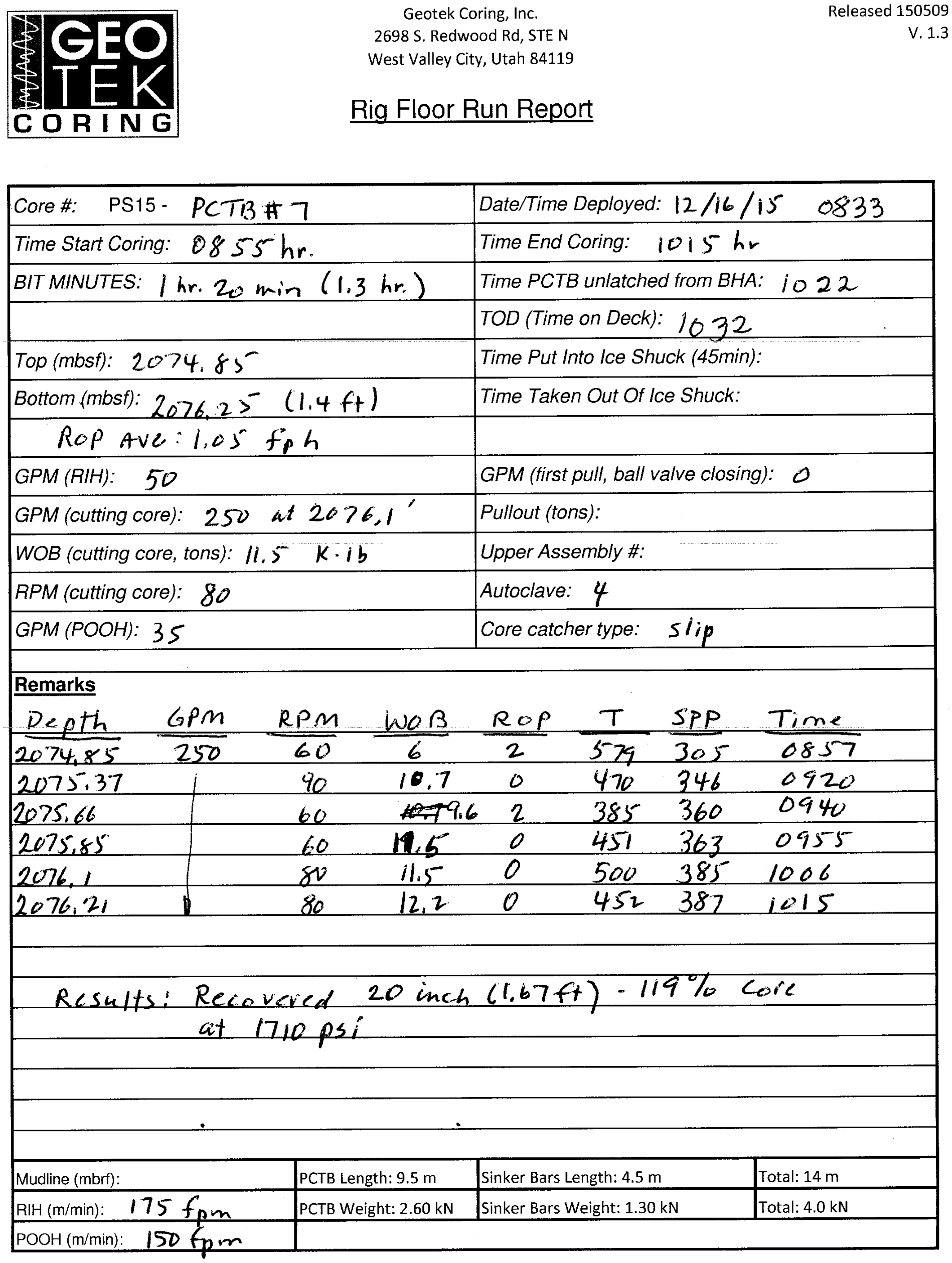
Core #: PS15 - PCTB #6	*Date/Time Deployed:* 12/16/15 0545
Time Start Coring: 0622 hr	*Time End Coring:* 0707
BIT MINUTES: 45 min (.75 hr.)	*Time PCTB unlatched from BHA:* 0719
	TOD (Time on Deck): 0739
Top (mbsf): 2069.57 ft	*Time Put Into Ice Shuck (45min):*
Bottom (mbsf): 2075 ft (5.43 ft)	*Time Taken Out Of Ice Shuck:*
RoP Ave: 7.24 fph	
GPM (RIH): 50	*GPM (first pull, ball valve closing):* 0
GPM (cutting core): 250 at 2072 ft.	*Pullout (tons):*
WOB (cutting core, tons): 8.1 K-lb.	*Upper Assembly #:* 3
RPM (cutting core): 90	*Autoclave:* 3
GPM (POOH): 35	*Core catcher type:* slip

Remarks

Depth	RoP	RPM	GPM	WOB	T	SPP	Time
2069.6	24	60	250	8	507	314	0622
2071	15	60		7.5	918	313	0627
2072	12	90		8.1	919	312	0632
2073	16	90		8.7	1311	314	0637
2074	19	90		4.8	1096	318	0640
2074.7	0	60		8.5	492	341	0649
2074.85	0	100		9.8	840	361	0655
2075	0	90		12.5	650	374	

Results: Recovered 34" core at zero pressure
(52%)

Mudline (mbrf):	PCTB Length: 9.5 m	Sinker Bars Length: 4.5 m	Total: 14 m
RIH (m/min): 175 fpm	PCTB Weight: 2.60 kN	Sinker Bars Weight: 1.30 kN	Total: 4.0 kN
POOH (m/min): 150 fpm			



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2698 S. Redwood Rd, STE N
West Valley City, Utah 84119

Released 150509
V. 1.3

Rig Floor Run Report

Core #: PS15 - PCTB # 7	*Date/Time Deployed:* 12/16/15 0833
Time Start Coring: 0855 hr.	*Time End Coring:* 1015 hr
BIT MINUTES: 1 hr. 20 min (1.3 hr.)	*Time PCTB unlatched from BHA:* 1022
	TOD (Time on Deck): 1032
Top (mbsf): 2074.85	*Time Put Into Ice Shuck (45min):*
Bottom (mbsf): 2076.25 (1.4 ft)	*Time Taken Out Of Ice Shuck:*
ROP Ave: 1.05 fph	
GPM (RIH): 50	*GPM (first pull, ball valve closing):* 0
GPM (cutting core): 250 at 2076.1'	*Pullout (tons):*
WOB (cutting core, tons): 11.5 K·lb	*Upper Assembly #:*
RPM (cutting core): 80	*Autoclave:* 4
GPM (POOH): 35	*Core catcher type:* slip

Remarks

Depth	GPM	RPM	WOB	ROP	T	SPP	Time
2074.85	250	60	6	2	579	305	0857
2075.37		90	10.7	0	470	346	0920
2075.66		60	~~10.7~~ 9.6	2	385	360	0940
2075.85		60	11.5	0	451	363	0955
2076.1		80	11.5	0	500	385	1006
2076.21		80	12.2	0	452	387	1015

Results: Recovered 20 inch (1.67 ft) - 119% core
at 1710 psi

Mudline (mbrf):	PCTB Length: 9.5 m	Sinker Bars Length: 4.5 m	Total: 14 m
RIH (m/min): 175 fpm	PCTB Weight: 2.60 kN	Sinker Bars Weight: 1.30 kN	Total: 4.0 kN
POOH (m/min): 150 fpm			

Geotek Coring, Inc.
2698 S. Redwood Rd, STE N
West Valley City, Utah 84119

Released 150509
V. 1.3

Rig Floor Run Report

Core #: PS15 - PCTB #8	*Date/Time Deployed:* 12/16/15 1258
Time Start Coring: 1309 hr.	*Time End Coring:* 1419 hr
BIT MINUTES: 1 hr 10 min (1.17 hr)	*Time PCTB unlatched from BHA:* 1438
	TOD (Time on Deck): 1455
Top (mbsf): 2076.21	*Time Put Into Ice Shuck (45min):*
Bottom (mbsf): 2078.38 (2.17 ft)	*Time Taken Out Of Ice Shuck:*
Ave RoP : 1.85 fph	
GPM (RIH): 50	*GPM (first pull, ball valve closing):* 0
GPM (cutting core): 251 @ 2078.01 ft.	*Pullout (tons):*
WOB (cutting core, tons): 11.3 K-lb.	*Upper Assembly #:*
RPM (cutting core): 90	*Autoclave:* 3
GPM (POOH): 35	*Core catcher type:* slip - skirtless

Remarks

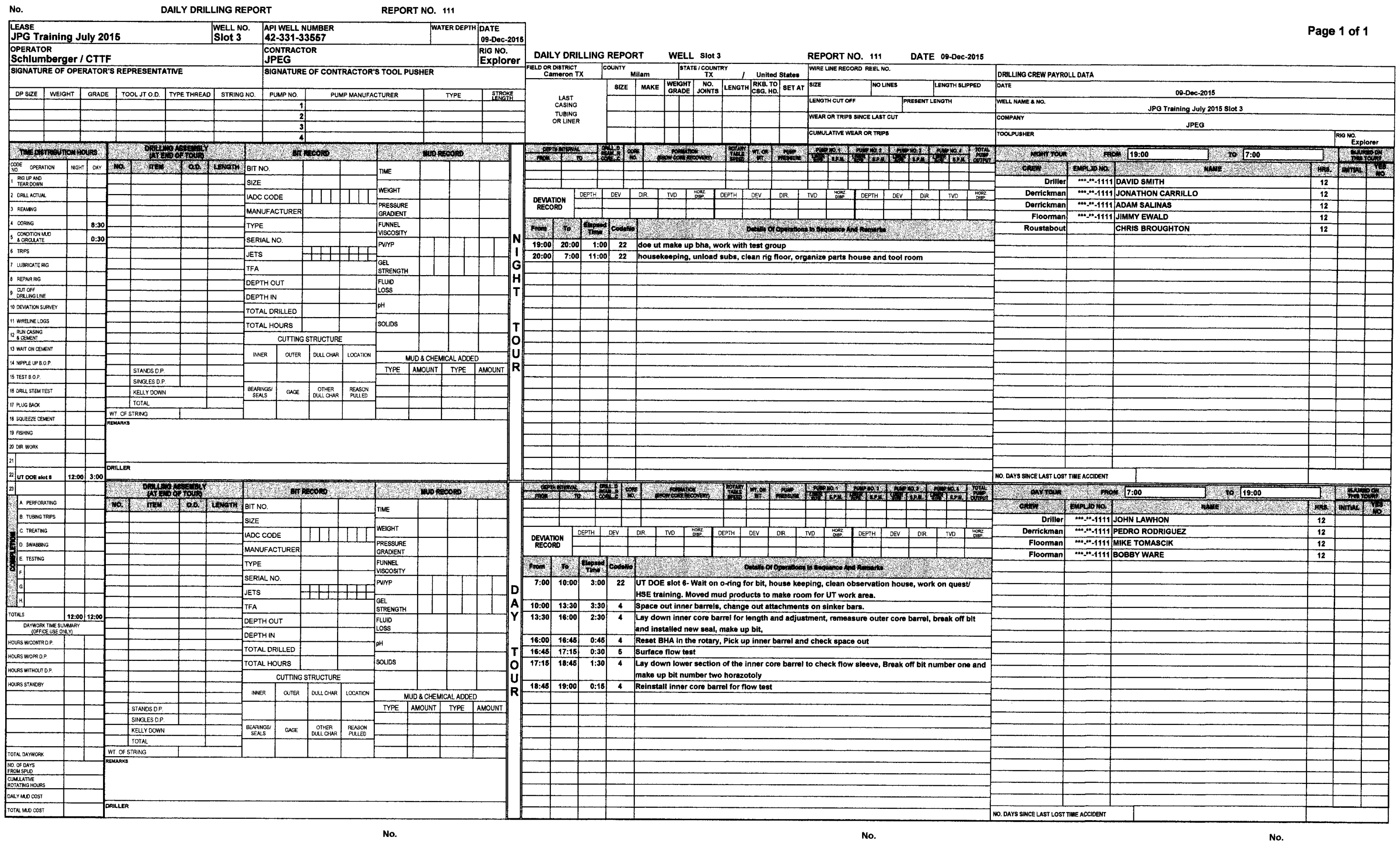
On rig floor, ~~pin~~ tube would not slide after removing pin
Repaired and second tool operated well.

Depth	GPm	RPM	WOB	ROP	T	SPP	Time
2076.9	250	60	6.7	4	576	332	1323
2077.1	251	90	8.3	2	638	356	1331
2077.4			10	7	832	353	1342
2077.7			11.3	4	820	362	1341
2078			11.3	2	518	380	1358
2078.26			10.5	1	320	366	1412
2078.34	↓	↓	10.2	2	408	355	1417

Result: Recovered 29 inches (2.4 ft) 111% at 1501 psi

Mudline (mbrf):	PCTB Length: 9.5 m	Sinker Bars Length: 4.5 m	Total: 14 m
RIH (m/min): 175 fpm	PCTB Weight: 2.60 kN	Sinker Bars Weight: 1.30 kN	Total: 4.0 kN
POOH (m/min): 150 fpm			

4. CTTF DAILY REPORTS



No.　　DAILY DRILLING REPORT　　REPORT NO. 111

LEASE JPG Training July 2015	WELL NO. Slot 3	API WELL NUMBER 42-331-33557	WATER DEPTH	DATE 09-Dec-2015
OPERATOR Schlumberger / CTTF		CONTRACTOR JPEG		RIG NO. Explorer
SIGNATURE OF OPERATOR'S REPRESENTATIVE		SIGNATURE OF CONTRACTOR'S TOOL PUSHER		

DP SIZE	WEIGHT	GRADE	TOOL JT O.D.	TYPE THREAD	STRING NO.	PUMP NO.	PUMP MANUFACTURER	TYPE	STROKE LENGTH
						1			
						2			
						3			
						4			

TIME DISTRIBUTION HOURS

CODE NO.	OPERATION	NIGHT	DAY
1	RIG UP AND TEAR DOWN		
2	DRILL ACTUAL		
3	REAMING		
4	CORING		8:30
5	CONDITION MUD & CIRCULATE		0:30
6	TRIPS		
7	LUBRICATE RIG		
8	REPAIR RIG		
9	CUT OFF DRILLING LINE		
10	DEVIATION SURVEY		
11	WIRELINE LOGS		
12	RUN CASING & CEMENT		
13	WAIT ON CEMENT		
14	NIPPLE UP B.O.P.		
15	TEST B.O.P.		
16	DRILL STEM TEST		
17	PLUG BACK		
18	SQUEEZE CEMENT		
19	FISHING		
20	DIR. WORK		
21			
22	UT DOE slot 6	12:00	3:00
23			
COMPLETION	A. PERFORATING		
	B. TUBING TRIPS		
	C. TREATING		
	D. SWABBING		
	E. TESTING		
	F.		
	G.		
	H.		
TOTALS		12:00	12:00

DAYWORK TIME SUMMARY (OFFICE USE ONLY)

HOURS W/CONTR D.P.

HOURS W/OPR D.P.

HOURS WITHOUT D.P.

HOURS STANDBY

TOTAL DAYWORK

NO. OF DAYS FROM SPUD

CUMULATIVE ROTATING HOURS

DAILY MUD COST

TOTAL MUD COST

DRILLING ASSEMBLY (AT END OF TOUR): NO. | ITEM | O.D. | LENGTH; STANDS D.P.; SINGLES D.P.; KELLY DOWN; TOTAL; WT. OF STRING; REMARKS; DRILLER

BIT RECORD: BIT NO.; SIZE; IADC CODE; MANUFACTURER; TYPE; SERIAL NO.; JETS; TFA; DEPTH OUT; DEPTH IN; TOTAL DRILLED; TOTAL HOURS; CUTTING STRUCTURE: INNER, OUTER, DULL CHAR, LOCATION; BEARINGS/SEALS, GAGE, OTHER DULL CHAR, REASON PULLED

MUD RECORD: TIME; WEIGHT; PRESSURE GRADIENT; FUNNEL VISCOSITY; PV/YP; GEL STRENGTH; FLUID LOSS; pH; SOLIDS; MUD & CHEMICAL ADDED: TYPE, AMOUNT, TYPE, AMOUNT

DAILY DRILLING REPORT　　WELL Slot 3　　REPORT NO. 111　　DATE 09-Dec-2015

FIELD OR DISTRICT Cameron TX	COUNTY Milam	STATE / COUNTRY TX / United States	WIRE LINE RECORD REEL NO.

LAST CASING TUBING OR LINER: SIZE | MAKE | WEIGHT GRADE | NO. JOINTS | LENGTH | RKB. TO CSG. HD. | SET AT

WIRE LINE RECORD: SIZE; NO LINES; LENGTH SLIPPED; LENGTH CUT OFF; PRESENT LENGTH; WEAR OR TRIPS SINCE LAST CUT; CUMULATIVE WEAR OR TRIPS

DEPTH INTERVAL FROM / TO; DRILL D REAM R CORE C; CORE NO.; FORMATION (SHOW CORE RECOVERY); ROTARY TABLE SPEED; WT. ON BIT; PUMP PRESSURE; PUMP NO. 1–4 LINER SIZE, S.P.M.; TOTAL PUMP OUTPUT

DEVIATION RECORD: DEPTH, DEV, DIR., TVD, HORZ. DISP.

NIGHT TOUR

From	To	Elapsed Time	Codeno	Details Of Operations In Sequence And Remarks
19:00	20:00	1:00	22	doe ut make up bha, work with test group
20:00	7:00	11:00	22	housekeeping, unload subs, clean rig floor, organize parts house and tool room

DAY TOUR

From	To	Elapsed Time	Codeno	Details Of Operations In Sequence And Remarks
7:00	10:00	3:00	22	UT DOE slot 6- Wait on o-ring for bit, house keeping, clean observation house, work on quest/ HSE training. Moved mud products to make room for UT work area.
10:00	13:30	3:30	4	Space out inner barrels, change out attachments on sinker bars.
13:30	16:00	2:30	4	Lay down inner core barrel for length and adjustment, remeasure outer core barrel, break off bit and installed new seal, make up bit,
16:00	16:45	0:45	4	Reset BHA in the rotary, Pick up inner barrel and check space out
16:45	17:15	0:30	5	Surface flow test
17:15	18:45	1:30	4	Lay down lower section of the inner core barrel to check flow sleeve, Break off bit number one and make up bit number two horazotoly
18:45	19:00	0:15	4	Reinstall inner core barrel for flow test

Page 1 of 1

DRILLING CREW PAYROLL DATA

DATE 09-Dec-2015

WELL NAME & NO. JPG Training July 2015 Slot 3

COMPANY JPEG

TOOLPUSHER

RIG NO. Explorer

NIGHT TOUR　FROM 19:00　TO 7:00

CREW	EMPL.ID NO.	NAME	HRS.	INJURED ON THIS TOUR? INITIAL	YES NO
Driller	***-**-1111	DAVID SMITH	12		
Derrickman	***-**-1111	JONATHON CARRILLO	12		
Derrickman	***-**-1111	ADAM SALINAS	12		
Floorman	***-**-1111	JIMMY EWALD	12		
Roustabout		CHRIS BROUGHTON	12		

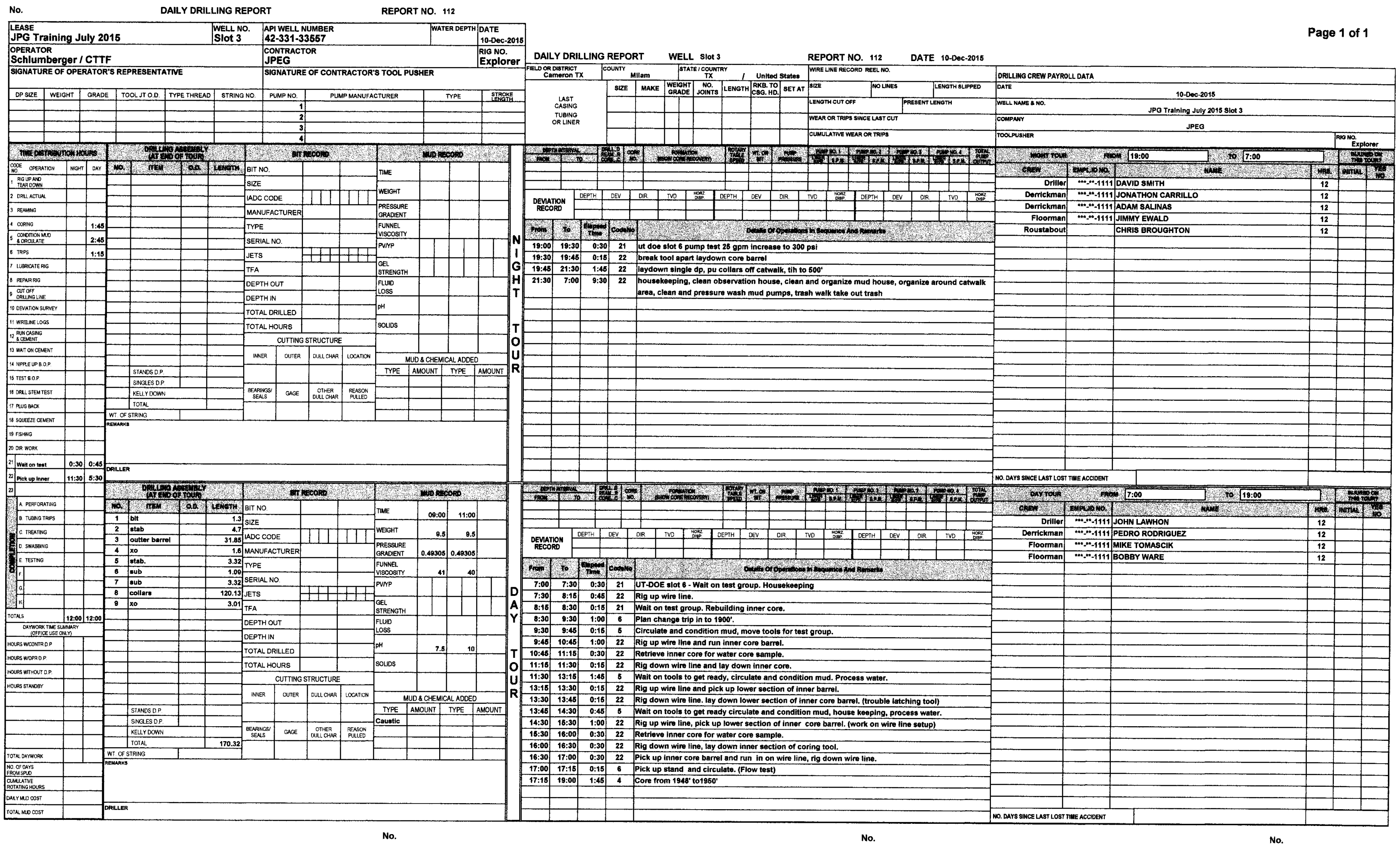
NO. DAYS SINCE LAST LOST TIME ACCIDENT

DAY TOUR　FROM 7:00　TO 19:00

CREW	EMPL.ID NO.	NAME	HRS.	INJURED ON THIS TOUR? INITIAL	YES NO
Driller	***-**-1111	JOHN LAWHON	12		
Derrickman	***-**-1111	PEDRO RODRIGUEZ	12		
Floorman	***-**-1111	MIKE TOMASCIK	12		
Floorman	***-**-1111	BOBBY WARE	12		

NO. DAYS SINCE LAST LOST TIME ACCIDENT

No.　　No.　　No.



No. DAILY DRILLING REPORT REPORT NO. 112

LEASE	WELL NO.	API WELL NUMBER	WATER DEPTH	DATE
JPG Training July 2015	Slot 3	42-331-33557		10-Dec-2015

OPERATOR	CONTRACTOR	RIG NO.
Schlumberger / CTTF	JPEG	Explorer

SIGNATURE OF OPERATOR'S REPRESENTATIVE

SIGNATURE OF CONTRACTOR'S TOOL PUSHER

DP SIZE	WEIGHT	GRADE	TOOL JT O.D.	TYPE THREAD	STRING NO.	PUMP NO.	PUMP MANUFACTURER	TYPE	STROKE LENGTH
						1			
						2			
						3			
						4			

TIME DISTRIBUTION HOURS

CODE NO.	OPERATION	NIGHT	DAY
1	RIG UP AND TEAR DOWN		
2	DRILL ACTUAL		
3	REAMING		
4	CORING		1:45
5	CONDITION MUD & CIRCULATE		2:45
6	TRIPS		1:15
7	LUBRICATE RIG		
8	REPAIR RIG		
9	CUT OFF DRILLING LINE		
10	DEVIATION SURVEY		
11	WIRELINE LOGS		
12	RUN CASING & CEMENT		
13	WAIT ON CEMENT		
14	NIPPLE UP B.O.P.		
15	TEST B.O.P.		
16	DRILL STEM TEST		
17	PLUG BACK		
18	SQUEEZE CEMENT		
19	FISHING		
20	DIR. WORK		
21	Wait on test	0:30	0:45
22	Pick up inner	11:30	5:30
23			
COMPLETION	A. PERFORATING		
	B. TUBING TRIPS		
	C. TREATING		
	D. SWABBING		
	E. TESTING		
	F.		
	G.		
	H.		
TOTALS		12:00	12:00

DAYWORK TIME SUMMARY (OFFICE USE ONLY)

HOURS W/CONTR D.P.

HOURS W/OPR D.P.

HOURS WITHOUT D.P.

HOURS STANDBY

TOTAL DAYWORK

NO. OF DAYS FROM SPUD

CUMULATIVE ROTATING HOURS

DAILY MUD COST

TOTAL MUD COST

NIGHT TOUR

DRILLING ASSEMBLY (AT END OF TOUR): NO. / ITEM / O.D. / LENGTH; STANDS D.P.; SINGLES D.P.; KELLY DOWN; TOTAL; WT. OF STRING

BIT RECORD: BIT NO.; SIZE; IADC CODE; MANUFACTURER; TYPE; SERIAL NO.; JETS; TFA; DEPTH OUT; DEPTH IN; TOTAL DRILLED; TOTAL HOURS; CUTTING STRUCTURE: INNER, OUTER, DULL CHAR, LOCATION; BEARINGS/SEALS, GAGE, OTHER DULL CHAR, REASON PULLED

MUD RECORD: TIME; WEIGHT; PRESSURE GRADIENT; FUNNEL VISCOSITY; PV/YP; GEL STRENGTH; FLUID LOSS; pH; SOLIDS; MUD & CHEMICAL ADDED: TYPE, AMOUNT, TYPE, AMOUNT

REMARKS

DRILLER

DAY TOUR

DRILLING ASSEMBLY (AT END OF TOUR)

NO.	ITEM	O.D.	LENGTH
1	bit		1.3
2	stab		4.7
3	outter barrel		31.85
4	xo		1.6
5	stab.		3.32
6	sub		1.09
7	sub		3.32
8	collars		120.13
9	xo		3.01
	STANDS D.P.		
	SINGLES D.P.		
	KELLY DOWN		
	TOTAL		170.32

WT. OF STRING

BIT RECORD: BIT NO.; SIZE; IADC CODE; MANUFACTURER; TYPE; SERIAL NO.; JETS; TFA; DEPTH OUT; DEPTH IN; TOTAL DRILLED; TOTAL HOURS; CUTTING STRUCTURE: INNER, OUTER, DULL CHAR, LOCATION; BEARINGS/SEALS, GAGE, OTHER DULL CHAR, REASON PULLED

MUD RECORD

TIME	09:00	11:00	
WEIGHT	9.5	9.5	
PRESSURE GRADIENT	0.49305	0.49305	
FUNNEL VISCOSITY	41	40	
PV/YP			
GEL STRENGTH			
FLUID LOSS			
pH	7.5	10	
SOLIDS			

MUD & CHEMICAL ADDED

TYPE	AMOUNT	TYPE	AMOUNT
Caustic			

REMARKS

DRILLER

No.

DAILY DRILLING REPORT WELL Slot 3 REPORT NO. 112 DATE 10-Dec-2015

FIELD OR DISTRICT	COUNTY	STATE / COUNTRY
Cameron TX	Milam	TX / United States

LAST CASING TUBING OR LINER: SIZE / MAKE / WEIGHT GRADE / NO. JOINTS / LENGTH / RKB. TO CSG. HD. / SET AT

WIRE LINE RECORD REEL NO.; SIZE; NO LINES; LENGTH SLIPPED; LENGTH CUT OFF; PRESENT LENGTH; WEAR OR TRIPS SINCE LAST CUT; CUMULATIVE WEAR OR TRIPS

DEPTH INTERVAL FROM / TO; DRILL D REAM R CORE C; CORE NO.; FORMATION (SHOW CORE RECOVERY); ROTARY TABLE SPEED; WT. ON BIT; PUMP PRESSURE; PUMP NO. 1–4 LINER SIZE / S.P.M.; TOTAL PUMP OUTPUT

DEVIATION RECORD: DEPTH / DEV / DIR. / TVD / HORZ. DISP.

NIGHT TOUR

From	To	Elapsed Time	CodeNo	Details Of Operations In Sequence And Remarks
19:00	19:30	0:30	21	ut doe slot 6 pump test 25 gpm increase to 300 psi
19:30	19:45	0:15	22	break tool apart laydown core barrel
19:45	21:30	1:45	22	laydown single dp, pu collars off catwalk, tih to 500'
21:30	7:00	9:30	22	housekeeping, clean observation house, clean and organize mud house, organize around catwalk area, clean and pressure wash mud pumps, trash walk take out trash

DAY TOUR

From	To	Elapsed Time	CodeNo	Details Of Operations In Sequence And Remarks
7:00	7:30	0:30	21	UT-DOE slot 6 - Wait on test group. Housekeeping
7:30	8:15	0:45	22	Rig up wire line.
8:15	8:30	0:15	21	Wait on test group. Rebuilding inner core.
8:30	9:30	1:00	6	Plan change trip in to 1900'.
9:30	9:45	0:15	5	Circulate and condition mud, move tools for test group.
9:45	10:45	1:00	22	Rig up wire line and run inner core barrel.
10:45	11:15	0:30	22	Retrieve inner core for water core sample.
11:15	11:30	0:15	22	Rig down wire line and lay down inner core.
11:30	13:15	1:45	5	Wait on tools to get ready, circulate and condition mud. Process water.
13:15	13:30	0:15	22	Rig up wire line and pick up lower section of inner barrel.
13:30	13:45	0:15	22	Rig down wire line. lay down lower section of inner core barrel. (trouble latching tool)
13:45	14:30	0:45	5	Wait on tools to get ready circulate and condition mud, house keeping, process water.
14:30	15:30	1:00	22	Rig up wire line, pick up lower section of inner core barrel. (work on wire line setup)
15:30	16:00	0:30	22	Retrieve inner core for water core sample.
16:00	16:30	0:30	22	Rig down wire line, lay down inner section of coring tool.
16:30	17:00	0:30	22	Pick up inner core barrel and run in on wire line, rig down wire line.
17:00	17:15	0:15	6	Pick up stand and circulate. (Flow test)
17:15	19:00	1:45	4	Core from 1948' to1950'

No.

Page 1 of 1

DRILLING CREW PAYROLL DATA

DATE 10-Dec-2015

WELL NAME & NO. JPG Training July 2015 Slot 3

COMPANY JPEG

TOOLPUSHER

RIG NO. Explorer

NIGHT TOUR FROM 19:00 TO 7:00

CREW	EMPL.ID NO.	NAME	HRS.	INJURED ON THIS TOUR? INITIAL	YES NO
Driller	***-**-1111	DAVID SMITH	12		
Derrickman	***-**-1111	JONATHON CARRILLO	12		
Derrickman	***-**-1111	ADAM SALINAS	12		
Floorman	***-**-1111	JIMMY EWALD	12		
Roustabout		CHRIS BROUGHTON	12		

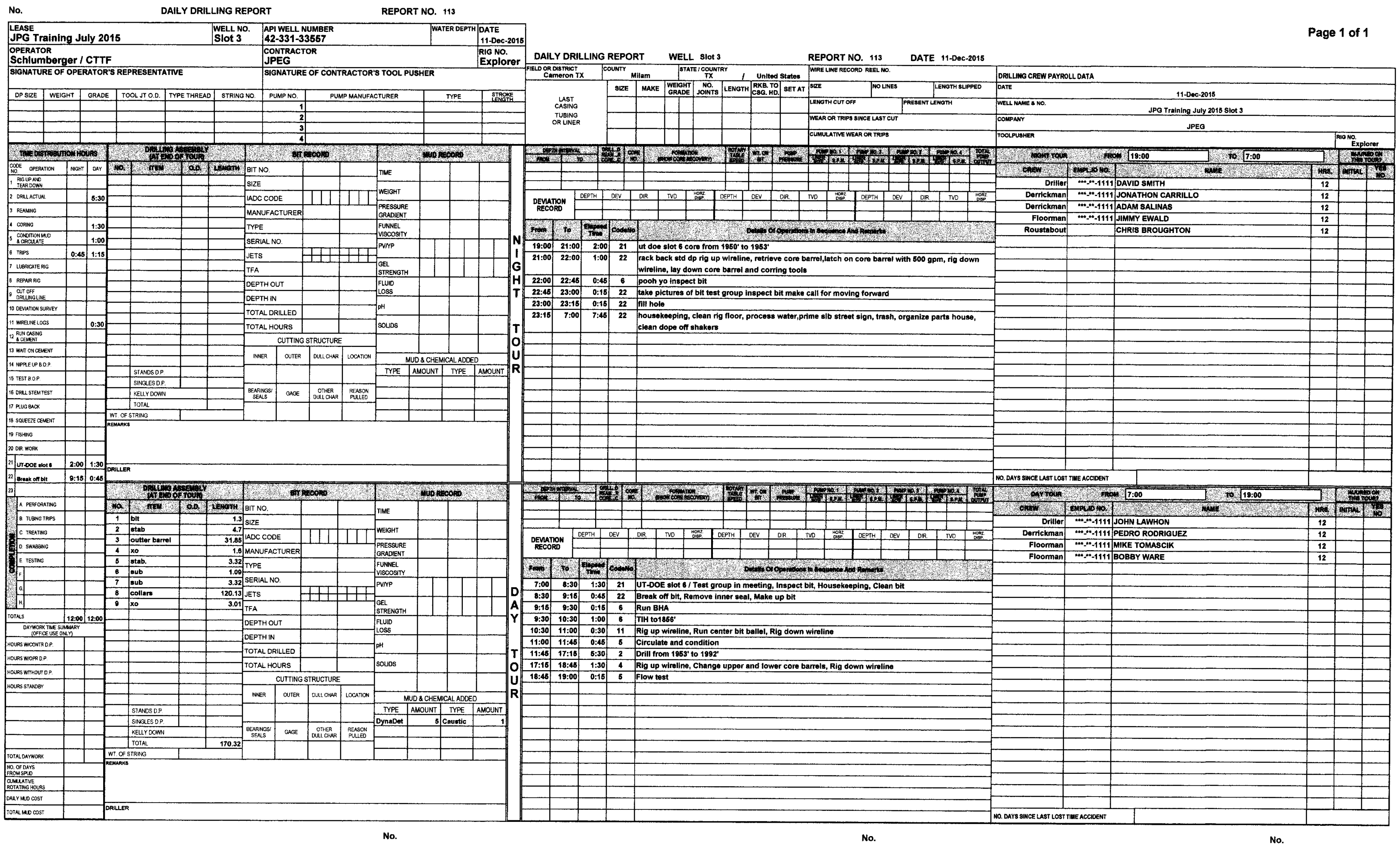
NO. DAYS SINCE LAST LOST TIME ACCIDENT

DAY TOUR FROM 7:00 TO 19:00

CREW	EMPL.ID NO.	NAME	HRS.	INJURED ON THIS TOUR? INITIAL	YES NO
Driller	***-**-1111	JOHN LAWHON	12		
Derrickman	***-**-1111	PEDRO RODRIGUEZ	12		
Floorman	***-**-1111	MIKE TOMASCIK	12		
Floorman	***-**-1111	BOBBY WARE	12		

NO. DAYS SINCE LAST LOST TIME ACCIDENT

No.



No.

DAILY DRILLING REPORT

REPORT NO. 113

LEASE JPG Training July 2015	WELL NO. Slot 3	API WELL NUMBER 42-331-33557	WATER DEPTH	DATE 11-Dec-2015
OPERATOR Schlumberger / CTTF		CONTRACTOR JPEG		RIG NO. Explorer
SIGNATURE OF OPERATOR'S REPRESENTATIVE		SIGNATURE OF CONTRACTOR'S TOOL PUSHER		

DP SIZE	WEIGHT	GRADE	TOOL JT O.D.	TYPE THREAD	STRING NO.	PUMP NO.	PUMP MANUFACTURER	TYPE	STROKE LENGTH
						1			
						2			
						3			
						4			

TIME DISTRIBUTION HOURS

CODE NO.	OPERATION	NIGHT	DAY
1	RIG UP AND TEAR DOWN		
2	DRILL ACTUAL		5:30
3	REAMING		
4	CORING		1:30
5	CONDITION MUD & CIRCULATE		1:00
6	TRIPS	0:45	1:15
7	LUBRICATE RIG		
8	REPAIR RIG		
9	CUT OFF DRILLING LINE		
10	DEVIATION SURVEY		
11	WIRELINE LOGS		0:30
12	RUN CASING & CEMENT		
13	WAIT ON CEMENT		
14	NIPPLE UP B.O.P.		
15	TEST B.O.P.		
16	DRILL STEM TEST		
17	PLUG BACK		
18	SQUEEZE CEMENT		
19	FISHING		
20	DIR. WORK		
21	UT-DOE slot 6	2:00	1:30
22	Break off bit	9:15	0:45
23			
COMPLETION A.	PERFORATING		
B.	TUBING TRIPS		
C.	TREATING		
D.	SWABBING		
E.	TESTING		
F.			
G.			
H.			
TOTALS		12:00	12:00

DAYWORK TIME SUMMARY (OFFICE USE ONLY)

HOURS W/CONTR D.P.

HOURS W/OPR D.P.

HOURS WITHOUT D.P.

HOURS STANDBY

TOTAL DAYWORK

NO. OF DAYS FROM SPUD

CUMULATIVE ROTATING HOURS

DAILY MUD COST

TOTAL MUD COST

NIGHT TOUR

DRILLING ASSEMBLY (AT END OF TOUR): NO. | ITEM | O.D. | LENGTH; STANDS D.P.; SINGLES D.P.; KELLY DOWN; TOTAL; WT. OF STRING

BIT RECORD: BIT NO.; SIZE; IADC CODE; MANUFACTURER; TYPE; SERIAL NO.; JETS; TFA; DEPTH OUT; DEPTH IN; TOTAL DRILLED; TOTAL HOURS; CUTTING STRUCTURE: INNER, OUTER, DULL CHAR, LOCATION; BEARINGS/SEALS, GAGE, OTHER DULL CHAR, REASON PULLED

MUD RECORD: TIME; WEIGHT; PRESSURE GRADIENT; FUNNEL VISCOSITY; PV/YP; GEL STRENGTH; FLUID LOSS; pH; SOLIDS

MUD & CHEMICAL ADDED: TYPE | AMOUNT | TYPE | AMOUNT

REMARKS

DRILLER

DAY TOUR

DRILLING ASSEMBLY (AT END OF TOUR)

NO.	ITEM	O.D.	LENGTH
1	bit		1.3
2	stab		4.7
3	outter barrel		31.85
4	xo		1.6
5	stab.		3.32
6	sub		1.09
7	sub		3.32
8	collars		120.13
9	xo		3.01
	STANDS D.P.		
	SINGLES D.P.		
	KELLY DOWN		
	TOTAL		170.32

WT. OF STRING

BIT RECORD: BIT NO.; SIZE; IADC CODE; MANUFACTURER; TYPE; SERIAL NO.; JETS; TFA; DEPTH OUT; DEPTH IN; TOTAL DRILLED; TOTAL HOURS; CUTTING STRUCTURE: INNER, OUTER, DULL CHAR, LOCATION; BEARINGS/SEALS, GAGE, OTHER DULL CHAR, REASON PULLED

MUD RECORD: TIME; WEIGHT; PRESSURE GRADIENT; FUNNEL VISCOSITY; PV/YP; GEL STRENGTH; FLUID LOSS; pH; SOLIDS

MUD & CHEMICAL ADDED

TYPE	AMOUNT	TYPE	AMOUNT
DynaDet	5	Caustic	1

REMARKS

DRILLER

No.

DAILY DRILLING REPORT

WELL Slot 3 REPORT NO. 113 DATE 11-Dec-2015

FIELD OR DISTRICT Cameron TX	COUNTY Milam	STATE / COUNTRY TX / United States

LAST CASING TUBING OR LINER: SIZE | MAKE | WEIGHT GRADE | NO. JOINTS | LENGTH | RKB. TO CSG. HD. | SET AT

WIRE LINE RECORD REEL NO.: SIZE; NO LINES; LENGTH SLIPPED; LENGTH CUT OFF; PRESENT LENGTH; WEAR OR TRIPS SINCE LAST CUT; CUMULATIVE WEAR OR TRIPS

DEPTH INTERVAL FROM | TO; DRILL. D REAM. R CORE. C; CORE NO.; FORMATION (SHOW CORE RECOVERY); ROTARY TABLE SPEED; WT. ON BIT; PUMP PRESSURE; PUMP NO. 1–4 LINER SIZE, S.P.M.; TOTAL PUMP OUTPUT

DEVIATION RECORD: DEPTH | DEV | DIR. | TVD | HORZ. DISP.

NIGHT TOUR

From	To	Elapsed Time	CodeNo	Details Of Operations In Sequence And Remarks
19:00	21:00	2:00	21	ut doe slot 6 core from 1950' to 1953'
21:00	22:00	1:00	22	rack back std dp rig up wireline, retrieve core barrel,latch on core barrel with 500 gpm, rig down wireline, lay down core barrel and corring tools
22:00	22:45	0:45	6	pooh yo inspect bit
22:45	23:00	0:15	22	take pictures of bit test group inspect bit make call for moving forward
23:00	23:15	0:15	22	fill hole
23:15	7:00	7:45	22	housekeeping, clean rig floor, process water,prime slb street sign, trash, organize parts house, clean dope off shakers

DAY TOUR

From	To	Elapsed Time	CodeNo	Details Of Operations In Sequence And Remarks
7:00	8:30	1:30	21	UT-DOE slot 6 / Test group in meeting, Inspect bit, Housekeeping, Clean bit
8:30	9:15	0:45	22	Break off bit, Remove inner seal, Make up bit
9:15	9:30	0:15	6	Run BHA
9:30	10:30	1:00	6	TIH to1856'
10:30	11:00	0:30	11	Rig up wireline, Run center bit ballel, Rig down wireline
11:00	11:45	0:45	5	Circulate and condition
11:45	17:15	5:30	2	Drill from 1953' to 1992'
17:15	18:45	1:30	4	Rig up wireline, Change upper and lower core barrels, Rig down wireline
18:45	19:00	0:15	5	Flow test

No.

Page 1 of 1

DRILLING CREW PAYROLL DATA

DATE 11-Dec-2015

WELL NAME & NO. JPG Training July 2015 Slot 3

COMPANY JPEG

TOOLPUSHER

RIG NO. Explorer

NIGHT TOUR FROM 19:00 TO 7:00

CREW	EMPL.ID NO.	NAME	HRS.	INJURED ON THIS TOUR? INITIAL	YES NO
Driller	***-**-1111	DAVID SMITH	12		
Derrickman	***-**-1111	JONATHON CARRILLO	12		
Derrickman	***-**-1111	ADAM SALINAS	12		
Floorman	***-**-1111	JIMMY EWALD	12		
Roustabout		CHRIS BROUGHTON	12		

NO. DAYS SINCE LAST LOST TIME ACCIDENT

DAY TOUR FROM 7:00 TO 19:00

CREW	EMPL.ID NO.	NAME	HRS.	INJURED ON THIS TOUR? INITIAL	YES NO
Driller	***-**-1111	JOHN LAWHON	12		
Derrickman	***-**-1111	PEDRO RODRIGUEZ	12		
Floorman	***-**-1111	MIKE TOMASCIK	12		
Floorman	***-**-1111	BOBBY WARE	12		

NO. DAYS SINCE LAST LOST TIME ACCIDENT

No.

No. **DAILY DRILLING REPORT** REPORT NO. 114

LEASE **JPG Training July 2015**	WELL NO. **Slot 3**	API WELL NUMBER **42-331-33557**	WATER DEPTH	DATE 12-Dec-2015
OPERATOR **Schlumberger / CTTF**		CONTRACTOR **JPEG**		RIG NO. **Explorer**
SIGNATURE OF OPERATOR'S REPRESENTATIVE		SIGNATURE OF CONTRACTOR'S TOOL PUSHER		

DP SIZE	WEIGHT	GRADE	TOOL JT O.D.	TYPE THREAD	STRING NO.	PUMP NO.	PUMP MANUFACTURER	TYPE	STROKE LENGTH
						1			
						2			
						3			
						4			

TIME DISTRIBUTION HOURS

CODE NO.	OPERATION	NIGHT	DAY
1	RIG UP AND TEAR DOWN		
2	DRILL ACTUAL	5:00	
3	REAMING		
4	CORING		
5	CONDITION MUD & CIRCULATE		
6	TRIPS	1:00	
7	LUBRICATE RIG		
8	REPAIR RIG		
9	CUT OFF DRILLING LINE		
10	DEVIATION SURVEY		
11	WIRELINE LOGS		
12	RUN CASING & CEMENT		
13	WAIT ON CEMENT		
14	NIPPLE UP B.O.P.		
15	TEST B.O.P.		
16	DRILL STEM TEST		
17	PLUG BACK		
18	SQUEEZE CEMENT		
19	FISHING		
20	DIR. WORK		
21	doe/ut slot 6	2:30	
22	housekeeping,	3:30	
23			
COMPLETION	A. PERFORATING		
	B. TUBING TRIPS		
	C. TREATING		
	D. SWABBING		
	E. TESTING		
	F.		
	G.		
	H.		
TOTALS		12:00	

DAYWORK TIME SUMMARY (OFFICE USE ONLY)		
HOURS W/CONTR D.P.		
HOURS W/OPR D.P.		
HOURS WITHOUT D.P.		
HOURS STANDBY		
TOTAL DAYWORK		
NO. OF DAYS FROM SPUD		
CUMULATIVE ROTATING HOURS		
DAILY MUD COST		
TOTAL MUD COST		

NIGHT TOUR

DRILLING ASSEMBLY (AT END OF TOUR)

NO.	ITEM	O.D.	LENGTH
	STANDS D.P.		
	SINGLES D.P.		
	KELLY DOWN		
	TOTAL		
	WT. OF STRING		

BIT RECORD

BIT NO.		
SIZE		
IADC CODE		
MANUFACTURER		
TYPE		
SERIAL NO.		
JETS		
TFA		
DEPTH OUT		
DEPTH IN		
TOTAL DRILLED		
TOTAL HOURS		

CUTTING STRUCTURE

INNER	OUTER	DULL CHAR	LOCATION
BEARINGS/ SEALS	GAGE	OTHER DULL CHAR	REASON PULLED

MUD RECORD

TIME			
WEIGHT			
PRESSURE GRADIENT			
FUNNEL VISCOSITY			
PV/YP			
GEL STRENGTH			
FLUID LOSS			
pH			
SOLIDS			

MUD & CHEMICAL ADDED

TYPE	AMOUNT	TYPE	AMOUNT

REMARKS

DRILLER

DAY TOUR

DRILLING ASSEMBLY (AT END OF TOUR)

NO.	ITEM	O.D.	LENGTH
1	bit		1.3
2	stab		4.7
3	outter barrel		31.85
4	xo		1.6
5	stab.		3.32
6	sub		1.09
7	sub		3.32
8	collars		120.13
9	xo		3.01
	STANDS D.P.		
	SINGLES D.P.		
	KELLY DOWN		
	TOTAL		170.32
	WT. OF STRING		

BIT RECORD

BIT NO.		
SIZE		
IADC CODE		
MANUFACTURER		
TYPE		
SERIAL NO.		
JETS		
TFA		
DEPTH OUT		
DEPTH IN		
TOTAL DRILLED		
TOTAL HOURS		

CUTTING STRUCTURE

INNER	OUTER	DULL CHAR	LOCATION
BEARINGS/ SEALS	GAGE	OTHER DULL CHAR	REASON PULLED

MUD RECORD

TIME			
WEIGHT			
PRESSURE GRADIENT			
FUNNEL VISCOSITY			
PV/YP			
GEL STRENGTH			
FLUID LOSS			
pH			
SOLIDS			

MUD & CHEMICAL ADDED

TYPE	AMOUNT	TYPE	AMOUNT

REMARKS

DRILLER

No.

DAILY DRILLING REPORT WELL Slot 3 REPORT NO. 114 DATE 12-Dec-2015

FIELD OR DISTRICT	COUNTY	STATE / COUNTRY
Cameron TX	Milam	TX / United States

	SIZE	MAKE	WEIGHT GRADE	NO. JOINTS	LENGTH	RKB. TO CSG. HD.	SET AT
LAST CASING TUBING OR LINER							

WIRE LINE RECORD REEL NO.		
SIZE	NO LINES	LENGTH SLIPPED
LENGTH CUT OFF	PRESENT LENGTH	
WEAR OR TRIPS SINCE LAST CUT		
CUMULATIVE WEAR OR TRIPS		

NIGHT TOUR

DEPTH INTERVAL FROM	DEPTH INTERVAL TO	DRILL.D REAM.R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY TABLE SPEED	WT. ON BIT	PUMP PRESSURE	PUMP NO. 1 LINER SIZE	PUMP NO. 1 S.P.M.	PUMP NO. 2 LINER SIZE	PUMP NO. 2 S.P.M.	PUMP NO. 3 LINER SIZE	PUMP NO. 3 S.P.M.	PUMP NO. 4 LINER SIZE	PUMP NO. 4 S.P.M.	TOTAL PUMP OUTPUT

DEVIATION RECORD	DEPTH	DEV	DIR.	TVD	HORZ. DISP.	DEPTH	DEV	DIR.	TVD	HORZ. DISP.	DEPTH	DEV	DIR.	TVD	HORZ. DISP.

From	To	Elapsed Time	CodeNo	Details Of Operations In Sequence And Remarks
19:00	21:30	2:30	21	doe/ut slot 6 core from 1992' to 1998'
21:30	0:15	2:45	22	rack back 1 std rig up wireline, latch core barrel,pump 50 gpm to wash around core barrel packed off pump 63 gpm to wash around core barrel, attempt to retrieve core barrel, pump 38 gpm adjust pack off onwireline, retrieve core barrel laydown core barrel, pick up center bit and tools, make up on rig floor, run center bit, rig down wireline
0:15	5:15	5:00	2	drill from 1998' to 2060'
5:15	6:15	1:00	6	pooh
6:15	7:00	0:45	22	housekeeping, fill hole, clena rig floor after trip, rig shutdown

DAY TOUR

DEPTH INTERVAL FROM	DEPTH INTERVAL TO	DRILL.D REAM.R CORE.C	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY TABLE SPEED	WT. ON BIT	PUMP PRESSURE	PUMP NO. 1 LINER SIZE	PUMP NO. 1 S.P.M.	PUMP NO. 2 LINER SIZE	PUMP NO. 2 S.P.M.	PUMP NO. 3 LINER SIZE	PUMP NO. 3 S.P.M.	PUMP NO. 4 LINER SIZE	PUMP NO. 4 S.P.M.	TOTAL PUMP OUTPUT

DEVIATION RECORD	DEPTH	DEV	DIR.	TVD	HORZ. DISP.	DEPTH	DEV	DIR.	TVD	HORZ. DISP.	DEPTH	DEV	DIR.	TVD	HORZ. DISP.

From	To	Elapsed Time	CodeNo	Details Of Operations In Sequence And Remarks

No.

Page 1 of 1

DRILLING CREW PAYROLL DATA

DATE 12-Dec-2015

WELL NAME & NO. JPG Training July 2015 Slot 3

COMPANY JPEG

TOOLPUSHER

RIG NO. Explorer

NIGHT TOUR FROM 19:00 TO 7:00

CREW	EMPL.ID NO.	NAME	HRS.	INJURED ON THIS TOUR? INITIAL	YES NO
Driller	***-**-1111	DAVID SMITH	12		
Derrickman	***-**-1111	JONATHON CARRILLO	12		
Derrickman	***-**-1111	ADAM SALINAS	12		
Floorman	***-**-1111	JIMMY EWALD	12		
Roustabout		CHRIS BROUGHTON	12		

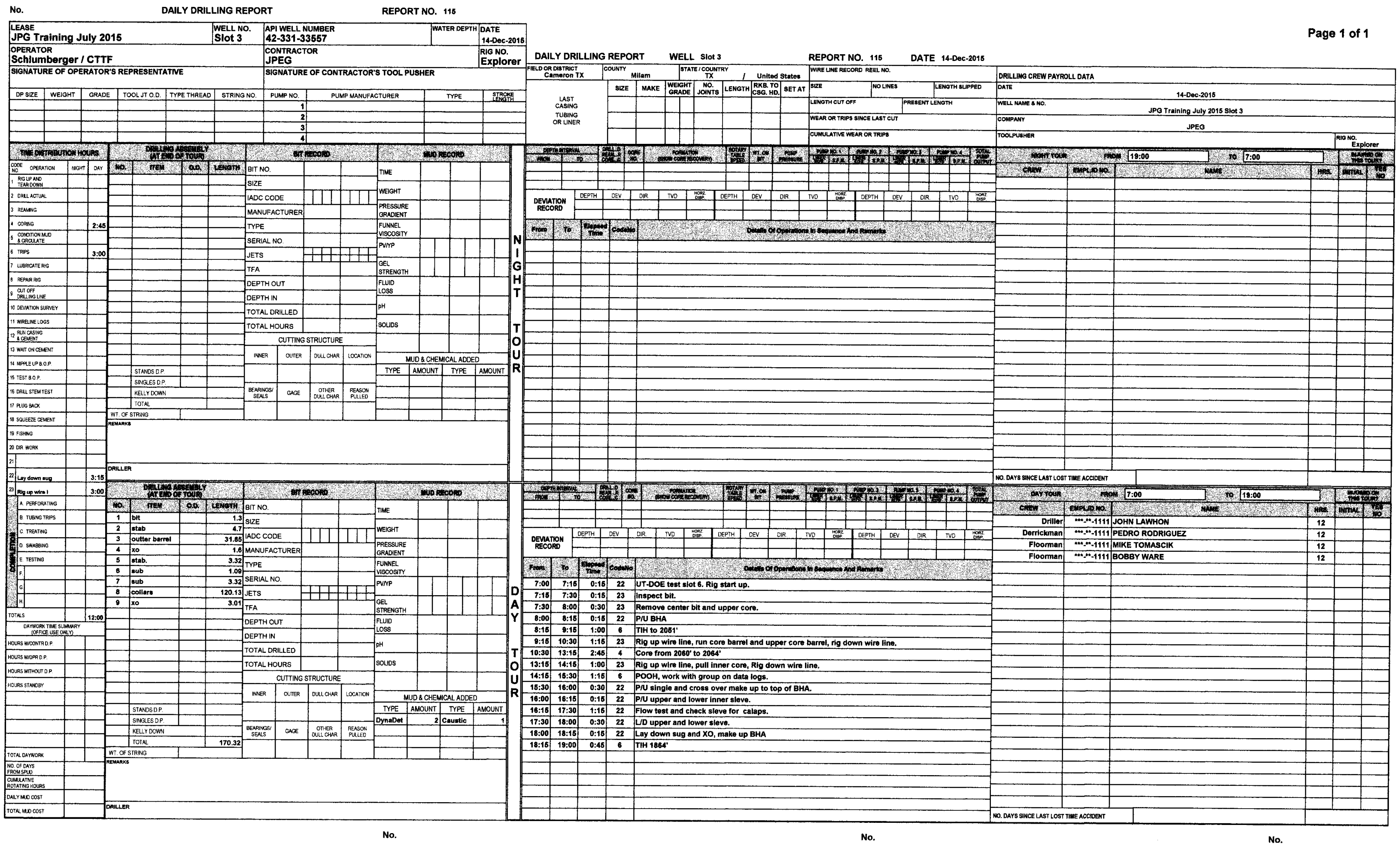
NO. DAYS SINCE LAST LOST TIME ACCIDENT

DAY TOUR FROM 7:00 TO 19:00

CREW	EMPL.ID NO.	NAME	HRS.	INJURED ON THIS TOUR? INITIAL	YES NO

NO. DAYS SINCE LAST LOST TIME ACCIDENT

No.



No. DAILY DRILLING REPORT REPORT NO. 115

LEASE JPG Training July 2015	WELL NO. Slot 3	API WELL NUMBER 42-331-33557	WATER DEPTH	DATE 14-Dec-2015
OPERATOR Schlumberger / CTTF		CONTRACTOR JPEG		RIG NO. Explorer
SIGNATURE OF OPERATOR'S REPRESENTATIVE		SIGNATURE OF CONTRACTOR'S TOOL PUSHER		

DP SIZE	WEIGHT	GRADE	TOOL JT O.D.	TYPE THREAD	STRING NO.	PUMP NO.	PUMP MANUFACTURER	TYPE	STROKE LENGTH
						1			
						2			
						3			
						4			

TIME DISTRIBUTION HOURS

CODE NO.	OPERATION	NIGHT	DAY
1	RIG UP AND TEAR DOWN		
2	DRILL ACTUAL		
3	REAMING		
4	CORING		2:45
5	CONDITION MUD & CIRCULATE		
6	TRIPS		3:00
7	LUBRICATE RIG		
8	REPAIR RIG		
9	CUT OFF DRILLING LINE		
10	DEVIATION SURVEY		
11	WIRELINE LOGS		
12	RUN CASING & CEMENT		
13	WAIT ON CEMENT		
14	NIPPLE UP B.O.P.		
15	TEST B.O.P.		
16	DRILL STEM TEST		
17	PLUG BACK		
18	SQUEEZE CEMENT		
19	FISHING		
20	DIR. WORK		
21			
22	Lay down sug		3:15
23	Rig up wire l		3:00
COMPLETION	A. PERFORATING		
	B. TUBING TRIPS		
	C. TREATING		
	D. SWABBING		
	E. TESTING		
	F.		
	G.		
	H.		
TOTALS			12:00

DAYWORK TIME SUMMARY (OFFICE USE ONLY)

HOURS W/CONTR D.P.

HOURS W/OPR D.P.

HOURS WITHOUT D.P.

HOURS STANDBY

TOTAL DAYWORK

NO. OF DAYS FROM SPUD

CUMULATIVE ROTATING HOURS

DAILY MUD COST

TOTAL MUD COST

NIGHT TOUR

DRILLING ASSEMBLY (AT END OF TOUR)

NO.	ITEM	O.D.	LENGTH
	STANDS D.P.		
	SINGLES D.P.		
	KELLY DOWN		
	TOTAL		

WT. OF STRING

BIT RECORD: BIT NO. / SIZE / IADC CODE / MANUFACTURER / TYPE / SERIAL NO. / JETS / TFA / DEPTH OUT / DEPTH IN / TOTAL DRILLED / TOTAL HOURS

CUTTING STRUCTURE: INNER / OUTER / DULL CHAR / LOCATION / BEARINGS/SEALS / GAGE / OTHER DULL CHAR / REASON PULLED

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / FUNNEL VISCOSITY / PV/YP / GEL STRENGTH / FLUID LOSS / pH / SOLIDS

MUD & CHEMICAL ADDED: TYPE / AMOUNT / TYPE / AMOUNT

REMARKS

DRILLER

DAY TOUR

DRILLING ASSEMBLY (AT END OF TOUR)

NO.	ITEM	O.D.	LENGTH
1	bit		1.3
2	stab		4.7
3	outter barrel		31.85
4	xo		1.6
5	stab.		3.32
6	sub		1.09
7	sub		3.32
8	collars		120.13
9	xo		3.01
	STANDS D.P.		
	SINGLES D.P.		
	KELLY DOWN		
	TOTAL		170.32

WT. OF STRING

BIT RECORD: BIT NO. / SIZE / IADC CODE / MANUFACTURER / TYPE / SERIAL NO. / JETS / TFA / DEPTH OUT / DEPTH IN / TOTAL DRILLED / TOTAL HOURS

CUTTING STRUCTURE: INNER / OUTER / DULL CHAR / LOCATION / BEARINGS/SEALS / GAGE / OTHER DULL CHAR / REASON PULLED

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / FUNNEL VISCOSITY / PV/YP / GEL STRENGTH / FLUID LOSS / pH / SOLIDS

MUD & CHEMICAL ADDED

TYPE	AMOUNT	TYPE	AMOUNT
DynaDet	2	Caustic	1

REMARKS

DRILLER

No.

Page 1 of 1

DAILY DRILLING REPORT WELL Slot 3 REPORT NO. 115 DATE 14-Dec-2015

FIELD OR DISTRICT Cameron TX	COUNTY Milam	STATE / COUNTRY TX / United States

LAST CASING TUBING OR LINER	SIZE	MAKE	WEIGHT GRADE	NO. JOINTS	LENGTH	RKB. TO CSG. HD.	SET AT

WIRE LINE RECORD REEL NO.

SIZE / NO LINES / LENGTH SLIPPED

LENGTH CUT OFF / PRESENT LENGTH

WEAR OR TRIPS SINCE LAST CUT

CUMULATIVE WEAR OR TRIPS

NIGHT TOUR

DEPTH INTERVAL FROM	TO	DRILL'D REAM'D CORE'D	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY TABLE SPEED	WT. ON BIT	PUMP PRESSURE	PUMP NO. 1 LINER SIZE	S.P.M.	PUMP NO. 2 LINER SIZE	S.P.M.	PUMP NO. 3 LINER SIZE	S.P.M.	PUMP NO. 4 LINER SIZE	S.P.M.	TOTAL PUMP OUTPUT

DEVIATION RECORD: DEPTH / DEV / DIR. / TVD / HORZ. DISP.

From	To	Elapsed Time	CodeNo	Details Of Operations In Sequence And Remarks

DAY TOUR

DEPTH INTERVAL FROM	TO	DRILL'D REAM'D CORE'D	CORE NO.	FORMATION (SHOW CORE RECOVERY)	ROTARY TABLE SPEED	WT. ON BIT	PUMP PRESSURE	PUMP NO. 1 LINER SIZE	S.P.M.	PUMP NO. 2 LINER SIZE	S.P.M.	PUMP NO. 3 LINER SIZE	S.P.M.	PUMP NO. 4 LINER SIZE	S.P.M.	TOTAL PUMP OUTPUT

DEVIATION RECORD: DEPTH / DEV / DIR. / TVD / HORZ. DISP.

From	To	Elapsed Time	CodeNo	Details Of Operations In Sequence And Remarks
7:00	7:15	0:15	22	UT-DOE test slot 6. Rig start up.
7:15	7:30	0:15	23	Inspect bit.
7:30	8:00	0:30	23	Remove center bit and upper core.
8:00	8:15	0:15	22	P/U BHA
8:15	9:15	1:00	6	TIH to 2051'
9:15	10:30	1:15	23	Rig up wire line, run core barrel and upper core barrel, rig down wire line.
10:30	13:15	2:45	4	Core from 2060' to 2064'
13:15	14:15	1:00	23	Rig up wire line, pull inner core, Rig down wire line.
14:15	15:30	1:15	6	POOH, work with group on data logs.
15:30	16:00	0:30	22	P/U single and cross over make up to top of BHA.
16:00	16:15	0:15	22	P/U upper and lower inner sleve.
16:15	17:30	1:15	22	Flow test and check sleve for calaps.
17:30	18:00	0:30	22	L/D upper and lower sleve.
18:00	18:15	0:15	22	Lay down sug and XO, make up BHA
18:15	19:00	0:45	6	TIH 1864'

No.

DRILLING CREW PAYROLL DATA

DATE 14-Dec-2015

WELL NAME & NO. JPG Training July 2015 Slot 3

COMPANY JPEG

TOOLPUSHER

RIG NO. Explorer

NIGHT TOUR FROM 19:00 TO 7:00

CREW	EMPL.ID NO.	NAME	HRS.	INJURED ON THIS TOUR? INITIAL	YES NO

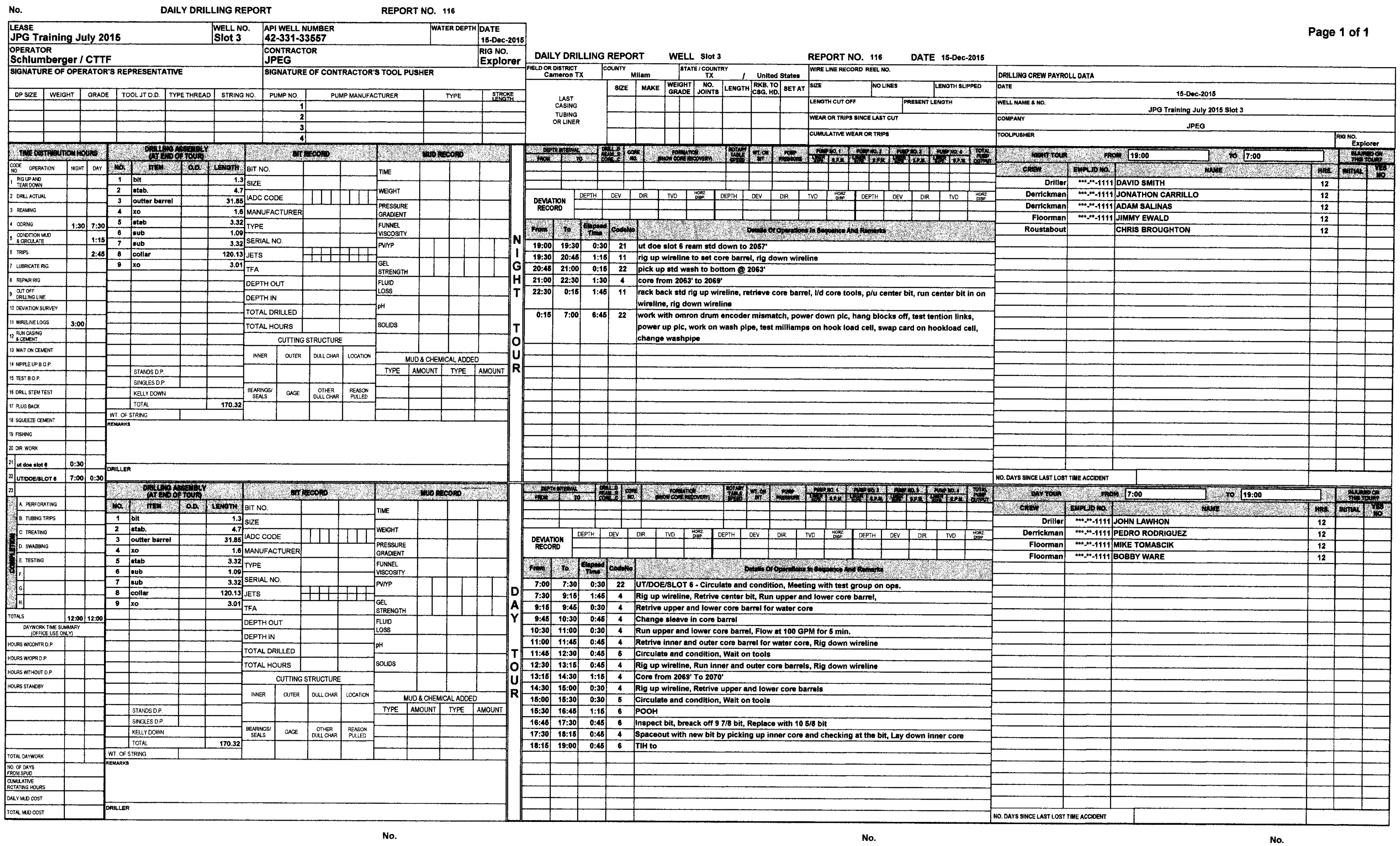
NO. DAYS SINCE LAST LOST TIME ACCIDENT

DAY TOUR FROM 7:00 TO 19:00

CREW	EMPL.ID NO.	NAME	HRS.	INJURED ON THIS TOUR? INITIAL	YES NO
Driller	***-**-1111	JOHN LAWHON	12		
Derrickman	***-**-1111	PEDRO RODRIGUEZ	12		
Floorman	***-**-1111	MIKE TOMASCIK	12		
Floorman	***-**-1111	BOBBY WARE	12		

NO. DAYS SINCE LAST LOST TIME ACCIDENT

No.



No. **DAILY DRILLING REPORT** REPORT NO. 116

Page 1 of 1

LEASE JPG Training July 2015	WELL NO. Slot 3	API WELL NUMBER 42-331-33557	WATER DEPTH	DATE 15-Dec-2015
OPERATOR Schlumberger / CTTF		CONTRACTOR JPEG		RIG NO. Explorer
SIGNATURE OF OPERATOR'S REPRESENTATIVE		SIGNATURE OF CONTRACTOR'S TOOL PUSHER		

DP SIZE	WEIGHT	GRADE	TOOL JT O.D.	TYPE THREAD	STRING NO.	PUMP NO.	PUMP MANUFACTURER	TYPE	STROKE LENGTH
						1			
						2			
						3			
						4			

TIME DISTRIBUTION HOURS

CODE NO.	OPERATION	NIGHT	DAY
1	RIG UP AND TEAR DOWN		
2	DRILL ACTUAL		
3	REAMING		
4	CORING	1:30	7:30
5	CONDITION MUD & CIRCULATE		1:15
6	TRIPS		2:45
7	LUBRICATE RIG		
8	REPAIR RIG		
9	CUT OFF DRILLING LINE		
10	DEVIATION SURVEY		
11	WIRELINE LOGS	3:00	
12	RUN CASING & CEMENT		
13	WAIT ON CEMENT		
14	NIPPLE UP B.O.P.		
15	TEST B.O.P.		
16	DRILL STEM TEST		
17	PLUG BACK		
18	SQUEEZE CEMENT		
19	FISHING		
20	DIR. WORK		
21	ut doe slot 6	0:30	
22	UT/DOE/SLOT 6	7:00	0:30
23			
COMPLETION	A. PERFORATING		
	B. TUBING TRIPS		
	C. TREATING		
	D. SWABBING		
	E. TESTING		
	F.		
	G.		
	H.		
TOTALS		12:00	12:00

DAYWORK TIME SUMMARY (OFFICE USE ONLY): HOURS W/CONTR D.P. / HOURS W/OPR D.P. / HOURS WITHOUT D.P. / HOURS STANDBY / TOTAL DAYWORK / NO. OF DAYS FROM SPUD / CUMULATIVE ROTATING HOURS / DAILY MUD COST / TOTAL MUD COST

NIGHT TOUR

DRILLING ASSEMBLY (AT END OF TOUR)

NO.	ITEM	O.D.	LENGTH
1	bit		1.3
2	stab.		4.7
3	outter barrel		31.85
4	xo		1.6
5	stab		3.32
6	sub		1.09
7	sub		3.32
8	collar		120.13
9	xo		3.01
	STANDS D.P.		
	SINGLES D.P.		
	KELLY DOWN		
	TOTAL		170.32
	WT. OF STRING		

BIT RECORD: BIT NO. / SIZE / IADC CODE / MANUFACTURER / TYPE / SERIAL NO. / JETS / TFA / DEPTH OUT / DEPTH IN / TOTAL DRILLED / TOTAL HOURS / CUTTING STRUCTURE: INNER, OUTER, DULL CHAR, LOCATION, BEARINGS/SEALS, GAGE, OTHER DULL CHAR, REASON PULLED

MUD RECORD: TIME / WEIGHT / PRESSURE GRADIENT / FUNNEL VISCOSITY / PV/YP / GEL STRENGTH / FLUID LOSS / pH / SOLIDS / MUD & CHEMICAL ADDED: TYPE, AMOUNT, TYPE, AMOUNT

REMARKS

DRILLER

DAILY DRILLING REPORT WELL Slot 3 REPORT NO. 116 DATE 15-Dec-2015

FIELD OR DISTRICT	COUNTY	STATE / COUNTRY
Cameron TX	Milam	TX / United States

LAST CASING TUBING OR LINER: SIZE / MAKE / WEIGHT GRADE / NO. JOINTS / LENGTH / RKB. TO CSG. HD. / SET AT

WIRE LINE RECORD REEL NO.: SIZE / NO LINES / LENGTH SLIPPED / LENGTH CUT OFF / PRESENT LENGTH / WEAR OR TRIPS SINCE LAST CUT / CUMULATIVE WEAR OR TRIPS

DEVIATION RECORD: DEPTH / DEV / DIR. / TVD / HORZ. DISP.

From	To	Elapsed Time	CodeNo	Details Of Operations In Sequence And Remarks
19:00	19:30	0:30	21	ut doe slot 6 ream std down to 2057'
19:30	20:45	1:15	11	rig up wireline to set core barrel, rig down wireline
20:45	21:00	0:15	22	pick up std wash to bottom @ 2063'
21:00	22:30	1:30	4	core from 2063' to 2069'
22:30	0:15	1:45	11	rack back std rig up wireline, retrieve core barrel, l/d core tools, p/u center bit, run center bit in on wireline, rig down wireline
0:15	7:00	6:45	22	work with omron drum encoder mismatch, power down plc, hang blocks off, test tention links, power up plc, work on wash pipe, test milliamps on hook load cell, swap card on hookload cell, change washpipe

DRILLING CREW PAYROLL DATA

DATE 15-Dec-2015

WELL NAME & NO. JPG Training July 2015 Slot 3

COMPANY JPEG

TOOLPUSHER

RIG NO. Explorer

NIGHT TOUR FROM 19:00 TO 7:00

CREW	EMPL.ID NO.	NAME	HRS.	INJURED ON THIS TOUR? INITIAL	YES NO
Driller	***-**-1111	DAVID SMITH	12		
Derrickman	***-**-1111	JONATHON CARRILLO	12		
Derrickman	***-**-1111	ADAM SALINAS	12		
Floorman	***-**-1111	JIMMY EWALD	12		
Roustabout		CHRIS BROUGHTON	12		

NO. DAYS SINCE LAST LOST TIME ACCIDENT

DAY TOUR

DRILLING ASSEMBLY (AT END OF TOUR)

NO.	ITEM	O.D.	LENGTH
1	bit		1.3
2	stab.		4.7
3	outter barrel		31.85
4	xo		1.6
5	stab		3.32
6	sub		1.09
7	sub		3.32
8	collar		120.13
9	xo		3.01
	STANDS D.P.		
	SINGLES D.P.		
	KELLY DOWN		
	TOTAL		170.32
	WT. OF STRING		

REMARKS

DRILLER

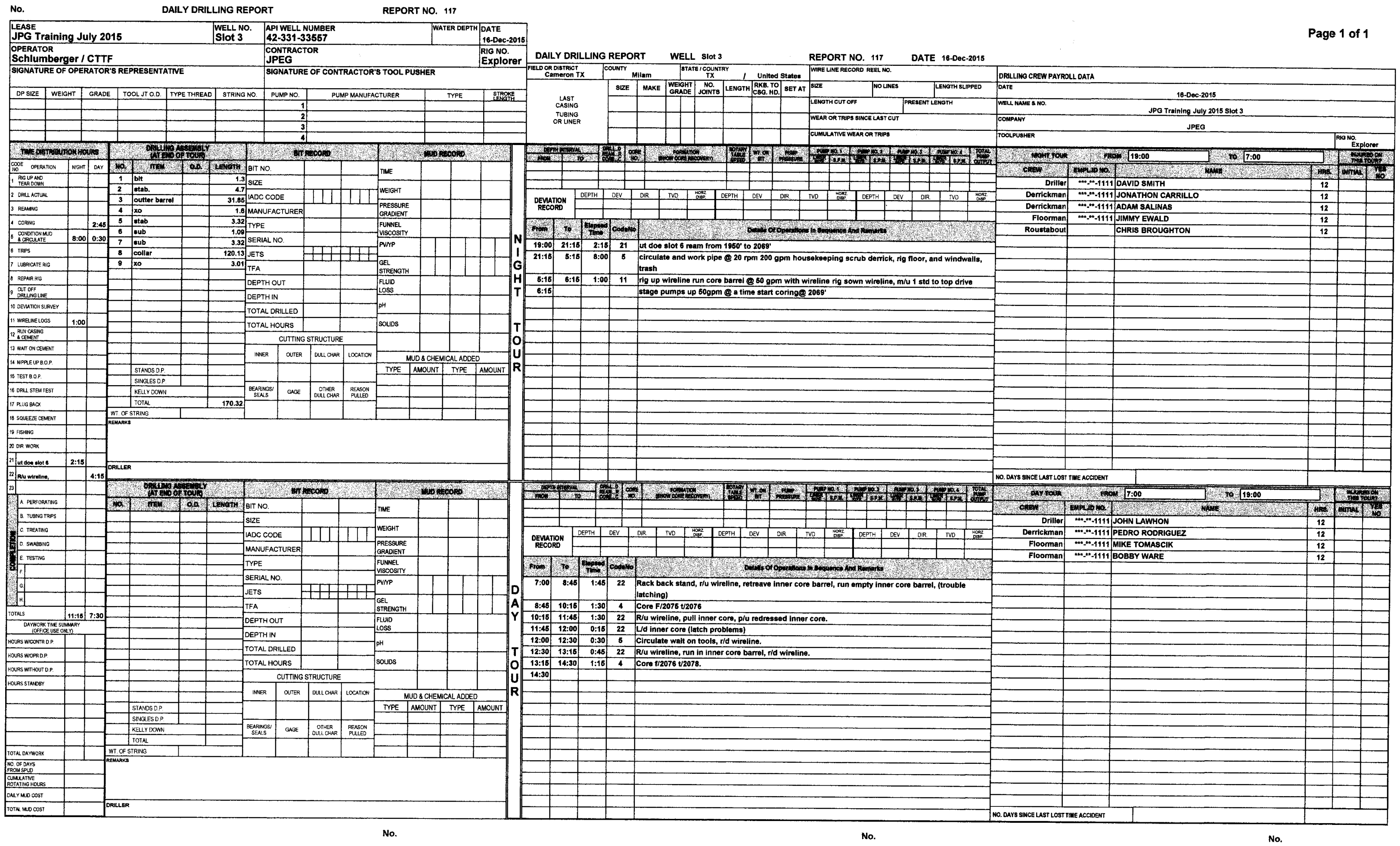
From	To	Elapsed Time	CodeNo	Details Of Operations In Sequence And Remarks
7:00	7:30	0:30	22	UT/DOE/SLOT 6 - Circulate and condition, Meeting with test group on ops.
7:30	9:15	1:45	4	Rig up wireline, Retrive center bit, Run upper and lower core barrel,
9:15	9:45	0:30	4	Retrive upper and lower core barrel for water core
9:45	10:30	0:45	4	Change sleave in core barrel
10:30	11:00	0:30	4	Run upper and lower core barrel, Flow at 100 GPM for 5 min.
11:00	11:45	0:45	4	Retrive inner and outer core barrel for water core, Rig down wireline
11:45	12:30	0:45	5	Circulate and condition, Wait on tools
12:30	13:15	0:45	4	Rig up wireline, Run inner and outer core barrels, Rig down wireline
13:15	14:30	1:15	4	Core from 2069' To 2070'
14:30	15:00	0:30	4	Rig up wireline, Retrive upper and lower core barrels
15:00	15:30	0:30	5	Circulate and condition, Wait on tools
15:30	16:45	1:15	6	POOH
16:45	17:30	0:45	6	Inspect bit, breack off 9 7/8 bit, Replace with 10 5/8 bit
17:30	18:15	0:45	4	Spaceout with new bit by picking up inner core and checking at the bit, Lay down inner core
18:15	19:00	0:45	6	TIH to

DAY TOUR FROM 7:00 TO 19:00

CREW	EMPL.ID NO.	NAME	HRS.	INJURED ON THIS TOUR? INITIAL	YES NO
Driller	***-**-1111	JOHN LAWHON	12		
Derrickman	***-**-1111	PEDRO RODRIGUEZ	12		
Floorman	***-**-1111	MIKE TOMASCIK	12		
Floorman	***-**-1111	BOBBY WARE	12		

NO. DAYS SINCE LAST LOST TIME ACCIDENT

No. No. No.



No. DAILY DRILLING REPORT REPORT NO. 117

LEASE JPG Training July 2015	WELL NO. Slot 3	API WELL NUMBER 42-331-33557	WATER DEPTH	DATE 16-Dec-2015
OPERATOR Schlumberger / CTTF		CONTRACTOR JPEG		RIG NO. Explorer
SIGNATURE OF OPERATOR'S REPRESENTATIVE		SIGNATURE OF CONTRACTOR'S TOOL PUSHER		

DP SIZE	WEIGHT	GRADE	TOOL JT O.D.	TYPE THREAD	STRING NO.

PUMP NO.	PUMP MANUFACTURER	TYPE	STROKE LENGTH
1			
2			
3			
4			

TIME DISTRIBUTION HOURS

CODE NO.	OPERATION	NIGHT	DAY
1	RIG UP AND TEAR DOWN		
2	DRILL ACTUAL		
3	REAMING		
4	CORING		2:45
5	CONDITION MUD & CIRCULATE	8:00	0:30
6	TRIPS		
7	LUBRICATE RIG		
8	REPAIR RIG		
9	CUT OFF DRILLING LINE		
10	DEVIATION SURVEY		
11	WIRELINE LOGS	1:00	
12	RUN CASING & CEMENT		
13	WAIT ON CEMENT		
14	NIPPLE UP B.O.P.		
15	TEST B.O.P.		
16	DRILL STEM TEST		
17	PLUG BACK		
18	SQUEEZE CEMENT		
19	FISHING		
20	DIR. WORK		
21	ut doe slot 6	2:15	
22	R/u wireline,		4:15
23			
COMPLETION	A. PERFORATING		
	B. TUBING TRIPS		
	C. TREATING		
	D. SWABBING		
	E. TESTING		
	F.		
	G.		
	H.		
TOTALS		11:15	7:30

DAYWORK TIME SUMMARY (OFFICE USE ONLY)

HOURS W/CONTR D.P.		
HOURS W/OPR D.P.		
HOURS WITHOUT D.P.		
HOURS STANDBY		
TOTAL DAYWORK		
NO. OF DAYS FROM SPUD		
CUMULATIVE ROTATING HOURS		
DAILY MUD COST		
TOTAL MUD COST		

NIGHT TOUR

DRILLING ASSEMBLY (AT END OF TOUR)

NO.	ITEM	O.D.	LENGTH
1	bit		1.3
2	stab.		4.7
3	outter barrel		31.85
4	xo		1.6
5	stab		3.32
6	sub		1.09
7	sub		3.32
8	collar		120.13
9	xo		3.01
	STANDS D.P.		
	SINGLES D.P.		
	KELLY DOWN		
	TOTAL		170.32

WT. OF STRING

REMARKS

DRILLER

BIT RECORD

BIT NO.
SIZE
IADC CODE
MANUFACTURER
TYPE
SERIAL NO.
JETS
TFA
DEPTH OUT
DEPTH IN
TOTAL DRILLED
TOTAL HOURS

CUTTING STRUCTURE: INNER, OUTER, DULL CHAR, LOCATION, BEARINGS/SEALS, GAGE, OTHER DULL CHAR, REASON PULLED

MUD RECORD

TIME
WEIGHT
PRESSURE GRADIENT
FUNNEL VISCOSITY
PV/YP
GEL STRENGTH
FLUID LOSS
pH
SOLIDS

MUD & CHEMICAL ADDED: TYPE, AMOUNT, TYPE, AMOUNT

DAILY DRILLING REPORT WELL Slot 3 REPORT NO. 117 DATE 16-Dec-2015

FIELD OR DISTRICT	COUNTY	STATE / COUNTRY
Cameron TX	Milam	TX / United States

	SIZE	MAKE	WEIGHT GRADE	NO. JOINTS	LENGTH	RKB. TO CSG. HD.	SET AT
LAST CASING TUBING OR LINER							

WIRE LINE RECORD REEL NO.
SIZE / NO LINES / LENGTH SLIPPED
LENGTH CUT OFF / PRESENT LENGTH
WEAR OR TRIPS SINCE LAST CUT
CUMULATIVE WEAR OR TRIPS

DEPTH INTERVAL FROM / TO; DRILL D REAM R CORE C; CORE NO.; FORMATION (SHOW CORE RECOVERY); ROTARY TABLE SPEED; WT. ON BIT; PUMP PRESSURE; PUMP NO. 1 LINER SIZE S.P.M.; PUMP NO. 2 LINER SIZE S.P.M.; PUMP NO. 3 LINER SIZE S.P.M.; PUMP NO. 4 LINER SIZE S.P.M.; TOTAL PUMP OUTPUT

DEVIATION RECORD: DEPTH, DEV, DIR., TVD, HORZ. DISP.

From	To	Elapsed Time	CodeNo	Details Of Operations In Sequence And Remarks
19:00	21:15	2:15	21	ut doe slot 6 ream from 1950' to 2069'
21:15	5:15	8:00	5	circulate and work pipe @ 20 rpm 200 gpm housekeeping scrub derrick, rig floor, and windwalls, trash
5:15	6:15	1:00	11	rig up wireline run core barrel @ 50 gpm with wireline rig sown wireline, m/u 1 std to top drive
6:15				stage pumps up 50gpm @ a time start coring@ 2069'

Page 1 of 1

DRILLING CREW PAYROLL DATA

DATE 16-Dec-2015

WELL NAME & NO. JPG Training July 2015 Slot 3

COMPANY JPEG

TOOLPUSHER

RIG NO. Explorer

NIGHT TOUR FROM 19:00 TO 7:00

CREW	EMPL.ID NO.	NAME	HRS.	INJURED ON THIS TOUR? INITIAL	YES NO
Driller	***-**-1111	DAVID SMITH	12		
Derrickman	***-**-1111	JONATHON CARRILLO	12		
Derrickman	***-**-1111	ADAM SALINAS	12		
Floorman	***-**-1111	JIMMY EWALD	12		
Roustabout		CHRIS BROUGHTON	12		

NO. DAYS SINCE LAST LOST TIME ACCIDENT

DAY TOUR

DRILLING ASSEMBLY (AT END OF TOUR)

NO.	ITEM	O.D.	LENGTH
	STANDS D.P.		
	SINGLES D.P.		
	KELLY DOWN		
	TOTAL		

WT. OF STRING

REMARKS

DRILLER

BIT RECORD

BIT NO.
SIZE
IADC CODE
MANUFACTURER
TYPE
SERIAL NO.
JETS
TFA
DEPTH OUT
DEPTH IN
TOTAL DRILLED
TOTAL HOURS

CUTTING STRUCTURE: INNER, OUTER, DULL CHAR, LOCATION, BEARINGS/SEALS, GAGE, OTHER DULL CHAR, REASON PULLED

MUD RECORD

TIME
WEIGHT
PRESSURE GRADIENT
FUNNEL VISCOSITY
PV/YP
GEL STRENGTH
FLUID LOSS
pH
SOLIDS

MUD & CHEMICAL ADDED: TYPE, AMOUNT, TYPE, AMOUNT

DEVIATION RECORD: DEPTH, DEV, DIR., TVD, HORZ. DISP.

From	To	Elapsed Time	CodeNo	Details Of Operations In Sequence And Remarks
7:00	8:45	1:45	22	Rack back stand, r/u wireline, retreave inner core barrel, run empty inner core barrel, (trouble latching)
8:45	10:15	1:30	4	Core F/2075 t/2076
10:15	11:45	1:30	22	R/u wireline, pull inner core, p/u redressed inner core.
11:45	12:00	0:15	22	L/d inner core (latch problems)
12:00	12:30	0:30	5	Circulate wait on tools, r/d wireline.
12:30	13:15	0:45	22	R/u wireline, run in inner core barrel, r/d wireline.
13:15	14:30	1:15	4	Core f/2076 t/2078.
14:30				

DAY TOUR FROM 7:00 TO 19:00

CREW	EMPL.ID NO.	NAME	HRS.	INJURED ON THIS TOUR? INITIAL	YES NO
Driller	***-**-1111	JOHN LAWHON	12		
Derrickman	***-**-1111	PEDRO RODRIGUEZ	12		
Floorman	***-**-1111	MIKE TOMASCIK	12		
Floorman	***-**-1111	BOBBY WARE	12		

NO. DAYS SINCE LAST LOST TIME ACCIDENT

No. No. No.

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