L. V. Hamner A-1
590' FSL x 1090' FWL, Section 21, T29N, R9W, San Juan County, NM

MesaVerde Sidetrack
Plug Back and Casing Repair Operations

For: Mr. John Byrum, D. J. Simmons Co.
Prepared By: R. Griffee, 8/21/95

Step 1, Initial Preparation, Prior to moving in rig.

1(a).   Construct Blowdown Pit, Blade Location.

1(b).   Install and/or test rig anchors.

1(c).   Attempt to blow well down.
         On Site consultant will attempt to blow well down appx one day prior to moving rig in.

Step 2, MIRU Completion Rig

Operational Day 1 (12.5 hours calculated) Step 2(a) through 4(a).

2(a).   Road rig to location.
         assume 1 hour travel from previous location (Could occur the night before rig
         operations commence). Have water truck on location in timely fashion based on
         previous blow down results.

2(b).   Rig up. Set pump and pit. Kill well with water if required. Nipple down well head.
         Nipple up 3000 psi BOPE. NU Stripping head. Lay blow down lines to pit.

Step 3. Pull 2 3/8" tubing.

3(a).   Pull on 2 3/8" tubing. If tubing is free, procede to step 3(d).

3(b).   Take stretch measurements. Determine if tubing is stuck in casing or in open hole.

3(c).   RU Wireline. Jet cut tubing below 7" casing shoe at appx 3693'.

3(d).   POOH with 2 3/8" tubing. SLM. Visually inspect, lay down.

Step 4. 7" Casing Scraper Run.

4(a).   PU 7" casing scraper and SN Install wireline retreivable standing valve in SN. Pick up
         2 3/8" work string and RIH with scraper to casing shoe at +/- 3693'. Pressure test tbg to
         1000 psi with rig pump. Retrieve plug on rig wireline. Insure that scraper is calipered to
         7" casing ID. This step is critical to the success of Step 5, and the reduction of risk in
         sticking the cement retainer.

Operational Day 2 (9 hours calculated) Step 4(b) through 5(h).

4(b).   POOH with tubing and scraper. Stand back work string and lay down scraper and SN.

Step 5. Plug Number 1, Open Hole Mesa Verde.

5(a). RU Wireline and Run CBL from the 7" casing shoe at 3693 to 250 ft above the discovered actual cement top. Check for stringers above cement top. Record Top of Cement depth.

5(b). Pick up 7" tbg set cement retainer. RIH on 2 3/8" work string to 3650'. Set retainer.

5(c). Pressure Test work string to 1000 psi.

5(d). Sting out of retainer. Load casing with water. Attempt to pressure test casing, above retainer to 500 psi.

5(e). Sting into retainer. Rig up Western Co. Establish injection rate into Mesa Verde open hole.

Cement Volume Calculation

TD = 4480', Retainer Depth = 3650', Shoe Depth = 3693', 6 1/4" hole capacity = .2131 cf/lf,
7" casing capacity = 0.2210 cf/lf
0.2131 cf/lf x (4480 - 3693) = 167.71 cf
Use 20% excess
167.71 cf x 1.2 = 201.25 cf
0.2141 cf/lf x (3693-3650) = 9.21 cf
(201.25+9.21) cf / 1.15 cf/sk = 183 sks, round up to 185 sks.

5(f). Mix 215 sks Class 'b' slurry (reduce volume correspondingly if tubing was jet cut above). Squeeze Mesa Verde open hole with 175 sks.

5(g). Sting out of retainer. Spot 10 sks slurry on top of retainer.

5(h). TOH with 2 3/8" work string. Stand back tbg, lay down stinger.

Step 6. Casing Repair (7") from Retainer to Cement Top

If the 7" casing successfully pressure tests to 500 psi in Step 5(d) above, Skip all of Step 6, go to Step 7.

Operational Day 3 (14 hours calculated) Step 6(a) through 6(c)

6(a). PU 7" test packer. RIH with 2 3/8" work string. Isolate casing leak(s) below the cement top. Continue isolating leak(s) above cement top. A retrievable bridge plug may be required.

6(b). Squeeze casing leak(s) below the discovered top of cement as required using a test packer and retireivable bridge plug if required.

6(c). WOC overnight

6(d). PU 6 1/4" bit. RIH on workstring. Drill out cement remaining in 7" casing. POOH. PU 7" test packer and RIH on workstring. Pressure test repaired casing interval to 500 psi with rig pump. POOH, lay down packer.

Step 7. Squeeze Cementing above primary Top of Cement to Surface

Operational Day 5 (6 1/2 hours calculated) Step 7(a) through 7(g).

Alter procedure as required depending on leaks discovered in step 6(a).

7(a). If required, perforate two squeeze holes at the top of cement found by analyzing bond log from step 5(a) (+/-). Rig down wireline.

7(b). Establish injection rate down casing, through squeeze holes, up 7" annulus, through Braden head. Use rig pump and tank.

7(c). PU 7" cement retainer. RIH with work string to 30' above the squeeze holes determined in step 7(a), or to a depth determined by leak isolation in step 6(a). Set retainer.

7(d). RU Western Co. Establish injection rate under retainer, through squeeze holes, up 7" annulus, through Braden head.

Cement Volume Calculation, Cement from Primary Top of Cement to Surface

8 3/4" hole x 7" casing annulus capacity; 0.1503 cf/lf
10 3/4 casing x 7" casing annulus capacity; 0.2993 cf/lf

0.1503 cf/lf x (Squeeze hole depth - 114) lf = _____ cf
use 15% excess, _____ cf x 1.2 = _____ cf
0.2993 cf/lf x 114 lf = 34.12 cf
(_____ + 34.12) cf / 1.15 cf/lf = _____ sks

7(e). Mix ___ sks Class 'b' slurry. Squeeze under retainer through squeeze holes, up annulus and through Braden head. Bring cement top to Surface

7(f). Sting out of retainer. Spot 5 sks slurry on top of retainer.

7(g) POOH with tubing. Lay down tbg and stinger. WOC over night.

Operational Day 6 (11 hours calculated) Step 7(h) through 9(b).

7(h). Pick up 6 1/4" bit and run in hole with workstring. Drill out cement and retainer remaining in 7" casing. Pressure test repaired casing interval to 500 psi with rig pump.

7(i). TOOH with work string.

Step 8. Casing Scraper Run

8(a) Pick up casing 7" casing scraper and run to retainer at 3650'. POOH and lay down work string and scraper.

Step 9. Rig down. MOL.

9(a).   ND BOPE. NU wellhead.

9(b).   Rig down and move to next location.

L. V. Hamner A-1
590' FSL x 1090' FWL, Section 21, T29N, R9W, San Juan County, NM

MesaVerde Sidetrack
4 1/2" Casing and Cementing Operation

Discussion

The following casing and cementing program is designed to install a 4 1/2" production casing string in the designed 45 degree (+/-) sidetracked hole. Casing strengths and specifications have been selected to provide adequate joint strength for running through the curve section of the directional well bore and to provide satisfactory burst strength to facilitate a nitrified hydraulic fracture treatment. The cementing program is designed to place cement in the casing / open hole annulus, with the top of the cement to be located inside the 7" casing just below the bottom of the Chacra formation. This is to allow a completion in the Chacra formation at some later date, as the operator chooses. If the option to complete the Chacra is selected at a later date, the 4 1/2" casing would be backed off, just above the cement top, so that the 7" casing could be perforated, and the Chacra zone could be hydraulically fractured after re-running the 4 1/2" casing string.

Casing Program

Run 4 1/2", 11.6 ppf, J55, LTC from new sidetracked TD to surface. LTC threads will be required due to the 45 degree hole. Install stage collar at 3400 ft (measured depth), just below the bottom of the Chacra formation . Note; 7" 20 ppf, J55, STC is set at 3693'. A window will have been cut in the 7" casing string to facilitate sidetracking operations from 3450' to 3600'. Centralize casing with 1 centralizer per joint. Install guide shoe on bottom and float collar one joint from bottom.

4 1/2", 11.6 ppf, J55, LTC data:
ID = 4.000", Drift ID = 3.875", Coupling OD = 5"
Collapse resistance = 4,960 psi, Internal Yield Pressure = 5350 psi
Body Tensile Yield = 184,000 lbs, Joint Strength = 162,000 lbs

7", 20 ppf, J55 STC data;
ID = 6.456", Drift ID = 6.331"

Clearance Calculations
4 1/2" csg inside 7", 20 ppf csg
(6.456- 5.000) / 2 = 0.728", assuming centered pipe

Cementing Program

Cement with 160 sks of Class 'b' neat with pumping additives as required by pilot testing. This slurry volume is calculated to bring the cement top to 3400 ft, using 20% excess over the open hole volume. Drop stage tool bomb and open stage collar ports. Circulate excess cement to the surface. Mix 70 bbls of packer fluid with oxeygen scavanger and clay stabilizer and circulate in place from the stage collar to the surface. Drop closing plug and displace with water. WOC 72 hours prior to commencing further completion operations.

Cement Volume Calculations

annular capacity 6 1/4" hole x 4 1/2" casing = 0.1026 cf/lf
annular capacity 7", 20 ppf csg x 4 1/2" casing = 0.1169 cf/lf
capacity of 4 1/2", 11.6 ppf casing = 0.0872 cf/lf

New TD = 4850 ft, measured Depth and 4557 ft, true vertical depth
Top of Window = 3450 ft
Stage Collar depth = 3400 ft

Open hole volume
(4850 - 3450)lf x 0.1026 cf/lf = 143.64 cf
use 20% excess
143.64 x 1.2 = 172.37 cf

Volume in 7" x 4 1/2" annulus
(3450 - 3400) x 0.1169 cf/lf = 5.85 cf

Shoe volume
40 ft x 0.0872 cf/lf = 3.49 cf

Slurry: Class 'b' neat.   Yield 1.15 cf/sk

172.37 cf + 5.85 cf + 3.49 cf = 181.71 cf
181.71 cf / 1.15 cf/sk = 158 sks.

Packer Fluid Volume Calculation

3400 lf x 0.1169 cf /lf / 5.615 cf/bbl = 70.8 bbls