APPENDIX C

APPROVED CHANGES AND WORKOVERS

PUNA GEOTHERMAL VENTURE GENERIC CHEMICAL TREATMENT TO REMOVE WELLBORE SCALE

May 12, 2009

Objective

Dissolve wellbore scale formation with approved chemicals: hydrochloric (HCl) acid for calcite; hydrofluoric (HF) acid or chealate (example: Nitrilotriacetate, C6H9NO6) for silica; or a blend of nitric (N), phosphoric (H3PO4) and hydrofluoric (HF) acids for sulfate scale.

Safety

Before job commences, hold a safety meeting for all personnel who will be on location. Meeting will be conducted jointly by Operator (PGV) and Service Company supervisors. As a minimum, the following points will be covered:

Procedure

- Review of applicable safety rules from common geothermal industry practice and site-specific rules for Puna Geothermal Venture
- Review evacuation plan
- Rules regarding mandatory use of face shields, gloves, hard hats and other protective gear
- Rules regarding safe areas for non-essential personnel during pumping and displacement of acid (as a minimum, areas around high-pressure lines will be marked off with a tape barrier)
- Location(s) of eye wash station(s)
- Location/availability of MSDS's
- Location(s) of telephone(s) and phone number list for hospital and emergency services
- Procedure for neutralizing drips or minor spills on the ground
- Procedures for containment and neutralizing of an acid spill

Service Company will have a supply of sodium carbonate (Na2CO3) or suitable substitute on location to neutralize minor acid spills.

Procedure

1. Shut in well by closing block valve on flow line. Shut master valve.

2. Rig up steel lines from pump truck to 3-in. casing head valve. Pressure test lines.

3. Pump at least one wellbore volume of fresh water ahead at approximately 5 BPM. Do not exceed 400 psi injection pressure without authorization of Operator representative. Well is expected to take water and chemical on a vacuum.

4. Pump chemical treatment with corrosion inhibitor, surfactant, and chelating agent as necessary to protect casing and prevent precipitation.

5. Wait for treatment to dissolve scale.

6. Displace acid with at least one wellbore volume of water.

7. Rig down pumping unit.

8. Return well to injection.

PUNA GEOTHERMAL VENTURE - GENERIC PROGRAM COILED TUBING CLEANOUT OF WELLBORE SCALE

12 May 2009

Objective

Remove wellbore scale with coiled tubing wash tools or hydroblast to improve injection capacity.

Safety

Before job commences, hold a safety meeting for all personnel who will be on location. Meeting will be conducted jointly by Operator (PGV) and Service Company supervisors.

Procedure

1. Mobilize coiled tubing rig and associated equipment.
   1.1. Notify all applicable Local, State & Federal agencies prior to rig up.
   1.2. Comply with all GRP, NSP, DLNR & UIC permits that pertain to well work.
   1.3. Ensure that contractors and drilling related personnel have been provided with the required safety training including H2S training and operation of H2S abatement system.

2. Nipple up to well and function test BOPE.

3. Make up wash tool or hydroblast nozzle

4. Run in hole with tubing, pumping water through wash tool or hydroblast nozzle, to bottom of well or as deep as tubing will go.

5. Set up for flow if necessary to cleanout well
   5.1. Rig up flow line and muffler with H2S abatement system according to PGV H2S abatement procedures
   5.2. Pump nitrogen and run tubing and attempt to unload and flow well while pumping caustic according to PGV H2S abatement procedures. Throttle well to keep flow below 100 kph of steam and zero carry over from muffler.
   5.3. Once well is flowing switch back to fluid to wash casing
   5.4. Continue to flow well until returns are clean and free of solids.

6. Shut in well and rig down tubing unit.

7. Comply with all applicable local, state and federal permits prior to placing the well back in service.

PUNA GEOTHERMAL VENTURE
GENERIC PROGRAM TO DRILL OUT WELLBORE SCALE WITH RIG

12 May 2009

Objective

Clean scale out of wellbore to improve injection capacity.

Procedure

1. Mobilize suitable rig and associated equipment.
   1.1. Notify all applicable Local, State & Federal agencies prior to rig up.
   1.2. Install direct communications between rig floor, tool pusher and company man.
   1.3. Comply with all GRP, NSP, DLNR & UIC permits that pertain to drilling.
   1.4. Ensure that the applicable drilling contractors have current well control training.
   1.5. Ensure that additional drilling related personnel have been provided with the required safety training.

2. Nipple up BOPE.

3. Kill well and keep water going into hole during cleanout.

4. Pull hang down liner if there is one.

5. Clean out scale.
   5.1. Run in hole with bit and stabilizer to fit I.D. of casing. Rotate and circulate as necessary to drill out scale.
   5.2. Run in hole with bit and stabilizer to fit I.D. of liner and/or open hole. Rotate and circulate as necessary to drill out scale

6. Rerun hang down liner, if applicable.

7. Secure well and rig down.

8. Comply with all applicable local, state and federal permits prior to placing the well back in service.

PUNA GEOTHERMAL VENTURE - GENERIC PROGRAM TO REMOVE AND/OR INSTALL PERFORATED LINER

12 May 2009

Objective

Remove damaged liner and/or install new liner to improve injection capacity and wellbore stability.

Procedure

1. Mobilize suitable rig and associated equipment.
   1.1. Notify all applicable Local, State & Federal agencies prior to rig up.
   1.2. Install direct communications between rig floor, tool pusher and company man.
   1.3. Comply with all GRP, NSP, DLNR & UIC permits that pertain to drilling.
   1.4. Ensure that the applicable drilling contractors have current well control training.
   1.5. Ensure that additional drilling related personnel have been provided with the required safety training.

2. Nipple up BOPE.

3. Kill well and keep water going into hole while working in hole.

4. Pull hang down liner if there is one.

5. Clean out scale.
   5.1. Run in hole with bit and stabilizer to fit I.D. of casing. Rotate and circulate as necessary to drill out scale.
   5.2. Run in hole with bit and stabilizer to fit I.D. of liner and/or open hole. Rotate and circulate as necessary to drill out scale as deep as necessary.

6. Pull liner, if necessary.
   6.1. If only part of liner is to be pulled, RIH with casing cutter and cut off liner at appropriate depth.
   6.2. RIH with casing spear, spear and pull liner.

7. Install liner, if necessary.
   7.1. Make up liner and run to TD.

8. Rerun hang down liner, if applicable.

9. Secure well and rig down.

10. Comply with all applicable local, state and federal permits prior to placing the well back in service.

PUNA GEOTHERMAL VENTURE - GENERIC PROGRAM TO SQUEEZE CEMENT

12 May 2009

Objective

Squeeze cement into formation to seal off undesired injection zone.

Procedure

1. Mobilize suitable rig and associated equipment.
   1.1. Notify all applicable Local, State & Federal agencies prior to rig up.
   1.2. Install direct communications between rig floor, tool pusher and company man.
   1.3. Comply with all GRP, NSP, DLNR & UIC permits that pertain to drilling.
   1.4. Ensure that the applicable drilling contractors have current well control training.
   1.5. Ensure that additional drilling related personnel have been provided with the required safety training.

2. Nipple up BOPE.

3. Kill well and keep water going into hole while working in hole.

4. Pull hang down liner if there is one.

5. Clean out scale.
   5.1. Run in hole with bit and stabilizer to fit I.D. of casing. Rotate and circulate as necessary to drill out scale to below area to be cemented.
   5.2. If necessary, run in hole with bit and stabilizer to fit I.D. of liner and/or open hole. Rotate and circulate as necessary to drill out scale below area to be cemented.

6. Establish plug below area to be cemented.
   6.1a Run bridge plug and set below area to be cemented,
   6.1b or pump cement plug below area to be cemented
   6.1c or fill hole with sand and cinders to below area to be cemented.
   6.2 Check plug back depth and pump cement plug

7. Squeeze cement.
   7.1. Pump squeeze cement across area to be cemented.
   7.2. Pressure up as necessary to squeeze cement.
   7.3. Wait for cement to set and then run in with bit and clean out cement and plug.

9. Rerun hang down liner, if applicable.

10. Secure well and rig down.

11. Comply with all applicable local, state and federal permits prior to placing the well back in service.

PUNA GEOTHERMAL VENTURE - GENERIC PROGRAM TO SQUEEZE CEMENT AND INSTALL CASING PATCH OR CEMENTED LINER

12 May 2009

Objective

Squeeze cement into undesirable injection zone and cover with casing patch or cemented liner.

Procedure

1. Mobilize suitable rig and associated equipment.
   1.1. Notify all applicable Local, State & Federal agencies prior to rig up.
   1.2. Install direct communications between rig floor, tool pusher and company man.
   1.3. Comply with all GRP, NSP, DLNR & UIC permits that pertain to drilling.
   1.4. Ensure that the applicable drilling contractors have current well control training.
   1.5. Ensure that additional drilling related personnel have been provided with the required safety training.

2. Nipple up BOPE.

3. Kill well and keep water going into hole while working in hole.

4. Pull hang down liner if there is one.

5. Clean out scale.
   5.1. Run in hole with bit and stabilizer to fit I.D. of casing. Rotate and circulate as necessary to drill out scale to below area to be cemented.
   5.2. If necessary, run in hole with bit and stabilizer to fit I.D. of liner and/or open hole. Rotate and circulate as necessary to drill out scale below area to be cemented.

6. Establish plug below area to be cemented.
   6.1a. Run bridge plug and set below area to be cemented,
   6.1b. or pump cement plug below area to be cemented
   6.1c. or fill hole with sand and cinders to below area to be cemented.
   6.2. Check plugback depth and pump cement plug.

7. Squeeze cement.
   7.2. Pump squeeze cement across area to be cemented.
   7.3. Pressure up as necessary to squeeze cement.
   7.4. Wait for cement to set and then run in with bit and clean out cement.

8a. Install casing patch, if necessary
   8a.1 Clean out cement and fill to TD
   8a.2 Make up casing patch and set across cemented area

8b. or Install liner, if necessary
   8b.1 Clean out cement and fill to bottom of liner installation
   8b.2 Make up and run liner
   8b.3 Cement liner in place, wait for cement to set
   8b.4 Clean out cement and fill to TD

9. Rerun hang down liner, if applicable.

10. Secure well and rig down.

11. Comply with all applicable local, state and federal permits prior to placing the well back in service.

PUNA GEOTHERMAL VENTURE - GENERIC PROGRAM TO PLUG BACK WELLBORE

12 May 2009

Objective

Plug back well to seal off undesirable injection zone at bottom of well.

Procedure

1. Mobilize suitable rig and associated equipment.
   1.1. Notify all applicable Local, State & Federal agencies prior to rig up.
   1.2. Install direct communications between rig floor, tool pusher and company man.
   1.3. Comply with all GRP, NSP, DLNR & UIC permits that pertain to drilling.
   1.4. Ensure that the applicable drilling contractors have current well control training.
   1.5. Ensure that additional drilling related personnel have been provided with the required safety training.

2. Nipple up BOPE.

3. Kill well and keep water going into hole while working in hole.

4. Pull hang down liner if there is one.

5. Clean out scale.
   5.1. Run in hole with bit and stabilizer to fit I.D. of casing. Rotate and circulate as necessary to drill out scale as deep as necessary for plug back.
   5.2. If necessary, run in hole with bit and stabilizer to fit I.D. of liner and/or open hole. Rotate and circulate as necessary to drill out scale as deep as necessary for plug back.

6. Plugback.
   6.1a. Run bridge plug and set below new TD
   6.1b. or pump cement plug below new TD
   6.1c. or fill hole with sand and cinders to below new TD
   6.2. Check plugback depth and pump cement plug above.

9. Rerun hang down liner, if applicable.

10. Secure well and rig down.

11. Comply with all applicable local, state and federal permits prior to placing the well back in service.

KS-11RD2 Kickoff Procedure using an Oriented Whipstock

March 30, 2009

Current Description of injection well KS-11 (see Attachment B – well diagram)

- 30" conductor set at 75 ft.
- 22", 106.5# casing from surface, shoe at 1002'.
- 16", 97# casing from surface, shoe at 2102'.
- 11 ¾", 36# casing from surface, shoe at 4422'.
- 9 5/8", 47# casing from surface, shoe at 3290'.
- 7", 23# liner hung down from surface to 3203'.
- 8 5/8" 36# liner hung from 4192' to 6405'.
- 6 5/8" liner cemented fro 4028' to 4752'.
- 10 5/8" open hole to 7950'.
- Fish in hole, top of fish at 6430'.

1. Pull 7", 23#, 22CR hang down liner.
   1.1. Pump down 7" casing to kill well.
   1.2. Bleed nitrogen off the 7" annulus to muffler with a temporary bleed line. Pump a minimum of 100 barrels to flush annulus.
   1.3. Back out set screws in the expansion spool.
   1.4. Make up spear assembly with 7", 23# grapple. Spear casing and pull casing. Lay down casing.

2. Pick up DP & tools to TD.
   2.1. RIH picking up tools, 3-1/2" and 5" drill pipe. Keep well dead.
   2.2. Flush pipe by circulating down string every 10 joints picked up.
   2.3. Run 8-1/2" bit and stabilizer or scraper on HWDP to top of 6-5/8" liner at 4028'.
   2.4. Run 5 ½" bit thru the 6 5/8" & 8 5/8" liner & tag fill. POH.

3. Run Casing Collar Locator over interval from 3100' to 3300' and locate first two collars above 9 5/8" shoe.

4. Back fill and plug 8-5/8" and 6 5/8" liners.
   4.1. RIH with OEDP and set cement plug from top of fill to 5100'. POH to 4700 ft and WOC until surface samples have set. Tag top of plug.
   4.2. RIH with OEDP and back fill 8-5/8" liner from top of cement at 5100' across the productive interval at 5000' to 4900' with sand, pea gravel & sand, crushed basalt or another plugging agent through the drill pipe. Tag top of sand with OEDP.
   4.3. RIH with OEDP and set 300 LF cement plug from top of sand, across the bottom of the 6 5/8" liner to approximately 4600'. POH to 9 5/8" casing shoe and squeeze, if possible. WOC until surface samples are set. Tag top of plug.

4.4. RIH with OEDP and back fill 6 5/8" liner with sand, pea gravel & sand or crushed basalt or another plugging agent through drill pipe from top of cement to 4150'. Tag top of plugging agent with OEDP.
4.5. Set cement plug from top of plugging agent across the top of the 6 5/8" liner to approximately 3900'. POH to 9 5/8" casing shoe and squeeze, if possible. WOC until surface samples are set. Tag top of plug.
4.6. Set cement plugs from top of cement at approximately 3900' to above the 9 5/8" shoe at 3290'. Polish plug as needed to set whipstock between collars above casing shoe.

5. Set whipstock and mill window above the 9 5/8" shoe.
   5.1. RIH with whipstock, starting mill, bit sub, drill pipe joint and UBHO sub below drill collars and pipe. Using gyro, set and orient whipstock according to procedure.
   5.2. Make up window milling assembly and mill through 9 5/8" and 11 ¾" casing, changing mill as needed. Once the window is complete, stop rotating, clean hole with high viscosity sweeps and POH without rotating.
   5.3. Inspect and gauge all mills for wear using a gauge ring of OD + 1/32".

6. Make up directional assembly with UBHO. RIH & directional drill with gyro until assembly is far enough off of casing to run MWD. Continue to drill with MWD to 4650' MD.

7. Run and cement a 7" liner.
   7.1. Run 7" liner with ECP directly below liner hanger.
   7.2. Cement liner in place.
   7.3. Inflate ECP with cement during pumping displacement.

8. Make up 6 1/8" directional assembly and drill to TD of 7509' MD (7174' TVD) as directed by Bill Teplow.

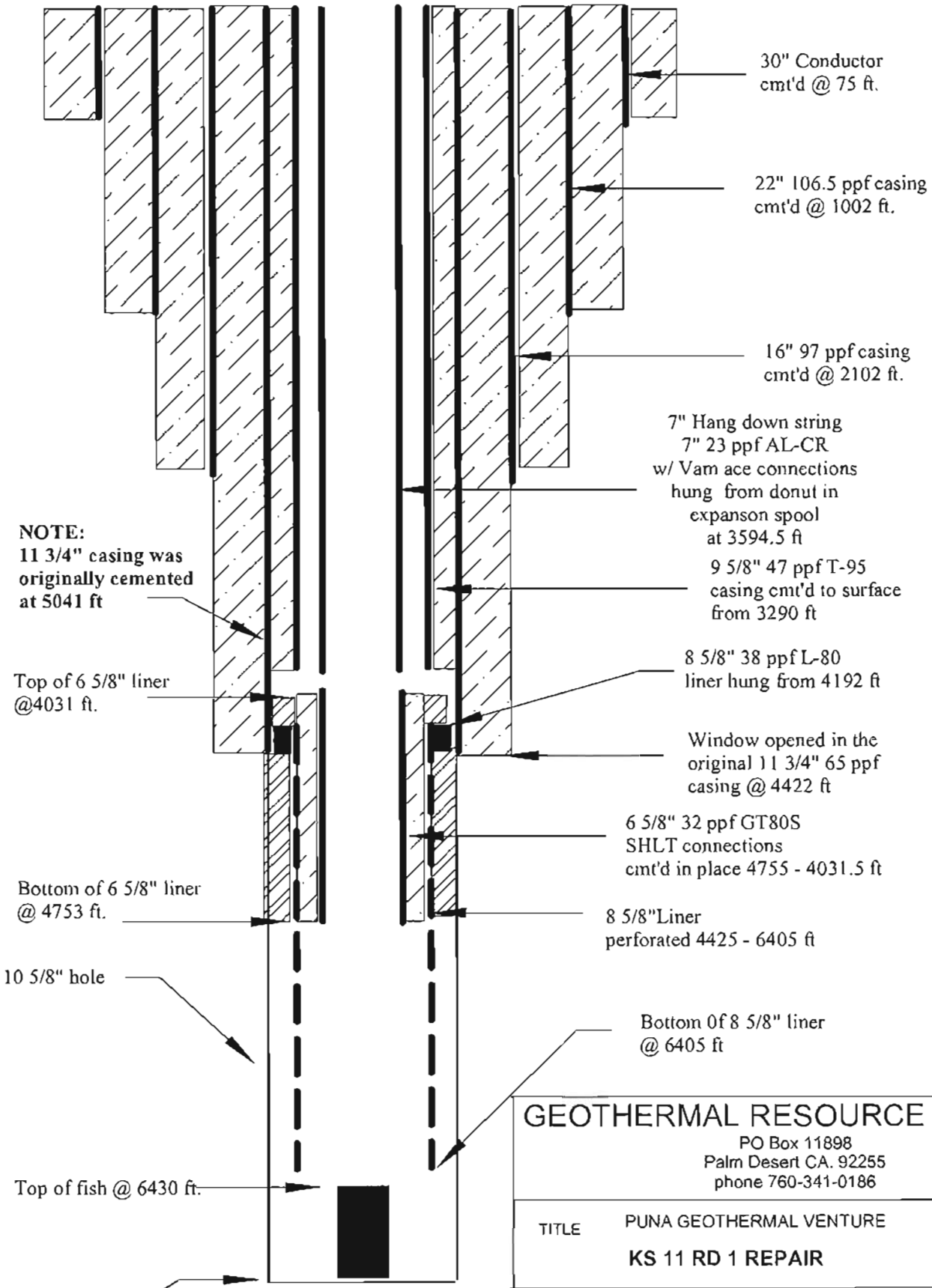
9. Run blank & perforated 5" liner if necessary to stabilize hole.

10. Rerun 7", 23#, 22CR hangdown.

11. Perform Mechanical Integrity Tests per UIC requirements.

12. After satisfactory MIT's, rig down and move off.

WELL KS 11RD REPAIR CONDITION AS OF 11 JANUARY 2007



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TITLE	PUNA GEOTHERMAL VENTURE KS 11 RD 1 REPAIR		
APPROVAL	DWG NO 100 -1		REV
WENDELL T. HOWARD	SCALE NTS		SHEET 1

PUNA GEOTHERMAL VENTURE GENERIC REDRILL PROGRAM

30 March 2009

1. Mobilize suitable rig and associated equipment.
   1.1. Notify all applicable Local, State & Federal agencies prior to rig up.
   1.2. Install direct communications between rig floor, tool pusher and company man.
   1.3. Comply with all GRP, NSP, DLNR & UIC permits that pertain to drilling.
   1.4. Ensure that the applicable drilling contractors have current well control training.
   1.5. Ensure that additional drilling related personnel have been provided with the required safety training.

2. Nipple up BOPE.

3. If required, pull hang down liner if there is one.

4. Side track well.
   4.1. If well is to be kicked off in open hole.
      4.1.1. Set light cement plug in open hole approximately 100 feet or more below kick off point.
      4.1.2. Set heavy cement plug across kick off point.
      4.1.3. Drill out with directional drilling assembly.
   4.2. If well is to be kicked off in casing.
      4.2.1. Set cement plugs at or below shoe of deepest cemented casing in slotted liner or open hole.
      4.2.2. Bring cement up to kick off point.
      4.2.3. Run, orientate and set whipstock on the cement plug.
      4.2.4. Drill out, mill window and dress window as needed.

5. Directionally drill new hole to casing point.
   5.1. If casing is necessary, run and cement liner with sufficient liner lap.

6. Directionally drill to TD.
   6.1. TD will typically be Kelly down after total loss circulation occurs or when sufficient rat hole has been drilled below production/injection zones.
      6.1.1. Run diagnostic test(s) as necessary.

7. Rig up and run perforated liner if needed to stabilize formation.

8. Run hang down liner from surface to a sufficient depth below the USDW.

9. Perform satisfactory mechanical integrity tests per UIC requirements.

10. Secure well and rig down.

11. Comply with all applicable local, state and federal permits prior to placing well back in service.