UIC - I - ___8___

EPA FALL-OFF TEST PLAN

DATE:

2008 - Present

Chavez, Carl J, EMNRD

From: Chavez, Carl J, EMNRD
Sent: Thursday, May 21, 2009 2:52 PM
To: 'Moore, Darrell'
Cc: 'Ken Davis'; Rusty Smith; Lackey, Johnny
Subject: RE:

Darrell, et al.:

Your request for an extension from June 1, 2009 to July 20, 2009 is hereby approved.

In response to your questions in the attached letter dated May 19, 2009, the OCD responses are in red text below.

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A minimum of at least 72 hours or until you see a boundary.

What exactly does the OCD need for confirmation? Would rate data submitted with the report be confirmation?

A plot or graph.

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Does the OCD have any specific equation that they require?

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Is this what the OCD wants or can a shorter fall-off period be used?

Minimum day fall-off period needed for test.

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Item 6 deals with the handling of waste at the well during the test. You could divert the waste from the test well to the furthest way class I well owned by Navajo. Item 4 is talking about an adequate volume of injected fluid being available for the 3 day injection period.

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Thank you.

Carl J. Chavez, CHMM
New Mexico Energy, Minerals & Natural Resources Dept.
Oil Conservation Division, Environmental Bureau
1220 South St. Francis Dr., Santa Fe, New Mexico 87505
Office: (505) 476-3490
Fax: (505) 476-3462
E-mail: CarlJ.Chavez@state.nm.us
Website: http://www.emnrd.state.nm.us/ocd/index.htm
(Pollution Prevention Guidance is under "Publications")

From: Moore, Darrell [mailto:Darrell.Moore@hollycorp.com]
Sent: Tuesday, May 19, 2009 8:03 AM
To: Chavez, Carl J, EMNRD
Cc: 'Ken Davis'; Rusty Smith; Lackey, Johnny
Subject:

Carl

Attached is a letter with an extension request and some questions about the fall off test on our injection wells. Hard copy will follow.

Thanks

Darrell Moore
Environmental Manager for Water and Waste
Navajo Refining Company, LLC
Phone Number 575-746-5281
Cell Number 575-703-5058
Fax Number 575-746-5451

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May 19, 2009

Carl J. Chavez, CHMM
New Mexico Energy Minerals & Natural Resources Department
Oil Conservation Division, Environmental Bureau
1220 South St. Francis Dr.
Santa Fe, New Mexico 87505

Re: Navajo Refining APT, PFO & MIT Test Plan (UICI-8) and Request for Extension on WDWs 1, 2 & 3

Dear Carl:

Navajo has received your May 1, 2009 e-mail concerning the subject 2009 Pressure Fall-Off (PFO) Test Plan. Generally, based on your comments, it appears that the Oil Conservation Division (OCD) wants a stand alone test plan for each of the Navajo WDW 1, 2 & 3 facilities at Artesia. We agree that most, if not all, of the required information is available but it is scattered between the original permit application files and numerous maintenance and other reports. These files are generally located in the state files with drilling records and other files our contractor, Subsurface Technology Inc. (Subsurface), has developed. Additionally, we will need to evaluate any new activity in the Area of Review. Since it will be virtually impossible to locate, evaluate, copy and assemble this information by June 1, 2009, we are requesting an extension to July 20, 2009. At or before that time, we will deliver the test plan to the OCD for approval. Upon receipt of approval, we will implement the test procedure and schedule the field work. Probably in the July-August time frame.

Subsurface has also reviewed the referenced e-mail and has asked the following questions:

Section II of the UIC Well Fall-Off Test Guidance (December 3, 2007) document states that, "shut down of the well for time sufficient to conduct a valid observation of the pressure fall-off".
What does the OCD consider sufficient when there are different radial flow periods, such as you find in naturally fractured or induced fractured formations?

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For convenience, we have sent Subsurface a copy of this letter. Please send them a copy of your response. If it would be more convenient to call them, you can contact Ken Davis with Subsurface at 713-880-4640. Or you can contact me at 575-748-3311.

Very truly yours,
NAVAJO REFINING COMPANY,LLC

Darrell Moore
Environmental Manager for Water and Waste

Cc: Subsurface Technology Inc.

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November 3, 2008

Carl J. Chavez, CHMM
New Mexico Energy, Minerals & Natural Resources Dept.
Oil Conservation Division, Environmental Bureau
1220 South St. Francis Dr., Santa Fe, New Mexico 87505

RE: WELL BUILD-UP/FALL OFF TEST WORK PLAN
NAVAJO REFINING COMPANY

Carl,

Enclosed, please find two copies of a workplan for testing the three injection wells we operate at this plant. We are hoping this will satisfy OCD's requirement of an annual fall off test. If there are any questions about this workplan, please call me at 575-746-5281.

Sincerely,

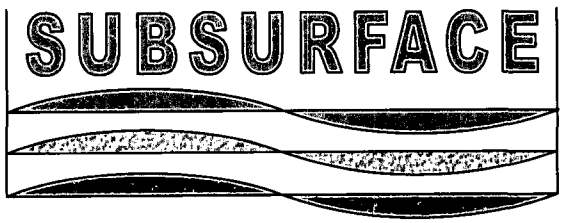
NAVAJO REFINING COMPANY, LLC

Darrell Moore

Darrell Moore
Environmental Manager for Water and Waste

Encl.

File: Injection Well Discharge Permits



WELL BUILD-UP/FALL-OFF TEST PLAN
MEWBOURNE WELL NO. 1
CHUKKA WELL NO. 2
AND
GAINES WELL NO. 3

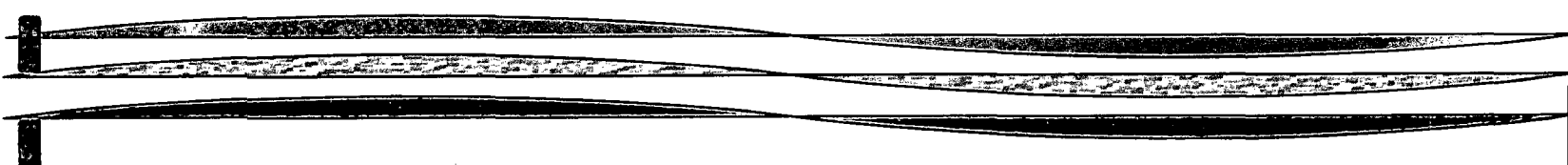
HOLLY CORPORATION INC.
NAVAJO REFINING
Artesia, New Mexico

Subsurface Project No. 70G6142

October 2008

Prepared By:

SUBSURFACE CONSTRUCTION CORP.
6925 Portwest Dr., Suite 110
Houston, Texas 77024



SUBSURFACE

WELL BUILD-UP/FALL-OFF TEST PLAN
MEWBOURNE WELL NO. 1
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HOLLY CORPORATION INC.
NAVAJO REFINING
Artesia, New Mexico

Subsurface Project No. 70G6142

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Prepared By:

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6925 Portwest Dr., Suite 110
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WELL BUILD-UP/FALL-OFF TEST PLAN
NAVAJO REFINERY
ARTESIA, NM
MEWBOURNE WELL NO. 1 (UIC-CLI-008-1)
CHUKKA WELL NO. 2 (UIC-CLI-008-2
GAINES WELL NO 3 (UIC-CLI-008-3)

General Test Operational Consideration

The falloff testing will be performed on Gaines Well No. 3 in the first year, then on the Mewbourne Well No. 1 in the second year, completing the process with Chukka Well No. 2 in the third year. This cycle will be repeated every three years.

This sequence will be repeated for each well on a yearly basis. For example, in 2009 the reservoir (Wolfcamp/Cisco/Canyon) will be tested via the Gaines Well No. 3, in 2010 via the Mewbourne Well No. 1, and in 2011 via the Chukka Well No. 2. This represents a fair approximation of the reservoir buildup pressure over time as all three wells inject into the Wolfcamp/Cisco/Canyon formations. The 2008 falloff tests show that the wells communicate, which will allow a fair representation of the reservoir pressure (reference to "2008 Annual Bottom-Hole Pressure Survey and Pressure Falloff Test for Mewbourne Well No.1, Chukka Well No. 2, and Gaines Well No. 3"). Communication between the wells shows that the reservoir is continuous between each well and that results from one well should be sufficient to represent the general reservoir characteristic and pressure buildup over time. See Table 5 for comparisons of reservoir values over time.

The process of performing buildup/falloff test on each individual well under the same conditions would likely yield similar results for each test, adding unneeded, costly redundancy. The request by Navajo Refining to perform one buildup/falloff test a year alternating between the well is justified having shown that the wells are communicating as represented in the data obtained during the 2008 buildup/falloff testing. The mechanical integrity testing will continue to be performed annually on each well as required.

The procedure for the target well will consist of the following. A constant rate will be maintained in the first targeted well for 24 hours prior to shut in with one offset well shut in and the other offset under a constant injection rate. Tandem bottom-hole memory

gauges will be lowered into the targeted well (two memory gauges per well, one primary, and one backup), and allowed to stabilize for one hour. Just before the targeted well is shut in, the two offset wells will be set to maintain a low constant injection rate. The targeted well will be shut in for a minimum of 72 hours, with both of the offset wells maintaining a low constant injection rate. At the end of the falloff test, the bottom-hole pressure gauges will be pulled from the well making gradient stops every 1,000 feet.

The injection build-up period will consist of no less than 72 hours at a constant rate. The pressure falloff sequence will be maintained for at a minimum, the same amount of time. Due to refinery expansion, the refinery does not have the storage capacity to shut in more than two wells for 24 hours and will have to maintain a constant injection into the two offset wells while performing a falloff in the adjacent well.

The memory gauges that will be used are quartz or sapphire gauges that will have a resolution of 0.0002% (FS) or 0.0003% (FS) respectively. The pressure range of the gauges will be from 0 - 10,000 psi minimum. These are typical bottom-hole memory gauges, with the best accuracy available in the area. The gauges will be lowered to the top of the injection interval at 7,924 feet in Mewbourne Well No. 1, 7,820 feet in Chukka Well No. 2, and 7,660 feet in Gaines Well No. 3. The recording period will be set to record pressures at a minimum of every 10 seconds, which should allow for a minimum of a 10-day recording period.

The fluid that will be used for the injection test is the refinery's brine waste water (effluent). A current waste analysis of the fluid will be included in the final report.

A crown valve has been installed on each of the three wells. A wireline lubricator will be installed into the crown valve before running into the wellbore with the memory gauges. The wells will be shut in through two inline gate valves. The first valve is located in the injection line just prior to the wellhead (wing valve), and the other is located behind the filter pods, and is mechanically operated from the control room at the plant (primary and secondary shut-in valves). The instantaneous shut in of the wells will be accomplished by the mechanical operated valve (MOV) behind the filter pods.

Background Information

All background information will be included in the final report encompassing a log of the events (Chronology of Field Activity), an overview of the Geology, a current one mile area of review (AOR) update, falloff analysis including injection data (rate and volume history), gauge calibration certificates, bottom-hole pressure analysis, well schematic, electric logs (if necessary), reservoir fluid description, and injection fluid analysis. The procedure for the buildup/falloff testing will also be included in the final report. An AOR update will be completed prior to the build-up/falloff testing to ascertain any changes, which have occurred in the AOR that might have an effect on the testing. Historically, there has not been any production or injection in the current injection interval within a one mile radius of Mewborune Well No. 1, Chukka Well No. 2, or Gaines Well No. 3.

Navajo Refining has been running buildup/falloff tests on Mewborune Well No. 1, Chukka Well No. 2 since 2000 using sapphire gauges. The tests were performed to comply with EPA directives for UIC non-hazardous Class I injection wells. April 1, 2008 through April 4, 2008 buildup/falloff tests were conducted on Mewborne Well No. 1, Chukka Well No. 2, and Gaines Well No. 3 concurrently, and the injection rates were varied at the end of the testing to ascertain that the wells were hydraulically connected. The 24-hour buildup portion of the testing was done at a constant injection rate in each of the offset wells. The falloff portion of the testing was terminated after 24 hours. The Mewbourne Well No. 1 had a permeability of 2,010 md (height of 175 ft, reservoir viscosity 0.72 cp), for a radius of investigation of 8,455 ft and a skin of 262. The Chukka Well No. 2 had a permeability of 1,091 md (height of 175 ft, reservoir viscosity 0.72 cp), for a radius of investigation of 6,221 ft and a skin of 155. The Gaines Well No. 3 had a permeability of 1,322 md (height of 175 ft, reservoir viscosity 0.72 cp), for a radius of investigation of 7,008 ft and a skin of 107. The pressure data at the end of the testing shows that the wells were hydraulically connected with pressure responses relative to changes in the offset wells injection rate (reference "2008 Annual Bottom-Hole Pressure Survey and Pressure Falloff Test for Mewbourne Well No.1, Chukka Well No. 2, and Gaines Well No. 3" for additional information). A summary of the historical reservoir data is presented in Table 5.

Figures 1 through 3 are the well schematics for Mewborune Well No. 1, Chukka Well No. 2, or Gaines Well No. 3. Table 2 is a summary of the injection intervals for each well. Table 3 is a summary of the injection fluid analysis. Table 4 is a summary of the formation fluids. The majority of the background information can also be found in the permit application that was submitted to the State of New Mexico Oil Conservation Division for each well, and reference data for this request can be found in the "2008 Annual Bottom-Hole Pressure Survey and Pressure Falloff Test for Mewbourne Well No.1, Chukka Well No. 2, and Gaines Well No. 3".

Conduct Annulus Pressure Testing

Utilizing the Navajo annulus monitoring system on each well, an annulus pressure test (APT) will be run at a minimum pressure of 300 psi for a period of no less than 30 minutes. The annulus pressure data will be recorded using a digital surface readout pressure recorder or plant recording equipment (RTU/PLC). Each well will be tested annually apart from the buildup/falloff testing of the reservoir.

Conducting the Falloff Testing

This is the generalized procedure that will be used to perform the buildup/falloff testing at Navajo Refining facility in Artesia, New Mexico:

Day 1

- Inject into one of the offset wells at a low constant rate.
- Shut in the remaining offset well.
- Inject into the target well for the buildup portion of the testing, at a constant rate, for a minimum of 72 hours.

Day 4

- Move in and rig up slick line unit on target well. Make a gauge ring run into the well and tag the bottom of fill. Pull out of the hole with the gauge ring and run tandem memory tools into the well. The memory tools will be set at top of the perforations. Allow the pressure to stabilize for approximately one hour. After

setting the memory tools in place, shut in the target well for a minimum of 72 hours.

- Start injection into each of the offset wells at a minimum constant rate just before shut in of the targeted well and maintain a constant rate for duration of the falloff testing period.

Day 7

- End the 72 hour pressure falloff test, making gradient stops every 1,000 feet while pulling the memory gauges from the wellbore.
- Turn over the targeted well to the refinery operations.
- Turn over the offset wells to the refinery operations.

Evaluation of the Test Results

The falloff analysis will be completed by a qualified engineer using PanSystem®2006 Edinburgh Petroleum Services Ltd. transient pressure analysis program and reviewed for accuracy by a licensed professional engineer (PE). The falloff analysis will include the following:

- A log-log plot with a derivative diagnostic plot used to identify flow regimes;
- A wellbore storage portion and infinite acting portion of the plot;
- A semi-log plot with wellbore storage, p*, and slope;
- An expanded portion of the semi-log plot showing the infinite acting pressure portion (radial flow);
- The geological parameters, height, porosity, compressibility of the rock for the falloff analysis will be based on historical data, loss and local geology developed for the permit application;
- The viscosity of the formation used for the calculations based on historical data;
- A summary of all the equations used for the analysis;
- An explanation of any temperature or pressure anomalies;

The injection records prior to the testing will be included in the analysis. All records from the testing shall be kept on file for no less than 5 years.

Table 1 is a summary of Well Data. Table 2 is a summary of the local geology for injection intervals. Table 3 is a summary of injected waste water. Table 4 is a summary of formation fluids. Table 5 is a summary of pressure fall-off test results.

TABLES

Well Data Table 1

	Mewbourne Well No. 1	Chukka Well No. 2	Gaines Well No. 3
Tubing	4.5", 11.6 lb/ft, N-80, SMLS, R3, LT&C 7879'	3.5", 9.2 lb/ft, J-55, NUE 10RD 7528'	4.5", 11.6 lb/ft, J-55, LT&C, 8RD 7575'
Packer	7"x 3.5", EVI Oil Tools (Arrow), X-1, ID 3", 7879'	5.5"x 2.875" Weatherford (Arrow), X-1, ID 2.4375", 7528'	7"x 2.875" Kenco Tools (Arrow), X-1, ID 2.4375" 7575'
Perforations	Upper: 7924 – 42; 7974 – 8030; 8050 – 56; 8066 – 80; 8118 – 27; 8132 – 40; 8160 – 64; 8170 – 88 Lower: 8220 - 54; 8260 - 70; 8280 - 8302; 8360 - 66; 8370 - 78; 8400 - 10; 8419 - 23; 8430 - 46; 8460 - 64; 8470 - 76	Upper: 7570 – 7620; 7676 – 7736 Lower: 7826 - 34; 7858 - 80; 7886 - 7904; 7916 - 36; 7944 - 64; 7990 - 8042; 8096 - 8116; 8191 - 8201; 8304 - 19; 8395 - 99	Upper: 7660 – 8450 Lower: 8540 - 8620
Protection Casing	7", 29 lb/ft, N-80, LT&C, 9094 - 7031	5.5", 17 lb/ft, L-80, LT&C	7", 29 lb/ft, N-80, LT&C
Cement Top Protection Casing	Surface	Surface	900'
PBTD / TD	9004' / 10,200'	8770' / 10,372'	9022' / 10,119'
Formation	Wolfcamp / Cisco / Canyon	Wolfcamp / Cisco / Canyon	Wolfcamp / Cisco / Canyon
Inj. Interval	7450' – 9016'	7270' – 8894'	7303' – 8894'
OCD UIC Permit Number	UIC-CLI-008-1	UIC-CLI-008-2	UIC-CLI-008-3
API Number	30-015-27592	30-015-20894	30-015-26575

Geology Information Table 2

Injection Zone Formation	Mewbourn Well No. 1 (KB height = 3693 feet)		Chukka Well No. 2 (KB height = 3623 feet)		Gaines Well No. 3 (KB height = 3625 feet)	
	Measured Depth below KB (feet)	Subsea Depth (feet)	Measured Depth below KB (feet)	Subsea Depth (feet)	Measured Depth below KB (feet)	Subsea Depth (feet)
Lower Wolfcamp	7450	-3757	7270	-3647	7303	-3678
Cisco	7816	-4123	7645	-4022	7650	-4025
Canyon	8475	-4782	8390	-4767	8390	-4765
Base of Injection Zone (base of Canyon)	9016	-5323	8894	-5271	8894	-5269

Injected Brine Waste Water Table 3

Chemical Date	Refinery Waste Water Jan 22, 1998	Refinery Waste Water June 14, 1999
Calcium (mg/L)	48	21
Magnesium (mg/L)	98	31
Potassium (mg/L)	51	18
Sodium (mg/L)	1200	424
Chloride (mg/L)	1100	630
Fluoride (mg/L)	3.9	74
Nitrate-N (mg/L)	<0.01	<10
Sulfate (mg/L)	1500	570
Alkalinity (CaCO3) (mg/L)	100	40
pH (s.u.)	6.0 – 9.0	6.0 – 9.0
Specific Gravity (g/L)	1.00 – 1.01	1.00 – 1.01

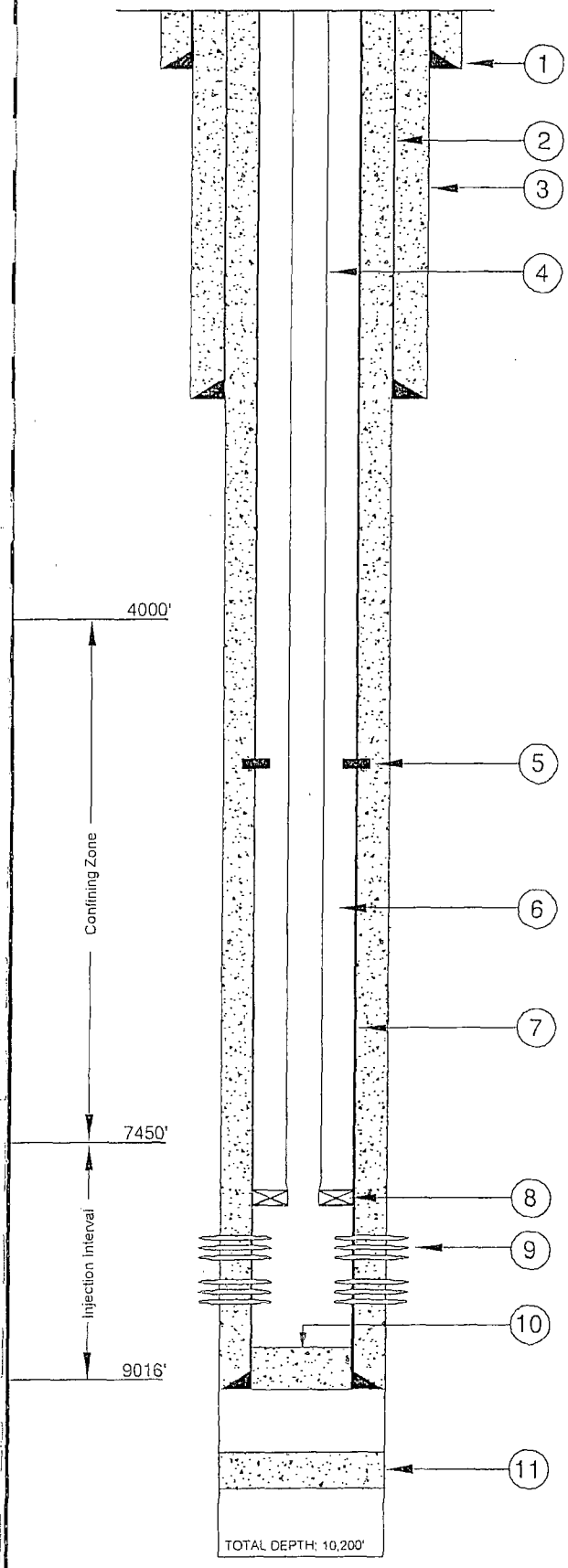
Formation Fluids Table 4

Chemical	Mewbourn Well No. 1	Chukka Well No. 2	Gaines Well No. 3	Average
Date	July 31, 1998	June 14, 1999	Nov 8, 2006	
Fluoride (mg/l)	2.6	9.7	Not Detected	6.15
Chloride (mg/L)	19,000	15,000	10,447	14,815.67
NO3-N (mg/L)	<10	<10	--	<10
SO4 (mg/L)	2,200	2000	1,908	2,036
CaCO3 (mg/L)	1000	1210	--	1105
Specific Gravity (g/L)	1.034	1.0249	--	1.0295
TDS (mg/L)	33,000	20,000	--	26,500
Specific Conductance (uMHOs/cm)	52,000	43,000	--	47,500
Potassium (mg/L)	213	235	85.5	177.83
Magnesium (mg/L)	143	128	155	142
Calcium (mg/L)	390	609	393	464
Sodium (mg/L)	12,770	8,074	6,080	8,974.67
pH (s.u.)	8.1	7.2	--	7.65

Summary of Pressure Fall-off Test Results Table 5

Test No.	Test Date	P_{static} (psia)	kh/μ (md-ft/cp)	V_{well} (10^6 gal)	V_{total} (10^6 gal)
WDW-1 (Static Pressure Ref Depth 7924 ft)					
1	07/31/98	2913.7	537,308	0.0	0.0
2	04/19/00	3073.7	479,925	95.4	108.6
3	12/18/00	3202.9	413,013	196.5	240.3
4	01/14/01	3207.8	405,663	204.7	253.2
5	05/17/01	3243.6	357,754	247.9	303.7
6	08/30/01	3254.8	354,579	276.4	349.5
7	02/14/02	3332.9	398,234	333.1	424.3
8	03/26/03	3370.33	452,416	466.6	631.7
9	08/26/03	3380.97	484,330	506.6	702.5
10	04/05/06	3422.45	751,105	842.4	1208.9
11	04/04/08	3443.53	351,832	1087.0	2714.6
WDW-2 (Static Pressure Ref Depth 7570 ft)					
1	06/05/99	2973.0	1,527,413	0.0	0.0
2	01/13/01	3207.7	713,248	48.7	253.0
3	02/02/01	3213.6	713,575	50.8	262.5
4	05/18/01	3243.6	712,844	56.3	304.4
5	08/29/01	3258.7	572,135	73.4	349.3
6	02/15/02	3311.7	874,047	91.5	424.3
7	03/22/03	3342.48	854,309	165.1	631.7
8	08/27/03	3349.14	837,073	195.9	702.5
9	04/06/06	3395.12	707,786	366.5	1208.9
10	04/03/08	3494.13	265,300	409.4	2714.6
WDW-3 (Static Pressure Ref Depth 7660 ft)					
1	11/05/06	3324.93	1,601,204	0.0	0.0
2	04/02/08	3326.72	321,411	9.3	2714.6

FIGURES



BELOW GROUND DETAILS

All depths are referenced to the Kelly bushing elevation of 12.5' above ground level. Ground level elevation is 3,678' above mean sea level.

1. Surface Casing: 13 ⅜", 48 lb/ft, J-55, ST&C set at 390' in a 17 ½" hole. Cemented with 150 sx Class C with 3 % calcium chloride, 375 sx Class C Litewate w/3 % calcium chloride and ½ lb/sx flocele. Circulated 86 sx to surface.

2. Intermediate Casing: 9 ⅝", 36 lb/ft, J-55, ST&C set at 2,555' in a 12 ¼ " hole. Cemented w/800 sx of Class C Lite w/ ½ lb/sx flocele and 2 lb/sx Gilsonite and 12 % salt. Followed by 200 sx of Class C w/2 % calcium chloride. Circulated 133 sx to surface.

3. Base of the USDW at 493'.

4. Injection Tubing: 4 ½", 11.6 lb/ft, N-80, SMLS, R3, LT&C set at 7,879'.

5. DV Tool: at 5,498'.

6. Annulus Fluid: 8.7 lb/gal brine water mixed w/UniChem Techni-Hib 370 corrosion inhibitor.

7. Protection Casing: 7", 29 lb/ft, N-80, LT&C: 9094' to 7031'. 7", 29 lb/ft, P-110, LT&C: 7031' to 5845'. 7", 26 lb/ft, P-110, LT&C; 5845' to surface. Casing cemented in two stages as follows:

   First Stage - 600 sx modified Class H w/0.4 % CFR-3, 5 lb/sx Gilsonite, 0.5 % Halad-344, and 1 lb/sx salt mixed at 13.0 ppg. Opened DV tool at 5498' and circulated 142 sx to surface.

   Second Stage - Lead Slurry: 220 sx Interfill "C" (35:65:6) mixed at 11.7 ppg. Tail Slurry: 550 sx modified Class H w/0.4 % CFR-3, 5 lb/sx, Gilsonite, 0.5 % Halad-344, 0.1 % HR-7, and 1 lb/sx mixed at 13.0 ppg. Circulated 75 sx to surface. Top out w/20 sx permium plus 3 % calcium chloride.

8. Packer: 7" x 3.5" EVI Oil Tools (Arrow), Model X-1 retrievable packer set at 7879'. Minimum I.D. is 3.0". Wireline re-entry guide on bottom. To release: turn ¼ turn to the right and pick up.

9. Perforations (2 SPF):

   Upper Zone - 7924-7942', 7974-8030', 8050-8056', 8066-8080', 8118-8127', 8132-8140', 8160-8164', 8170-8188'.

   Lower Zone - 8220-8254', 8260-8270', 8280-8302', 8360-8366', 8370-8378', 8400-8410', 8419-8423', 8430-8446', 8460-8464', 8470-8476'.

10. PBTD: 9004'.

11. Cement Plug: 45 sx Class H from 9624' to 9734'.

SUBSURFACE

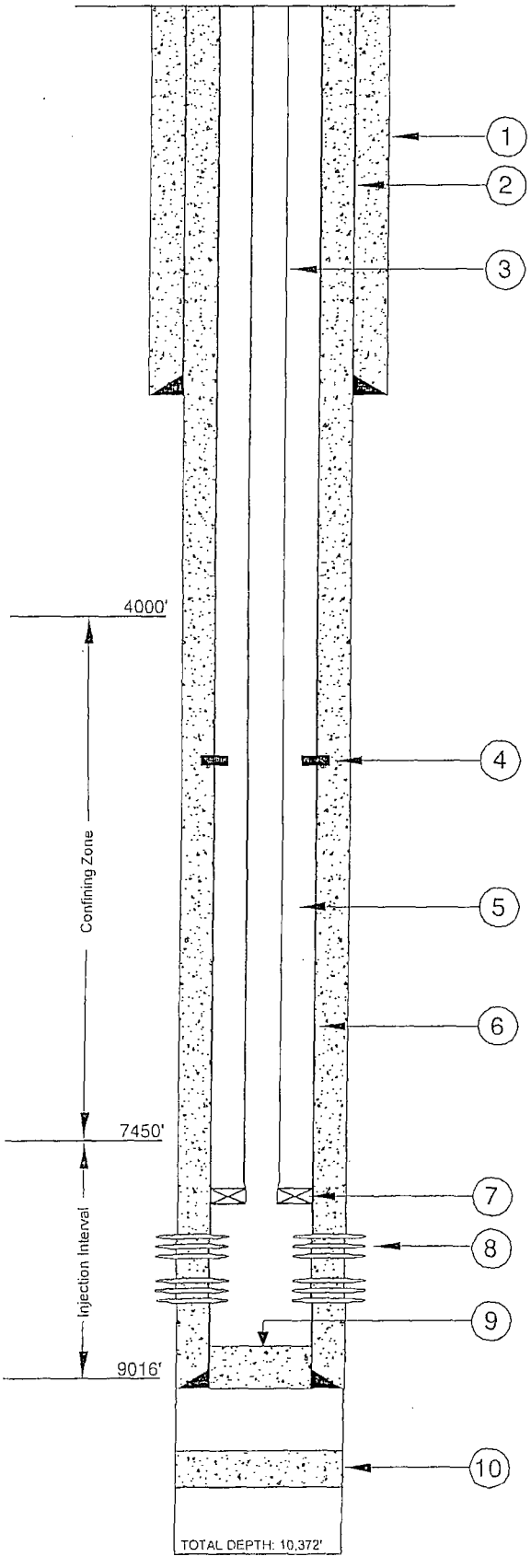
HOUSTON, TX.
SOUTH BEND, IN.
BATON ROUGE, LA.

FIGURE 1

NAVAJO REFINING COMPANY
ARTESIA, NEW MEXICO

BELOW GROUND DETAILS
WASTE DISPOSAL WELL NO. 1

DATE: 07/13/01	CHECKED BY:	JOB NO: 70D5256
DRAWN BY: WDL	APPROVED BY:	DWG. NO:



BELOW GROUND DETAILS

All depths are referenced to the Kelly bushing elevation of 13' above ground level. Ground level elevation is 3610' above mean sea level.

1. Base of the USDW at 473'.
2. Surface Casing: 8 5/8", 32 lb/ft, set at 1995' in an 11" hole. Cemented to surface with 800 sacks of cement.
3. Injection Tubing: 3 ½", 9.2 lb/ft, J-55, smls, NUE 10 rd. set at 7528'.
4. DV Tool: at 5,785'.
5. Annulus Fluid: 8.7 lb/gal brine water mixed w/UniChem Techni-Hib 370 corrosion inhibitor.
6. Protection Casing: 5 ½", 17 lb/ft, L-80, LT&C: 8869' to the surface and set in a 7 7/8" hole. Casing cemented in two stages as follows:

   First Stage - 575 sacks of modified Class "H" with 0.4 % CFR-3, 5 lb/sk Gilsonite, 0.5 % Halad-344, and 3 lb/sk salt. Mixed at 13.0 ppg. Opened DV tool at 5785 and circulated 20 sacks to surface.

   Second Stage - Lead Slurry: 300 sacks of Interfill "C" (35:65:6) mixed at 11.7 ppg. Tail slurry: 695 sacks modified Class "H" with 0.4% CFR-3, 5 lb/sk Gilsonite, 0.5 % Halad-344 and 3 lb/sk salt mixed at 13.0 ppg. Circulated 150 sacks to surface. Topped out with 10 yards of Redi-mix.
7. Packer: 5 ½" x 2 7/8" Weatherford Completion Tools (Arrow) Model X-1 retrievable packer set at 7528'. Minimum ID is 2.4375". Wireline re-entry guide is on bottom. To release: turn ¼ turn to the right and pick up.
8. Perforations (2 SPF):

   Zone 1: 7570-7620', 7676-7736'

   Zone 2: 7826-7834', 7858-7880', 7886-7904', 7916-7936', 7944-7964', 7990-8042', 8096-8116', 8191-8201', 8304-8319',8395-8399'.
9. PBTD: 8770'
10. Cement Plug: 45 sacks from 9675' to 9775'.

SUBSURFACE

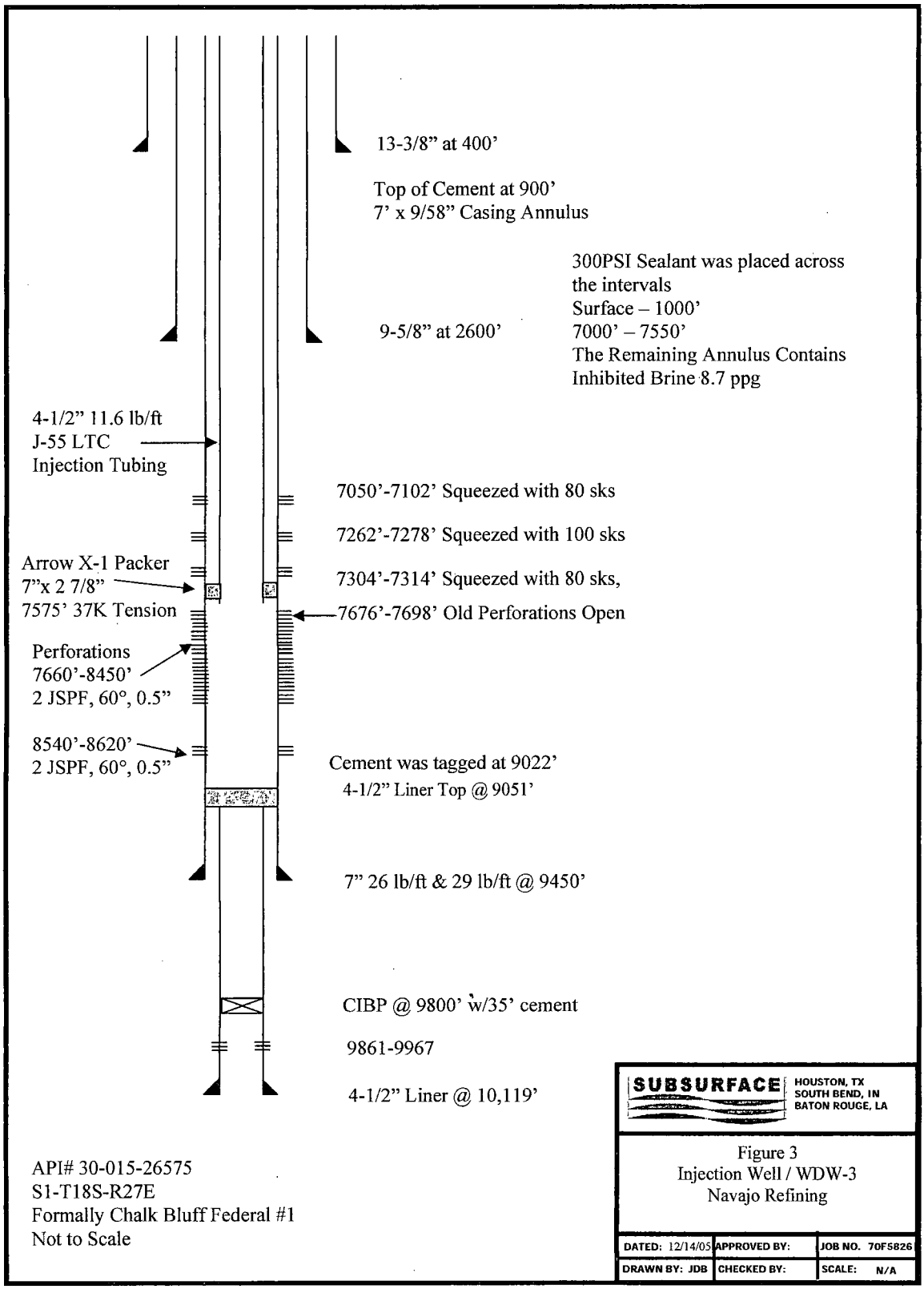
HOUSTON, TX.
SOUTH BEND, IN.
BATON ROUGE, LA.

FIGURE 2

NAVAJO REFINING COMPANY
ARTESIA, NEW MEXICO

BELOW GROUND DETAILS
WASTE DISPOSAL WELL NO. 2

DATE: 07/13/01	CHECKED BY:	JOB NO: 70D5256
DRAWN BY: WDL	APPROVED BY:	DWG. NO:



API# 30-015-26575
S1-T18S-R27E
Formally Chalk Bluff Federal #1
Not to Scale

SUBSURFACE
HOUSTON, TX
SOUTH BEND, IN
BATON ROUGE, LA

Figure 3
Injection Well / WDW-3
Navajo Refining

DATED: 12/14/05	APPROVED BY:	JOB NO. 70F5826
DRAWN BY: JDB	CHECKED BY:	SCALE: N/A