



Project Memo

Operator: Devon **Job Number:** 2013-119
Well Name: Lava Tube #27 State 1H
Date: May 11, 2013
To: Buddy Strain **From:** Dicky Robichaux / David McCutcheon
CC: Dan Eby / Fred Ng / Kerry Girlinghouse / David Moody
Subject: Detailed Well Control Procedures

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Background

While drilling 8³/₄" pilot hole; a kick was taken at 12,065' with 9.2 ppg mud, strong flow was observed at surface. WWCI was dispatched and observed 2,550 psi on the casing upon arrival on location. The surface casing in this well is 9⁵/₈" 40 ppf J-55 set at 4,110'. A Formation Integrity Test (FIT) was performed with 8.6 ppg fluid giving a 9.2 ppg equivalent (129 psi surface pressure). As of March 30, lubricate and Bleed operations have been performed in an attempt to reduce surface casing pressure from 2,550 psi.

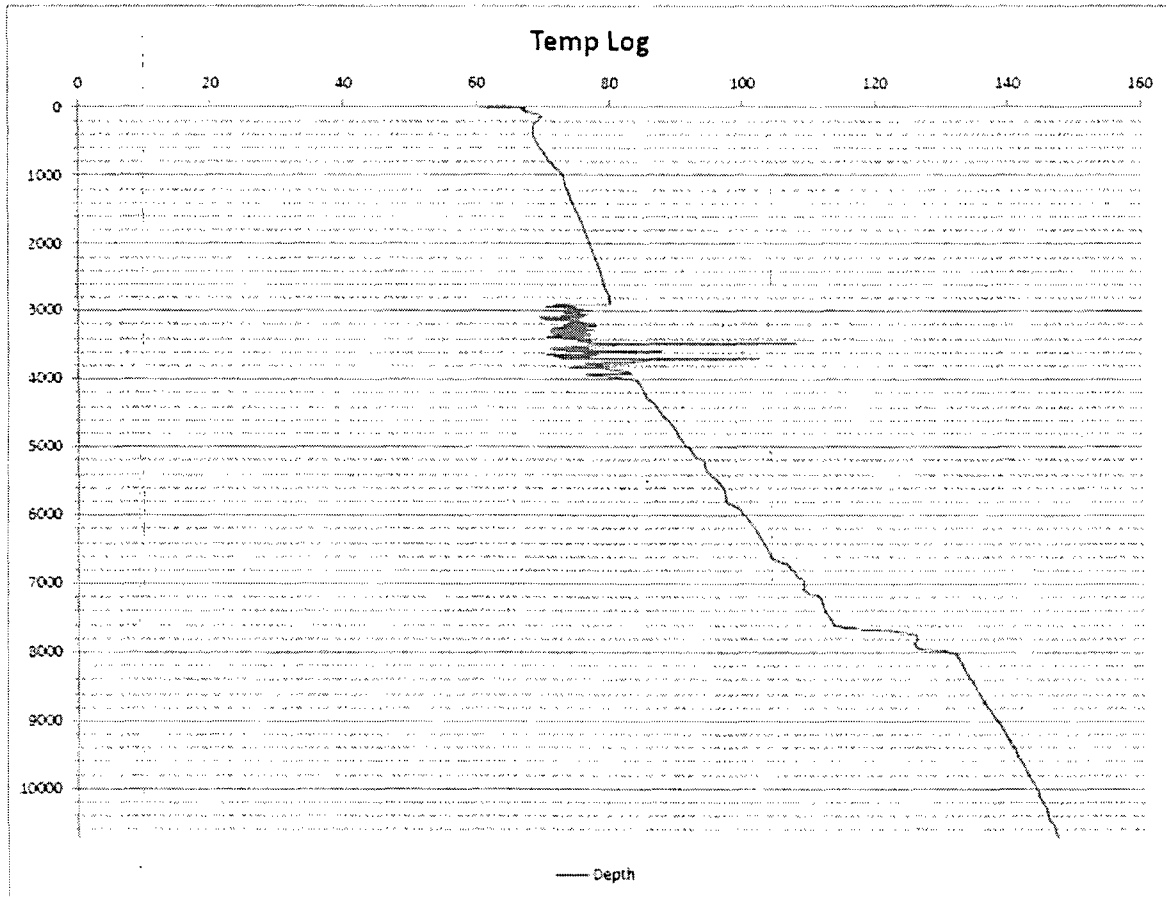
Drill pipe parted and was sheared in order to remove the Scan Texas rig and move in a 460-K snubbing unit. The snubbing unit has been rigged up and tested. The drill pipe has been dressed and latched with in the BOP stack and recovered to surface. A total of 2,625' of drill pipe has been recovered. Dual barriers were installed inside of the 9⁵/₈" casing and the lower BOP's have been re-dressed and tested. The lower fish has been dressed off and re-latched with a high pressure overshot. The overshot has been pressure and pull tested at 2,712'.

On May 9, 2013 final Temp and Noise logs were run identifying an additional more defined thief zone at 7,800' to 8,000' this coincides with the production zone of a nearby well the Big Aristotle 27- H1. On May 10, 2013 a free point and sonic stuck pipe logs were run and identified stuck pipe at a depth of @ 5,300'. The sonic log depicted wall contact at multiple areas in the open hole section.



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Temp log run on May 9th 2013 Note: 3,000' to 4,000' is a speed change and non-relevant. 7,800' to 8,000' is considered the main exit flow from the Lava Tube well bore.



Objective

The primary objective of this memo is to summarize forward plan for the Kill and abandonment operation of the Lava Tube #27 well. This procedure is written with the understanding that the Wolfcamp formation is cemented and sealed off and cross flow is present from the lower Bone springs to the Delaware and upper bone springs. It is also assumed that the Big Aristotle well has been shut in and not producing.



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Detailed Procedures to Kill and Abandon the Lava Tube 27

Sever DP to gain access to annulus for pumping operation

- Rig up electric line and RIH with 2" severing charge to 10,700'.
 - Pressure up on drill pipe to 500psi.
 - Sever drill pipe.
 - POOH with electric line and rig down same.
 - Record drill pipe pressure and or fluid level drop.

Establish circulation in preparation for kill and cement.

- Establish injection rate at 2, 4, 6 and 8 bmp down drill pipe.
- Service all equipment; ensure full mud volume at surface and record all pressures.
 - Pump 190 bbls 9.3 ppg duo-vis mud into drillpipe to determine injectivity; If established. Record shut in drill pipe pressure or fill same to determine fluid level and BHP. Pump an additional 150bbls 9.3ppg dual visc mud.
 - Pump 10 bbls mud clean lead
 - Mix and pump 50 bbls 14.6 ppg Thixotropic cement on the fly at 3 BPM
 - Pump 5 bbls mud clean chaser
 - Displace with 185bbls 9.3 ppg duo-vis mud at 4 BPM, slow down at 183 bbls of displacement to 1 BPM
 - i. This will put the top of cement at 9,700', that equates to covering the lower Bone springs formation.
 - ii. Note: All above and below calculations are based on a 8 3/4" hole size and is assumed smaller due to hole instability. All top of fluid and cement depths are considered minimum Top of fluid or cement depths.
- Wait 6 hours for cement to set up, time starts when the cement is blended in the mixer.
- Pressure test cement to 2,500psi. Should test fail repeat upper steps?
- R/D Cement pump lines from drillpipe

Run Stuck pipe log and Set Magna Range Plug inside 5" DP ID 2.28" plug

- Rig up electric line truck
- Install 2.3" Gauge Ring
 - Install lubricator
 - Pressure test to 250 psi low 2,500 psi High
 - Run in hole with 2.3" gauge ring to locate top of cement
 - POOH with gauge ring
- Install stuck pipe log
 - Install lubricator
 - Pressure test to 250 psi low 2,500 psi High



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- Run in hole and determine top of cement on 5" X 8 3/4" hole.
- POOH with wireline, secure drill string
- Remove lubricator
- Pick up 2.28" Magna Range plug
 - Install lubricator
 - Pressure test to 250 psi low 2,500 psi High
 - Run in hole with 2.28" Magna Range Plug
 - Set plug at @ 30 feet above top of cement or end of tubing, depending on CCL recordings @ 10,670'
 - POOH with wireline, secure drill string
 - Remove Lubricator
- Test Plug
 - Rig up cement pump to drillpipe
 - Pressure test plug to 1,500 psi
 - Bleed off pressure and rig down cement pump and rig up wireline.
- Pick up wireline dump bailer
 - Mix cement and fill dump bailer
 - Install lubricator
 - Pressure test to 250 low 1,500 High
 - Run in hole with dump bailer
 - Dump bail 10 feet cement on top of plug
 - POOH

Sever DP to gain access to annulus for pumping operation

- Pick up severing charge and CCL
 - Install lubricator
 - Pressure test to 250 psi low 2,500 psi High
 - Run in hole to 8,000' or 30' above TOC determined by last stuck pipe log. Pressure up drill pipe to 500 psi and monitor for annulus communication
 - Fire severing charge
 - POOH with wireline
 - Lay down wireline and rig down same
 - Record drill pipe pressure and or fluid level drop / BHP.

Establish injection in preparation for kill and cement

- Establish injection rate at 2, 4, 6 and 8 bmp down drill pipe.
- Service all equipment; ensure full mud volume at surface and record all pressures.



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- Pump 141 bbls 9.3 ppg duo-vis mud into drillpipe to determine injectivity; If established. Record shut in drill pipe pressure or fill same to determine fluid level / BHP.
 - Pump 10 bbls mud clean lead
 - Mix and pump 50 bbls 14.6 ppg Thixotropic cement on the fly at 3 BPM
 - Pump 5 bbls mud clean chaser
 - Displace with 136 bbls 9.3 ppg duo-vis mud at 4 BPM, slow down at 134 bbls of displacement to 1 BPM
 - i. This will put the top of cement at 7,000', that equates to covering the upper Bone springs to a point of interest noted on the Temp log.
 - ii. Note: All above and below calculations are based on a 8 3/4" hole size and is assumed smaller due to hole instability. All top of fluid and cement depths are considered minimum Top of fluid or cement depths.
- Wait 6 hours for cement to set up, time starts when the cement is blended in the mixer.
- Pressure test cement to 2,500psi. Should test fail repeat upper steps?
- R/D Cement pump lines from drillpipe

Run Stuck pipe log and Set Magna Range Plug inside 5" DP ID 2.28" plug

- Rig up electric line truck
- Install 2.3" Gauge Ring
- Install lubricator
 - Pressure test to 250 psi low 2,500 psi High
 - Run in hole with 2.3" gauge ring to locate top of cement
 - POOH with gauge ring
- Install stuck pipe log
- Install lubricator
 - Pressure test to 250 psi low 2,500 psi High
 - Run in hole and determine top of cement on 5" X 8 3/4" hole.
 - POOH with wireline, secure drill string
 - Remove lubricator
- Pick up 2.28" Magna Range plug
- Install lubricator
 - Pressure test to 250 psi low 2,500 psi High
 - Run in hole with 2.28" Magna Range Plug
 - Set plug at @ 30 feet above top of cement or end of tubing, depending on CCL recordings @ 7,970'
 - POOH with wireline, secure drill string
 - Remove Lubricator



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- Test Plug
 - Rig up cement pump to drillpipe
 - Pressure test plug to 1,500 psi
 - Bleed off pressure and rig down cement pump and rig up wireline.
- Pick up wireline dump bailer
 - Mix cement and fill dump bailer
 - Install lubricator
 - Pressure test to 250 low 1,500 High
 - Run in hole with dump bailer
 - Dump bail 10 feet cement on top of plug
 - POOH

Sever DP to gain access to annulus for pumping operation

- Pick up severing charge and CCL
- Install lubricator
 - Pressure test to 250 psi low 2,500 psi High
 - Run in hole to 7,000' or 30' above TOC determined by last stuck pipe log. Pressure up drill pipe to 500 psi and monitor for annulus communication
 - Fire severing charge
 - POOH with wireline
 - Lay down wireline and rig down same
 - Record drill pipe pressure and or fluid level drop / BHP.

Establish injection in preparation for kill and cement

- Establish injection rate at 2, 4, 6 and 8 bmp down drill pipe.
- Service all equipment; ensure full mud volume at surface and record all pressures.
 - Pump 124 bbls 9.3 ppg dual visc mud into drillpipe to determine injectivity; If established. Record shut in drill pipe pressure or fill same to determine fluid level / BHP.
 - Pump 10 bbls mud clean lead
 - Mix and pump 50 bbls 14.6 ppg Thixotropic cement on the fly at 3 BPM
 - Pump 5 bbls mud clean chaser
 - Displace with 119 bbls 9.3 ppg dual visc mud at 4 BPM, slow down at 117bbls of displacement to 1 BPM
 - i. This will put the top of cement at 6,000', which equates to covering the Delaware to a point of interest noted on the Temp log.
 - ii. Note: All above and below calculations are based on a 8 3/4" hole size and is assumed smaller due to hole instability. All top of fluid and cement depths are considered minimum Top of fluid or cement depths.



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- Wait 6 hours for cement to set up, time starts when the cement is blended in the mixer.
- Pressure test cement to 2,500psi. Should test fail repeat upper steps?
- R/D Cement pump lines from drillpipe

Run Stuck pipe log and Set Magna Range Plug inside 5" DP ID 2.28" plug

- Rig up electric line truck
- Install 2.3" Gauge Ring
 - Install lubricator
 - Pressure test to 250 psi low 2,500 psi High
 - Run in hole with 2.3" gauge ring to locate top of cement
 - POOH with gauge ring
- Install stuck pipe log
 - Install lubricator
 - Pressure test to 250 psi low 2,500 psi High
 - Run in hole and determine top of cement on 5" X 8 3/4" hole.
 - POOH with wireline, secure drill string
 - Remove lubricator
- Pick up 2.28" Magna Range plug
 - Install lubricator
 - Pressure test to 250 psi low 2,500 psi High
 - Run in hole with 2.28" Magna Range Plug
 - Set plug at @ 30 feet above top of cement or end of tubing, depending on CCL recordings @ 6,970'
 - POOH with wireline, secure drill string
 - Remove Lubricator
- Test Plug
 - Rig up cement pump to drillpipe
 - Pressure test plug to 1,500 psi
 - Bleed off pressure and rig down cement pump and rig up wireline.
- Pick up wireline dump bailer
 - Mix cement and fill dump bailer
 - Install lubricator
 - Pressure test to 250 low 1,500 High
 - Run in hole with dump bailer
 - Dump bail 10 feet cement on top of plug
 - POOH



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Sever DP to gain access to annulus for pumping operation

- Pick up severing charge and CCL
- Install lubricator
 - Pressure test to 250 psi low 2,500 psi High
 - Run in hole to 5,300' or 30' above TOC determined by last stuck pipe log. Pressure up drill pipe to 500 psi and monitor for annulus communication
 - Fire severing charge
 - POOH with wireline
 - Lay down wireline and rig down same
 - Record drill pipe pressure and or fluid level drop / BHP.

Establish circulation in preparation for cement

- Establish Circulation rate at 2, 4, 6 and 8 bmp down drill pipe.
- Service all equipment; ensure full mud volume at surface and record all pressures.
 - Pump Bottoms up 272 bbls 9.3 ppg duo-vis mud into drillpipe
 - Pump 10 bbls mud clean lead
 - Mix and pump 90 bbls 14.6 ppg Class H cement on the fly at 3 BPM
 - Pump 5 bbls mud clean chaser
 - Displace with 66 bbls 9.3 ppg duo-vis mud at 4 BPM, slow down at 64bbls of displacement to 1 BPM
 - POOH to 3,500' above top of cement.
 - i. This will put the top of cement at 4,010', which equates to covering the remaining open hole and 100' overlap into the 9 5/8" casing.
 - ii. Note: All above and below calculations are based on a 8 3/4" hole size and is assumed smaller due to hole instability. All top of fluid and cement depths are considered minimum Top of fluid or cement depths.
- Wait 12 hours for cement to set up, time starts when the cement is blended in the mixer.
- RIH and tag top of cement, record depth.
- Pressure test cement to 2,500psi.
- R/D Cement pump lines from drill pipe.
- POOH with drill pipe.

Setting of 9 5/8" bridge plug

- Rig up electric line truck
 - Install bridge plug
 - RIH tag top of cement and set plug 30' above same.
 - Continue abandonment procedure as per Devon and State of New Mexico requirements.

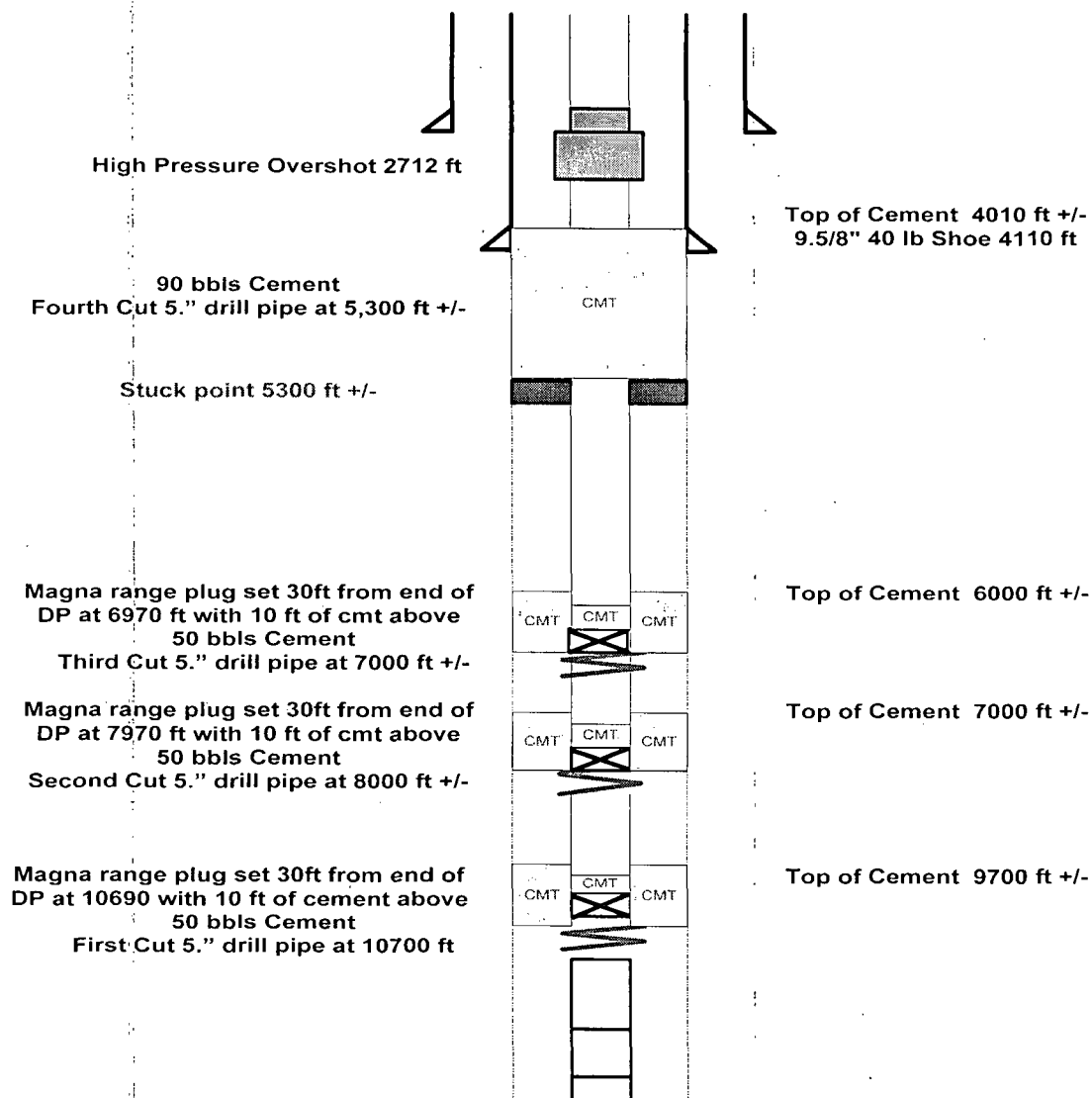


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Wellbore Diagram



Abandonment



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P&A Procedure for Lava Tube 27 State 1H

1. Notify NMOCD 4 hours prior to beginning P&A operation
 2. RU wireline
 3. Set CIBP at 2600 on wireline
 4. Test to 1500 psi
 5. ND Scan Texas BOP
 6. RU Pulling Unit BOP
 7. TIH open ended and tag with 13K
 8. Mix and spot 20 sxs of cement
 9. TOH 5 stands and circulate bottoms up
 10. WOC 4 hours
 11. TIH and tag cement. Must tag cement at 2,550' or higher
 12. TOH and set second CIBP at 500'
 13. Test plug to 1500 psi
 14. TIH open ended and tag plug w 3K
 15. Mix and pump 200 sxs of cement to circulate surface. Be prepared to handle cement returns to surface. If cement falls, top off with sackrete
 16. Record NMOCD notification, test pressure and set down weight in Wellview
 17. Nipple down BOP Curt wellhead off and set a dry hole marker with the following information welded, stamped or otherwise permanently engraved into the marker's metal
 - The operator name
 - Lease name and well number
 - Location, (unit letter, section, township and range)
 - Date of plugging
- The marker shall not be less than four inches in diameter and extend four feet above mean ground level.
18. As soon as practical, level location, remove deadmen and other "junk", and restore location to a safe clean condition. Upon completion of plugging and clean up restoration operations, contact the NMOCD to arrange for an inspection of the well and location