DATE IN	SUSPENSE	ENGINEER	LOGGED IN	TYPE	APP NO.
1/08/2014		PRG	1/17/2014	IPI	pMAM1401748850

ABOVE THIS LINE FOR DIVISION USE ONLY

-4610

NEW MEXICO OIL CONSERVATION DIVISION
- Engineering Bureau -
1220 South St. Francis Drive, Santa Fe, NM 87505

ADMINISTRATIVE APPLICATION CHECKLIST

THIS CHECKLIST IS MANDATORY FOR ALL ADMINISTRATIVE APPLICATIONS FOR EXCEPTIONS TO DIVISION RULES AND REGULATIONS WHICH REQUIRE PROCESSING AT THE DIVISION LEVEL IN SANTA FE

Application Acronyms:

[NSL-Non-Standard Location] [NSP-Non-Standard Proration Unit] [SD-Simultaneous Dedication]
[DHC-Downhole Commingling] [CTB-Lease Commingling] [PLC-Pool/Lease Commingling]
[PC-Pool Commingling] [OLS - Off-Lease Storage] [OLM-Off-Lease Measurement]
[WFX-Waterflood Expansion] [PMX-Pressure Maintenance Expansion]
[SWD-Salt Water Disposal] [IPI-Injection Pressure Increase]
[EOR-Qualified Enhanced Oil Recovery Certification] [PPR-Positive Production Response]

IPI
COG Operating
OWL 20504 JV-P
30-015-35435

[1] **TYPE OF APPLICATION** - Check Those Which Apply for [A]

[A] Location - Spacing Unit - Simultaneous Dedication
☐ NSL ☐ NSP ☐ SD

Check One Only for [B] or [C]

[B] Commingling - Storage - Measurement
☐ DHC ☐ CTB ☐ PLC ☐ PC ☐ OLS ☐ OLM

[C] Injection - Disposal - Pressure Increase - Enhanced Oil Recovery
☐ WFX ☐ PMX ☐ SWD ☒ IPI ☐ EOR ☐ PPR

[D] Other: Specify _____

[2] **NOTIFICATION REQUIRED TO:** - Check Those Which Apply, or Does Not Apply

[A] ☐ Working, Royalty or Overriding Royalty Interest Owners

[B] ☐ Offset Operators, Leaseholders or Surface Owner

[C] ☐ Application is One Which Requires Published Legal Notice

[D] ☐ Notification and/or Concurrent Approval by BLM or SLO
U.S. Bureau of Land Management - Commissioner of Public Lands, State Land Office

[E] ☐ For all of the above, Proof of Notification or Publication is Attached, and/or,

[F] ☐ Waivers are Attached

[3] **SUBMIT ACCURATE AND COMPLETE INFORMATION REQUIRED TO PROCESS THE TYPE OF APPLICATION INDICATED ABOVE.**

[4] **CERTIFICATION:** I hereby certify that the information submitted with this application for administrative approval is **accurate** and **complete** to the best of my knowledge. I also understand that **no action** will be taken on this application until the required information and notifications are submitted to the Division.

Note: Statement must be completed by an individual with managerial and/or supervisory capacity.

Brian Collins	See attached cover letter	Sr. Operations Engineer	01/09/2014
Print or Type Name	Signature	Title	Date

bcollins@concho.com
e-mail Address

CONCHO

December 3, 2013

Mr. Phillip Goetze
New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, NM 87505

RE: COG Operating, LLC
Request to Increase Maximum Allowable Injection Pressure
Owl 20504 JV-P #5 SWD
2310' FSL, 2130' FWL, Sec. 18, T26S, R27E, Eddy County
Order SWD-1091, API: 30-015-35435

Dear Mr. Goetze:

COG Operating, LLC respectfully requests administrative approval to increase the maximum allowable injection pressure on the referenced SWD well from 587 psi to 837 psi. We ran a step-rate test starting at approximately 0.5 BPM and ending at 6.00 BPM that showed no distinctive break-over in the injection pressure. The friction-corrected data plots as a straight line having a 35 psi/BPM slope. It doesn't appear that we reached fracture pressure at the maximum injection rate of 6 BPM achieved during the step-rate test. The uncorrected surface injection pressure was approximately 800 psi at the 6 BPM rate.

The well was shut in for 60 days prior to the step-rate test and had a shut in surface pressure of 505 psi after the 60 day shut in. It appears that the reservoir pressure has increased due to the water injected into the disposal zone. Fracture gradient increases with increasing reservoir pressure as shown on the attached fracture gradient calculation sheet. The surface pressure required for fracture initiation calculates to be 837 psi based on the fracture gradient calculated using the increased reservoir pressure and the actual density of the injected water and does not include friction pressure (static pressure only).

Back up data and the step-rate test plot are attached. Please contact me at bcollins@concho.com or 575.748.6924 if you have questions.

Sincerely,

Brian Collins
Senior Operations Engineer

$837 - 50 = 787 psi$

$\frac{787\ psi}{2934\ ft} = 0.27$

XC: Mr. Randy Dade, NMOCD Artesia

Corporate Address: Fasken Center, Tower II 550 West Texas Avenue, Suite 100 Midland, Texas 79701 PHONE 432.683.7443 FAX 432.683.7441
Local Address: Concho West 2208 West Main Street Artesia, New Mexico 88210 PHONE 575.748.6940 FAX 575.748.6950

Owl 20504 JV-P #5 SWD
Fracture Gradient Calculation for Request to Increase Allowable Injection Pressure
2-Dec-13

COG Operating, LLC requests that the permitted surface injection pressure be increased from 587 psi to 837 psi. We ran a step-rate test starting at 0.45 bpm and ending at 6.00 bpm that showed no distinctive break-over in the injection pressure. The data plots as a straight line with a consistent 35 psi/bpm slope when corrected for friction pressure. It doesn't appear that we reached fracture pressure at the maximum rate of 6 bpm (800 psi surface injection pressure, uncorrected) achieved during the step rate test.

The well was shut in for 60 days prior to the step rate test and had a shut in surface pressure of 505 psi after the 60 day shut in. It appears that the reservoir pressure has increased due to the water injected into the disposal zone. Fracture gradient increases with increasing reservoir pressure as described in the fracture gradient equation shown below. The calculated allowable surface pressure is 837 psi based on the fracture gradient calculated using the increased reservoir pressure and the actual density of the injected water.

Basic Fracture Gradient Formula: $FG = (\alpha \times S/D) + ((1-\alpha) \times P/D))$

FG = fracture gradient, psi/ft
S/D = overburden pressure gradient, psi/ft
P = reservoir pressure, psi
D = depth, ft

α = Poisson's Ratio/(1-Poisson's Ratio)

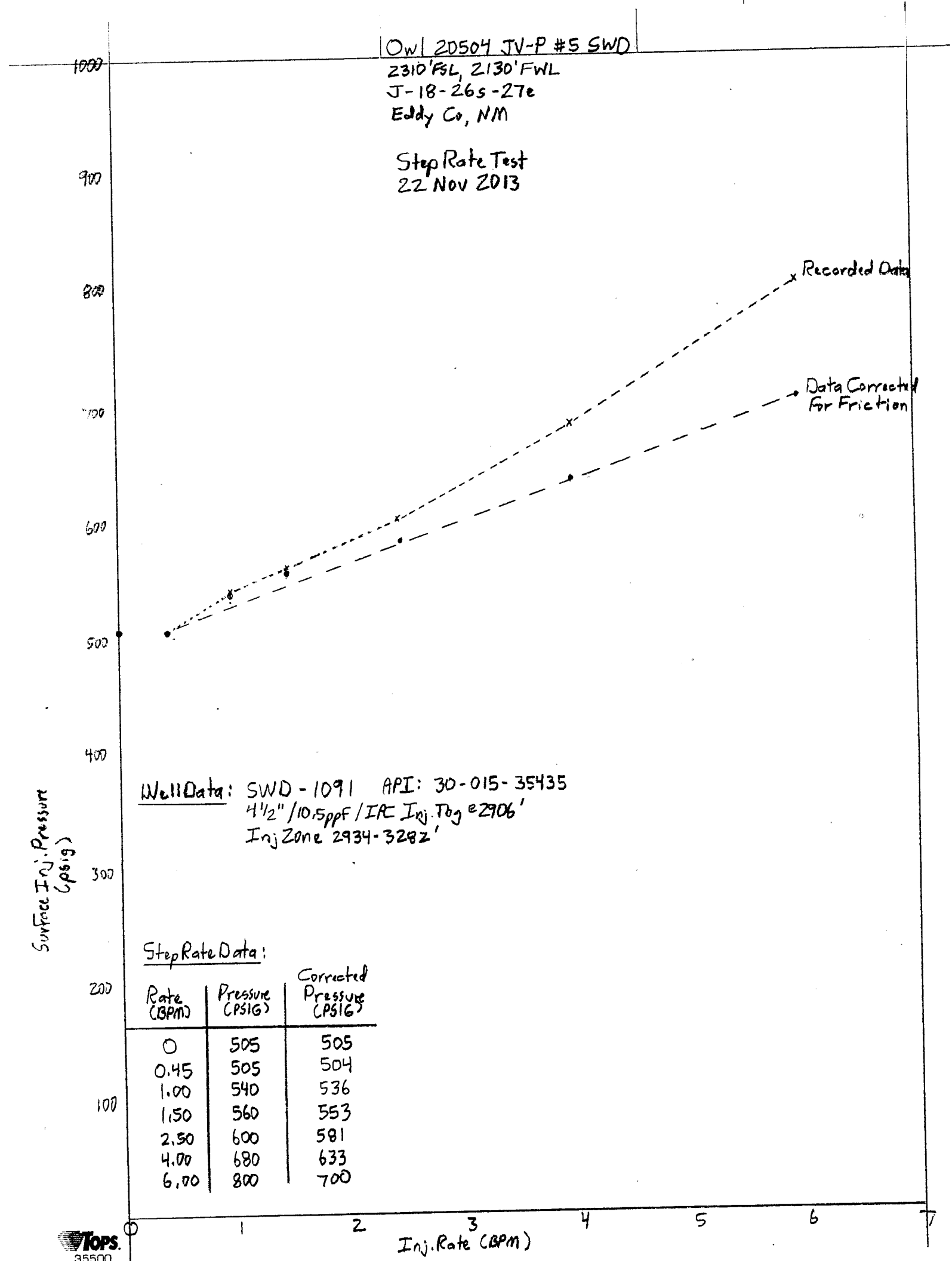
Basic Data:	Poisson's Ratio =	0.25		(for sandstone from literature and service company frac expert)
	α =	0.33		
	S/D =	1	psi/ft	(normally varies between 1.0 and 1.1 psi/ft---used 1.00 psi/ft to be conservative)
	SI Surface Press =	505	psi	(surface pressure recorded after well was shut in for 60 days)
	Inj. Wtr. Dens. =	9.4	ppg	(density of actual injected water)
	D =	2934	ft	(depth to top injection zone perforation)
	P =	1939	psi	(calculated reservoir pressure from 60 day shut in)
Fracture Gradient:	FG =	0.77	psi/ft	

Proposed Allowable Surface Injection Pressure = 837 psi

Proposed Surface Injection Pressure = (Fracture Gradient - Fluid Hydrostatic Gradient) x Depth

Ow| 20504 JV-P #5 SWD
2310'FSL, 2130'FWL
J-18-26s-27e
Eddy Co, NM

Step Rate Test
22 Nov 2013



Well Data: SWD-1091 API: 30-015-35435
4 1/2" / 10.5ppf / IPC Inj. Tog @ 2906'
Inj Zone 2934-3282'

Step Rate Data:

Rate (BPM)	Pressure (PSIG)	Corrected Pressure (PSIG)
0	505	505
0.45	505	504
1.00	540	536
1.50	560	553
2.50	600	581
4.00	680	633
6.00	800	700

Hazen Williams Friction Calculations for 4.5"/10.5ppf/IPC Injection Tubing

Owl 5 SWD Step Rate Test 22 November 2013

22-Nov-13

Basic Data:

Approx. ID IPC tubing = 3.90", C = 150

ID 7" casing = 6.366", C = 100

ID treating lines = 2", C = 130

Number 90 deg bends in treating lines = 10

k=.23 for 2" nom pipe size, r/d=2

Q (bpm)	Q (bpd)	C Factor	ID Pipe (inches)	Fluid Density (ppg)	Line Length (feet)	Line Segment Friction (psi)	Cum Line Segment Friction	Surface Pressure (psi)	Friction Corrected Surface Pressure (psi)
0	0							505	505
0.45	648	100	6.366	9.400	200	0	0		
0.45	648	150	3.900	9.400	2906	0	0		
0.45	648	130	2.000	9.400	60	0	1	505	504
1	1440	100	6.366	9.400	200	0	0		
1	1440	150	3.900	9.400	2906	2	2		
1	1440	130	2.000	9.400	60	2	4	540	536
1.5	2160	100	6.366	9.400	200	0	0		
1.5	2160	150	3.900	9.400	2906	4	4		
1.5	2160	130	2.000	9.400	60	3	7	560	553
2.5	3600	100	6.366	9.400	200	0	0		
2.5	3600	150	3.900	9.400	2906	10	10		
2.5	3600	130	2.000	9.400	60	9	19	600	581
4	5760	100	6.366	9.400	200	0	0		
4	5760	150	3.900	9.400	2906	24	25		
4	5760	130	2.000	9.400	60	22	47	680	633
6	8640	100	6.366	9.400	200	1	1		
6	8640	150	3.900	9.400	2906	52	52		
6	8640	130	2.000	9.400	60	47	100	800	700

Q (BPM)	Q (BPD)	Q (CF/S)	A (Sq Ft)	V (F/S)	hf (ft)	Delta Pf (psi)	Number Elbows	Total Delta Pf (psi)
0.45	648	0.04211	0.02182	2	0.013	0	10	0
1	1440	0.09358	0.02182	4	0.066	0	10	0
1.5	2160	0.14038	0.02182	6	0.148	0	10	1
2.5	3600	0.23396	0.02182	11	0.411	0	10	2
4	5760	0.37433	0.02182	17	1.051	1	10	5
6	8640	0.5615	0.02182	26	2.366	1	10	12

Elite
Well Services LLC

P.O. Box 1426
Artesia, NM 88211-1426

COG Operating

Owl 20504 JV-P #5 SWD

Interval 1
Eddy County, New Mexico

Sales Order: 00001820

API#30-015-35435

Post Job Report

For: Brian Collins
Date: Friday, November 22, 2013

Elite Well Service

Job Log

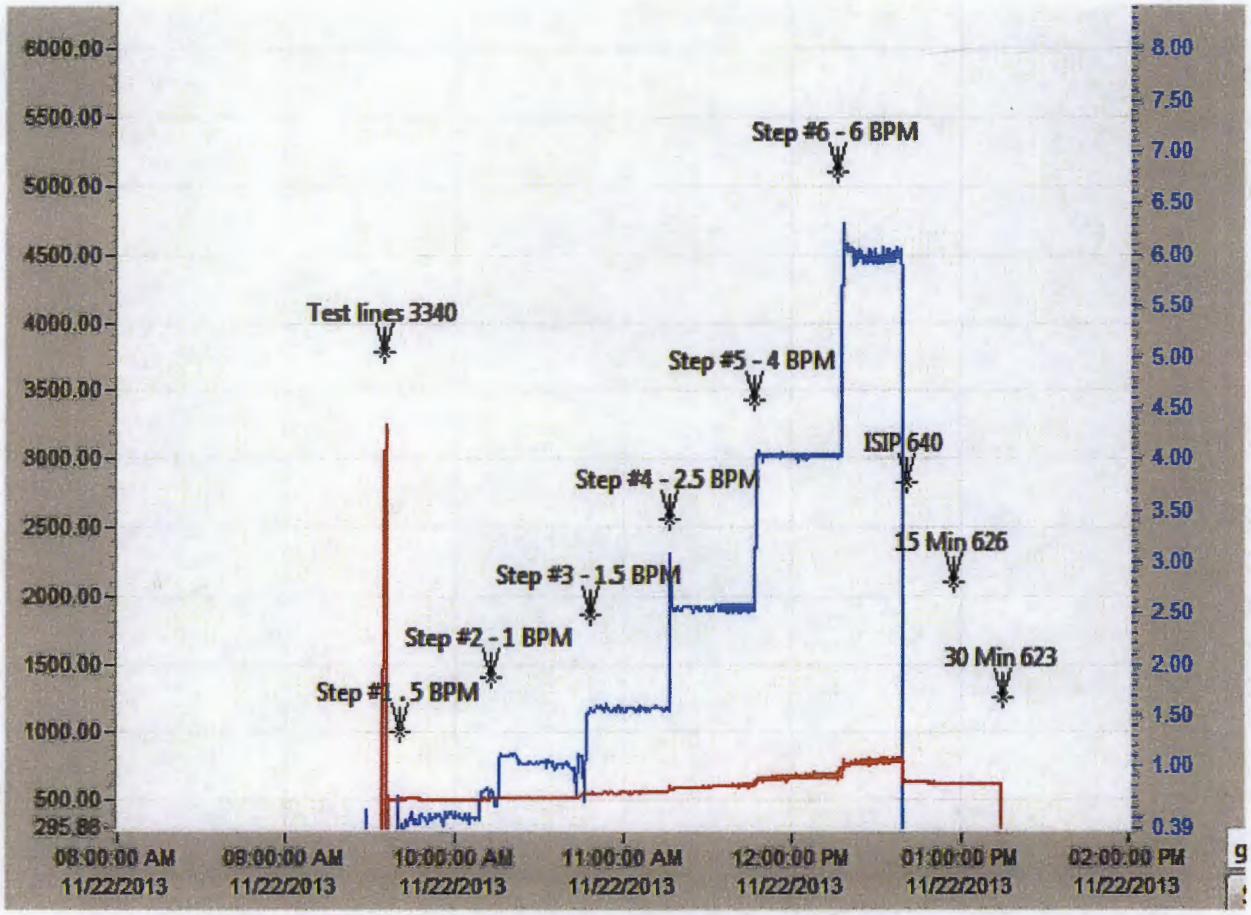
Crew: R. Derrick & Crew

Job Date: 11/22/2013

Sales Order #:
API #:
WO #:
PO #:

Time	Description	Comment	Stage Clean Volume (bbl)	Tubing Pressure (psig)	Slurry Rate~Tbg (bbl/min)
9:32	Test Lines				
9:34	Open Well			505	
9:36	Step #1		15	510	.5
10:13	Step #2		30	521	1
10:44	Step #3		45	560	1.5
11:14	Step #4		75	595	2.5
11:45	Step #5		120	680	4
12:15	Step #6		124	780	6
12:37	ISIP			640	
12:42	5 Min			632	
12:47	10 Min			628	
12:52	15 Min			626	
12:57	20 Min			625	
1:02	25 Min			624	
1:07	30 Min			623	
	Total Fluid		429		

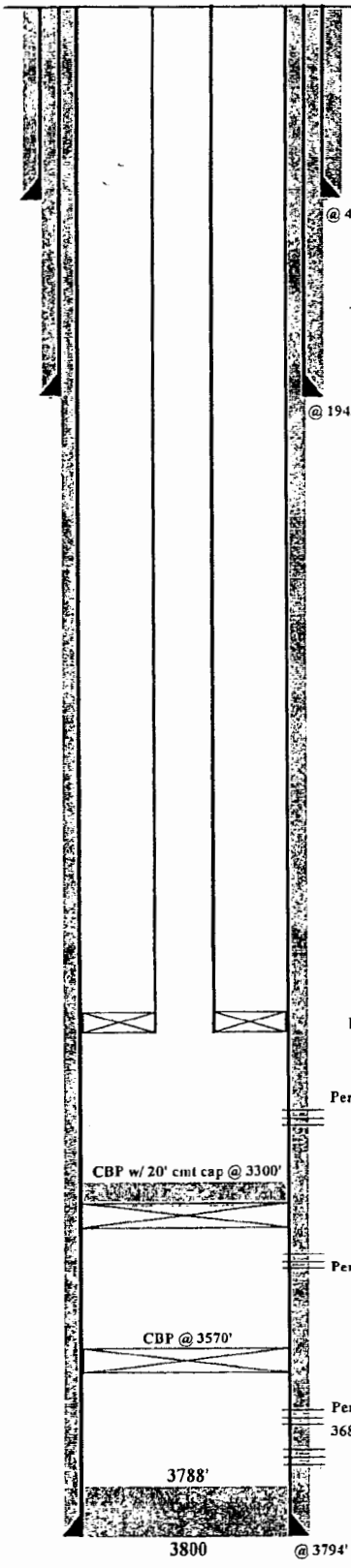
Elite
Well Services LLC



Created: November 22, 2013 at 1:20 PM

Tubing Detail

75 jts 4-1/2" 10 5# IPC tbg
2-7/8"x4-1/2" X-over
2 313 X nipple
Baker Loc-set Packer



KB = 3301 X-Mas Tree Top Conn.
GL = 3289
Diff = 12

@ 400' - 13-3/8" 54.5# J-55 Surf. Csg. Cmtd w/ 450 Sx Cmt Circ

TOC Surf By Circ

@ 1945' - 9-5/8" 36# J-55 Interm Csg. Cmtd w/ 750 Sx Cmt Circ

Packer @ 2906'

Perfs: Cherry Canyon 2934' - 3282' w/ 4 JSPF

CBP w/ 20' cmt cap @ 3300'

Perfs: Cherry Canyon 3332' - 56' w/ 4 JSPF

CBP @ 3570'

Perfs: Lwr Cherry Canyon 3612' - 16'; 3646' - 54';
3688' - 3728'; w/ 4 JSPF

3788'

3800

@ 3794' - 7" 23# J-55 Prod. Csg. Cmtd w/ 700 Sx

Revised				Drawn	BMM
		SWD			7/3/2007
	LEASE	20504 JV-P Owl	#5		
	FIELD	Hay Hollow			
	LOCATION	2310' FSL 2130' FEL Sec. 18 T26S R27E		Approved	
	COUNTY	Eddy	STATE New Mexico		
	PRODUCING FORMATION	Brushy Canyon		Date	
		BTA Oil Producers			