# UIC - I - ___8___

# EPA FALL-OFF/ SRT MONITORING (WDW-1)

# DATE:

# 2010

## Chavez, Carl J, EMNRD

**From:** Chavez, Carl J, EMNRD
**Sent:** Wednesday, October 19, 2011 4:06 PM
**To:** 'Moore, Darrell'
**Cc:** Sanchez, Daniel J., EMNRD; VonGonten, Glenn, EMNRD; Dade, Randy, EMNRD
**Subject:** Navajo Refining Company UIC Class I (NH) Injection Wells WDWs 1, 2 & 3 (UICI-008) Fall Off Test Plan (August 2011)

Darrell:

The New Mexico Oil Conservation Division (OCD) is in receipt of your above subject test plan. OCD has already approved the Fall-Off Test (FOT) Plan with conditions on July 28, 2009. The OCD notes that it is also in the process of reviewing C-103s Sundry Notices for the upcoming FOTs.

OCD observes some changes in this FOT Plan submittal that are not acceptable to the OCD. For example, Exhibit 1 is not an acceptable exhibit to the OCD for reasons specified in the 2010 FOT report review and later during the May 2011 meeting in Santa Fe. However, the operator continues to submit exhibits with certain assumptions that have not been accepted or approved by the OCD, i.e., that the injection wells are show interconnection with the injection zone during past FOTs. Perhaps the operator can conduct the 2011 FOT with the information and exhibits needed to prove the interconnection of injection wells with the injection zone? The Certified PE should provide the exhibits in the 2011 FOT Report with the analysis and conclusions supporting any claims for the OCD to review and consider before approving. This is apparently a FOT frequency per well issue that the operator is attempting to prove.

The OCD provides the following comments, observations, and/or recommendations on the above subject plan below.

Comments:

- The OCD approved the original Fall-Off Test (FOT) Plan based on OCD Guidance dated December 3, 2007. There should not be any significant changes to this FOT Plan because it is flexible where needed to allow operators to implement it on each injection well.
- OCD likes to be notified to witness the installation of bottom hole gauges and to be present at least one hour before injection shut-off and commencement of FOT monitoring.
- OCD is concerned about the Section VI No. 1(e) WDW-3 Cement Bond Log quality being poor from 900 ft. to 1200 ft- especially at the depths: 2662 – 2160; 4876 – 5372; and 6750 – 7600 ft. micro annulus scenario.

Observations:

- Section V No. 2: The objective of the FOT is NOT to achieve or limit a 100 psig pressure differential before vs. after FOT injection vs. shut-off, but it is a minimum pressure differential that OCD stipulates in its guidance for a successful FOT and injection zone that may still continue to be utilized for disposal, i.e., not too pressured up and subject to continued fracturing under daily allowed maximum surface injection pressure operational limits.
- Section V No. 7 and Exhibit 1: OCD observes a bottom hole pressure chart for WDWs 1, 2 and 3 at 7660 feet that the operator presented in the 2010 FOT and again during a May 2011 meeting in Santa Fe, New Mexico to show the interconnection between injection wells and the injection formation. The OCD had commented that there was no explanation or conclusion provided from the Certified PE who conducted and completed the 2010 FOT report that supports the operator's claim that all injection wells are interconnected based on Exhibit 1.

  Furthermore, the OCD requested a statement or information supporting the operator's claim by the Certified PE, but never received one. At the meeting, the OCD explained that based on Exhibit 1, there was no support for the claim. In order to make the interconnection determination, during each FOT at each well and off-set injection wells (WDWs not being FOT'd) before and throughout the FOT would need bottom hole pressures monitored in tandem at each well location to establish the interconnectivity of the injection wells with the receiving injection formation under a uniform time scale. This would be a chart that could be plotted that would show during the test the interconnectivity of the wells for each FOT. The OCD doubts that the operator can make the case for interconnectivity between injection wells and injection formation because of the significant distance between the injection wells and fact that sedimentation in formation varies laterally and uniformity in sedimentation, saturated porosity and permeability due to variation in sedimentation would by chance make the injection formation aerially extensive and uniform over a 3 to 5 mile radius from each injection well. Also, even if by chance there was

uniformity over the mileage specified, the distance between injection wells and corresponding pressure would likely not be observed.

- Exhibit 6: OCD observes in Section B a proposed MIT once every 5 years. OCD's UIC Program requires annual MITs and/or after down hole work is performed on a well.

Recommendations:

- Operator is running survey logs to the bottom of fill or below USDW (fresh water) zones, which excludes an evaluation of casing in the fresh water zone. Please run logs up to surface.
- Be sure to also record and provide injection flow rate and pressure leading up to shut-off and monitoring throughout the FOT monitoring period. OCD needs to confirm that a pseudo steady-state condition was achieved before shut-off. This data is also needed for software modeling of the FOT.
- Please provide electronic data from the FOTs at each well in order for the OCD to run its software model to confirm the results in the report.
- Section V No. 13: Surface pressure monitoring and Horner Plot during injection should be used to confirm radial flow condition is achieved instead of waiting a set period if operator wishes to reduce the injection period.

**Disclaimer:** *Please be advised that OCD has already approved with conditions Navajo Refining Company's Fall-Off Test (FOT) Plan on July 28, 2009, and is not providing approval of this FOT Plan; however, comments, observations and recommendations herein should help Navajo Refining Company understand the OCD's concerns based on the submittal.*

Please contact me if you have questions. 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/
"Why not Prevent Pollution; Minimize Waste; Reduce the Cost of Operations; & Move Forward with the Rest of the Nation?" To see how, go to "Pollution Prevention & Waste Minimization" at:
http://www.emnrd.state.nm.us/ocd/environmental.htm#environmental)

Submit 1 Copy To Appropriate District Office
District I – (575) 393-6161
1625 N. French Dr., Hobbs, NM 88240
District II – (575) 748-1283
811 S. First St., Artesia, NM 88210
District III – (505) 334-6178
1000 Rio Brazos Rd., Aztec, NM 87410
District IV – (505) 476-3460
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico
Energy, Minerals and Natural Resources

OIL CONSERVATION DIVISION
1220 South St. Francis Dr.
Santa Fe, NM 87505

Form C-103
Revised August 1, 2011

WELL API NO.
**30-015-26592**

5. Indicate Type of Lease
STATE ☒ FEE ☐

6. State Oil & Gas Lease No.
**B-2071-28**

SUNDRY NOTICES AND REPORTS ON WELLS
(DO NOT USE THIS FORM FOR PROPOSALS TO DRILL OR TO DEEPEN OR PLUG BACK TO A DIFFERENT RESERVOIR. USE "APPLICATION FOR PERMIT" (FORM C-101) FOR SUCH PROPOSALS.)

7. Lease Name or Unit Agreement Name
**Mewbourne WDW-1**

1. Type of Well: Oil Well ☐ Gas Well ☐ Other **Injection Well**

8. Well Number **WDW-1**

2. Name of Operator
**Navajo Refining Company**

9. OGRID Number

3. Address of Operator
**Post Office Box 159, Artesia, New Mexico 88211**

10. Pool name or Wildcat: **Navajo Permo-Penn 96918**

4. Well Location
Unit Letter **O** : **660** feet from the **South** line and **2210** feet from the **East** line
Section **31** Township **17S** Range **28E** NMPM County **Eddy**

11. Elevation *(Show whether DR, RKB, RT, GR, etc.)*
**3678' GL**

12. Check Appropriate Box to Indicate Nature of Notice, Report or Other Data

| NOTICE OF INTENTION TO: | | SUBSEQUENT REPORT OF: | |
|---|---|---|---|
| PERFORM REMEDIAL WORK ☐ | PLUG AND ABANDON ☐ | REMEDIAL WORK ☐ | ALTERING CASING ☐ |
| TEMPORARILY ABANDON ☐ | CHANGE PLANS ☐ | COMMENCE DRILLING OPNS. ☐ | P AND A ☐ |
| PULL OR ALTER CASING ☐ | MULTIPLE COMPL ☐ | CASING/CEMENT JOB ☐ | |
| DOWNHOLE COMMINGLE ☐ | | | |
| OTHER: **PERFORM PRESSURE FALLOFF TEST** ☒ | | OTHER: ☐ | |

13. Describe proposed or completed operations. (Clearly state all pertinent details, and give pertinent dates, including estimated date of starting any proposed work). SEE RULE 19.15.7.14 NMAC. For Multiple Completions: Attach wellbore diagram of proposed completion or recompletion.

**November 14, 2011** –Install bottomhole gauges into WDW-1, WDW-2, and WDW-3 by 11:45am. Continue injection into all three wells.
**November 15, 2011** – Continue injection into all three wells.
**November 16, 2011** – At 12:15pm, the offset wells WDW-2 and WDW-3 will be shut-in. A constant injection rate will be established for WDW-1 and continue for a 30 hour injection period. Do not exceed 1000 psig wellhead pressure.
**November 17, 2011** – At 7:00pm, WDW-1 will be shut in for a 30-hour falloff period. WDW-2 and WDW-3 will remain shut-in.
**November 18, 2011** – All three wells will continue to be shut in while monitoring falloff pressure in all three wells.
**November 19, 2011** – At 7:00am, acquire downhole pressure gauges from all three wells. Tag bottom of fill and come out of hole very slowly, making 7-minute gradient stops while coming out of WDW-1 every 1000 feet (7000 ft, 6000 ft, 5000 ft, 4000 ft, 3000 ft, 2000 ft, 1000 ft, surface). Run in hole with a temperature tool and conduct temperature survey from the surface to the top of the fill. Turn the wells back to Navajo personnel.

Spud Date: | Rig Release Date:

I hereby certify that the information above is true and complete to the best of my knowledge and belief.

SIGNATURE Timothy Jr TITLE Project Engineer DATE 10/3/11

Type or print name Timothy Jones E-mail address: tjones@subsurfacegroup.com PHONE: 713-880-4640

**For State Use Only**

APPROVED BY: [signature] TITLE Environmental Engineer DATE 10/19/2011

Conditions of Approval (if any): See E-mail Conditions dated 10/19/2011 attached.

## Chavez, Carl J, EMNRD

**To:** Ken Davis
**Cc:** Moore, Darrell; Sanchez, Daniel J., EMNRD; Dade, Randy, EMNRD; Bonham, Sherry, EMNRD
**Subject:** Navajo Refining Company C-103a for UIC Class I (NH) Injection Wells WDWs 1, 2 & 3 (UICI-008) Fall Off Tests (2011)

Ken, et al.:

Please find the OCD's approval with conditions stipulated below for the C-103 submittals dated October 3, 2011 from Subsurface Technologies, Inc. for WDWs 1, 2 & 3 Fall-Off Tests

OCD Santa Fe will post in the OCD RBDMS Well Files and on OCD Online "UICI-8" WDW-1 FOT File

Please contact me if you have questions. 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
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"Why not Prevent Pollution; Minimize Waste; Reduce the Cost of Operations; & Move Forward with the Rest of the Nation?" To see how, go to "Pollution Prevention & Waste Minimization" at:
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**Sent:** Wednesday, October 19, 2011 4:06 PM
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**Cc:** Sanchez, Daniel J., EMNRD; VonGonten, Glenn, EMNRD; Dade, Randy, EMNRD
**Subject:** Navajo Refining Company UIC Class I (NH) Injection Wells WDWs 1, 2 & 3 (UICI-008) Fall Off Test Plan (August 2011)

Darrell:

The New Mexico Oil Conservation Division (OCD) is in receipt of your above subject test plan. OCD has already approved the Fall-Off Test (FOT) Plan with conditions on July 28, 2009. The OCD notes that it is also in the process of reviewing C-103s Sundry Notices for the upcoming FOTs.

OCD observes some changes in this FOT Plan submittal that are not acceptable to the OCD. For example, Exhibit 1 is not an acceptable exhibit to the OCD for reasons specified in the 2010 FOT report review and later during the May 2011 meeting in Santa Fe. However, the operator continues to submit exhibits with certain assumptions that have not been accepted or approved by the OCD, i.e., that the injection wells are show interconnection with the injection zone during past FOTs. Perhaps the operator can conduct the 2011 FOT with the information and exhibits needed to prove the interconnection of injection wells with the injection zone? The Certified PE should provide the exhibits in the 2011 FOT Report with the analysis and conclusions supporting any claims for the OCD to review and consider before approving. This is apparently a FOT frequency per well issue that the operator is attempting to prove.

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- OCD likes to be notified to witness the installation of bottom hole gauges and to be present at least one hour before injection shut-off and commencement of FOT monitoring.
- OCD is concerned about the Section VI No. 1(e) WDW-3 Cement Bond Log quality being poor from 900 ft. to 1200 ft- especially at the depths: 2662 – 2160; 4876 – 5372; and 6750 – 7600 ft. micro annulus scenario.

Observations:

- Section V No. 2: The objective of the FOT is NOT to achieve or limit a 100 psig pressure differential before vs. after FOT injection vs. shut-off, but it is a minimum pressure differential that OCD stipulates in its guidance for a successful FOT and injection zone that may still continue to be utilized for disposal, i.e., not too pressured up and subject to continued fracturing under daily allowed maximum surface injection pressure operational limits.
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Oil Conservation Division, Environmental Bureau
1220 South St. Francis Dr., Santa Fe, New Mexico 87505
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http://www.emnrd.state.nm.us/ocd/environmental.htm#environmental)

SUBSURFACE

RECEIVED OCD

2011 OCT -6 A 12:52

October 3, 2011

Mr. Ed Martin
Oil Conservation Division
District IV
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

RE: Subsurface Project No. : 70A6645

Dear Mr. Martin:

On behalf of Navajo Refining Company, please find enclosed three (3) Form C-103 Sundry Notices for the pressure transient testing of Navajo Refining's disposal wells WDW-1, WDW-2, and WDW-3. These forms were also sent to Sherry Bonham at the Artesia OCD Office.

Please call Ken Davis or me at (713) 880-4640 if you have any questions.

Sincerely,

Tim Jones
Project Engineer

TJ/bl

cc: Sherry Bonham
Ken Davis

Subsurface Technology, Inc.
6925 Portwest Drive Suite 110 Houston TX 77024
713/880-4640 Fax 713/880-3248 1-800-535-4105

## Chavez, Carl J, EMNRD

**Subject:** FW: OCD/NMED Mtg
**Location:** Santa Fe

**Start:** Tue 5/31/2011 10:00 AM
**End:** Tue 5/31/2011 12:00 PM
**Show Time As:** Tentative

**Recurrence:** (none)

**Meeting Status:** Not yet responded

**Organizer:** Lackey, Johnny

Johnny Lackey, et al.:

Re: Today's Meeting Summary

The New Mexico Oil Conservation Division (OCD) would like to thank the Navajo Refining Company and New Mexico Environment Department for participating in the meeting this morning. OCD Director Bailey was pleased to be able to meet you and requested a briefing of the meeting.

I'm writing to provide a basic summary and/or briefing of the meeting based on the agenda (see below) and other items that were discussed based on our communication this morning.

Agenda

**A. Recovery System Upgrade**

1. Project Scope
2. Drawings
3. Completion Schedule

**B. Underground Line Testing**

1. Status
2. Percentage Tested in 2010 (Lovington & Artesia)
3. Praxair Methods
    a. Long Range Guided Wave Ultrasonic Pipe Screening
    b. Tracer Tight Pipeline Testing
    c. Navajo Requests OCD approval to utilize both methods for Underground line testing in lieu of hydrotesting.

**C. Injection Wells Fall Off Test Requirements (Any decision on one well per year?)**

1. One well per year
2. All 3 wells inject into the same formation
3. View graph

Agenda Briefing:

A) Recovery System Upgrade:

OCD responded to the phase separated hydrocarbon recovery system report in March of 2011. The only changes to the original report were: Double walled tanks will be singled walled an set into fiberglass tubs for secondary containment. OCD requested to know if there were other changes from the original report that was reviewed by the OCD and NMED? The June 2011 deadline for completion of Phase I was moved back to December 15, 2011.

OCD requested that Navajo Engineers review the pipeline specs submitted by the consultant to ensure that lines (similar to last design that failed) are of proper size to allow pumps to operate efficiently etc. Also, Navajo indicated that the lines would be accessible during clean-outs when scale blocks flow and is required to be removed to maintain flow rates over time.

Issue: 24 hr. shut-down notification issues when system shut-down due to weather conditions and/or when product recovery wells automatically shut-off due to lack of product of specified thickness. Also, there may be periods of no flow even though the OCD expects flow to occur 24/7 for 365 days per year. There may be segments of the recovery system that go down periodically for more than 24 hours and/or the system may be shut-in due to weather conditions. The tanks are not insulated. OCD requires notification when the above occurs, and if the agencies notice the system is ineffective by the quarterly or annual reporting requirements, then corrective actions to the system must be undertaken. Thus, free-phase recovery well analysis will not be needed at each recovery well location with product.

Recent MW-94 product discovery in well shall be included in Phase I.

NMED and OCD were ok with Navajo moving forward with its Phase I, II and III Plans.

B) Underground Line Testing:

The 14 pipelines that are considered arteries to the refining process and would result in shutting-down units within the refinery to MIT the lines with water must be submitted to the OCD with identification and corresponding units. The refinery would like to use the Prax-Air Tracer Test and Ultrasonic Wave Technology on buried metal lines to identify corrosion spots within the line per Prax-Air QA/QC wall thickness methods and will conserve on water use at the facility. OCD will address this request upon receipt of the line information and communicate with Navajo on an acceptable approach to monitoring and replacement of identified corroded lines in the process. The benefit of the process is that all 14 lines could be tested at one time and during the Prax-Air Tracer Method for the above ground tank leak detection method.

C) Injection Well/Fall-Off Tests (FOTs):

1) OCD requests a Certified PE down-hole analysis from the recent 2010 Fall-Off Tests that supports Navajo's request for reduced FOTing on wells on wells seated in the same injection zone and that are shown to be connected by pressure differentials of offset Class I Wells during the FOT. By Federal Law, all UIC Class I Wells must undergo a FOT.annually. WDWs 2 and 3 are within ½ mile of each other, but are over a mile away from WDW-1. OCD noticed that no professional analysis of the bottom-hole pressure data from off-set UIC Class I Wells was provided in the FOT reports for WDWs 1, 2 and 3. Navajo indicated that their down-hole consultant should have an analysis prepared and submitted to the OCD by June 30$^{th}$ or early July 2011.

2) OCD requested that a Certified PE provide an opinion on the variable annulus pressure observed in WDWs 1, 2 and 3 to determine why annulus pressure is oscillating in the wells. Navajo indicated that instrument calibrations and pump stabilizations have been undertaken to prevent the fluctuating annulus pressure from occurring in the wells. Also, Navajo noted that during MITs on the wells, they passed and bradenhead tests were also performed that passed. OCD indicated that the 30 min. MIT is a snap shot in time of well's MIT and that the oscillating annulus pressures should not be occurring, but that an expert opinion or analysis was needed for the OCD and EPA to consider based on the phenomena. Navajo will have a signed certified PE analysis with an opinion to the OCD by COB on 6/10/2011.

Miscellaneous:

The OCD requested a new pipeline MIT procedure and report format for the new fiberglass effluent line from the refinery to the 2 UIC Class I (Non-Hazardous) disposal wells east of the refinery. The OCD received the recent MIT charts, but a procedure and report format with conclusions was not submitted for review by the OCD. Therefore, similar to past pipeline MIT reports from Navajo Refining Company's Consultant, the OCD needs to receive a report that summarizes the process with diagrams with any conclusions by the third-party consultant to ensure that an independent expert certifies that the MIT passed the test. Please submit the new procedure with report outline to the OCD by September 1, 2011.

The RO Reject effluent allowed for good cause by the OCD in the past is in questions based on recent annual reporting of the quality of the effluent. OCD noted from the annual report that Iron and Sulfates were exceeding 20.6.2 NMAC. Why did OCD allow the discharge onto the farm fields? OCD believes the data may have warranted the discharge at the time, but recent sampling indicates exceedances that violate the discharge permit. NMED is reviewing the recent Annual Report and will work with OCD on the response letter to give Navajo some guidance going forward to assess any impacts to ground water, etc. Navajo is looking into any process change that may have elevated the sulfate in the reject water and

| | NAVAJO REFINING COMPANY MEETIN (5/31/2011) | | |
|---|---|---|---|
| | SANTA FE, NEW MEXICO OIL CONSERVATION DIVISION | | |
| **Name** | **Company** | **Title** | **Phone** |
| Carl Chavez | NMOCD | Env. Engr. | 505-476-3490 |
| Darrell Moore | Navajo Refining | Env. Mgr | 575-746-5281 |
| JOHNNY LACKEY | NAVAJO REFINING | ENV. MGR | 575-746-5490 |
| Michael Wheatley | NAVAJO REFINING | REF MGR | 575-748-6743 |
| Hope Monzeglio Petrie | HWB | Project Leader | 505-476-6045 |
| LEONA TSINNAJINNIE | HWB | | (505)476-6057 |
| Dave Cobrain | HWB | Staff Mgr | 505-476-6055 |
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**May 31, 2011**

**NMED/OCD Meeting Agenda**

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2. Drawings
3. Completion Schedule

**B. Underground Line Testing**

1. Status
2. Percentage Tested in 2010 (Lovington & Artesia)
3. Praxair Methods
    a. Long Range Guided Wave Ultrasonic Pipe Screening
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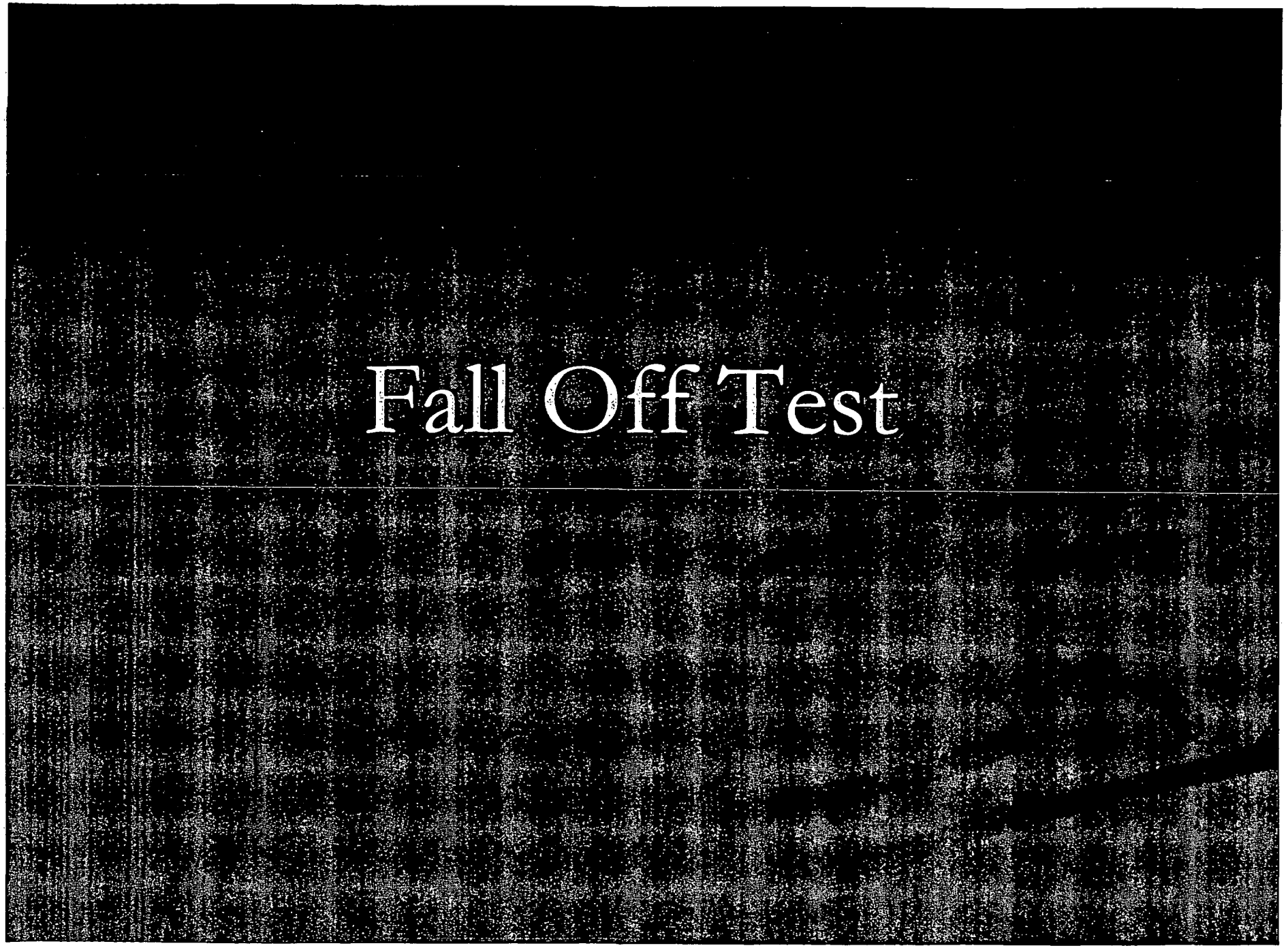
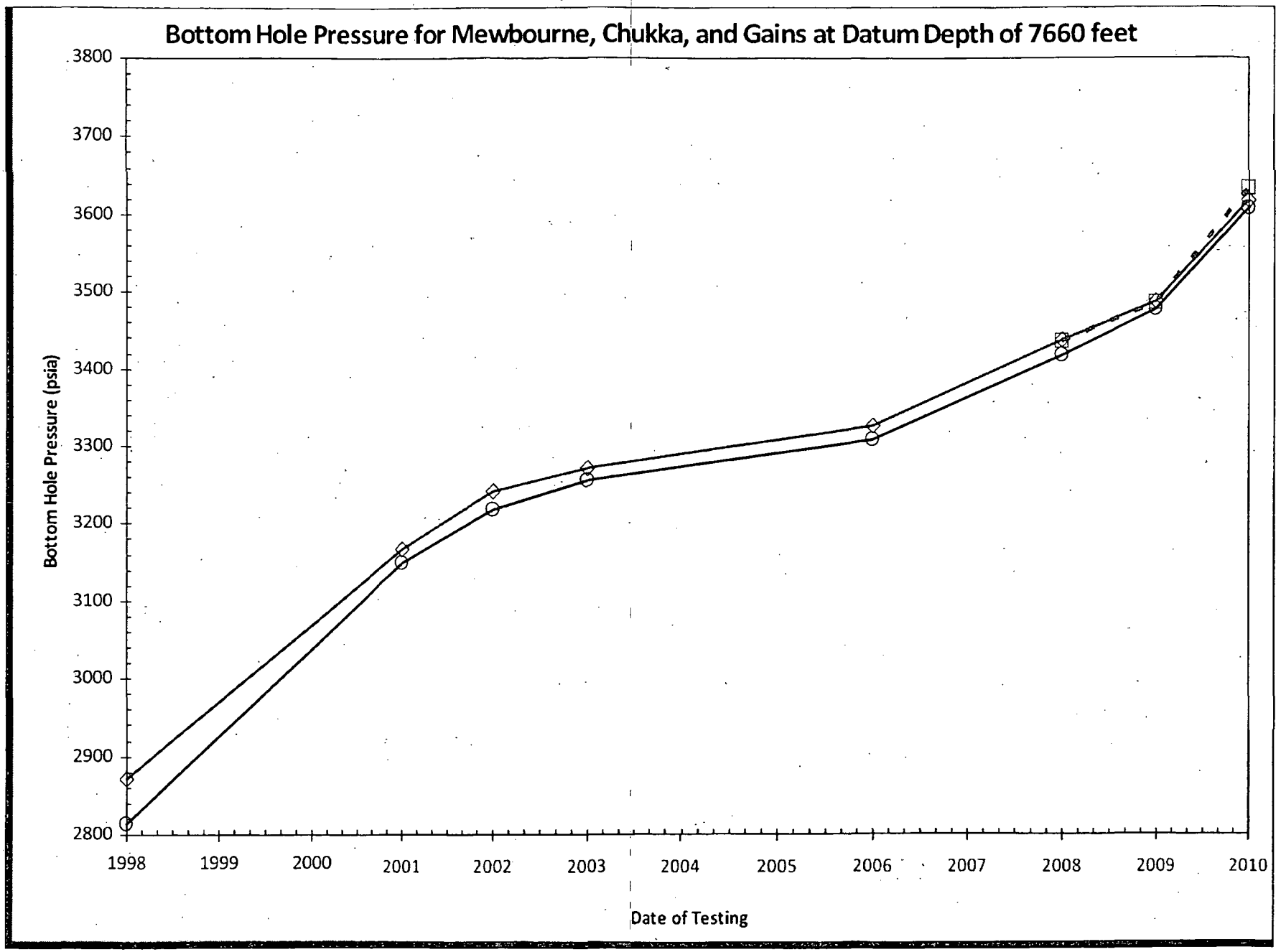
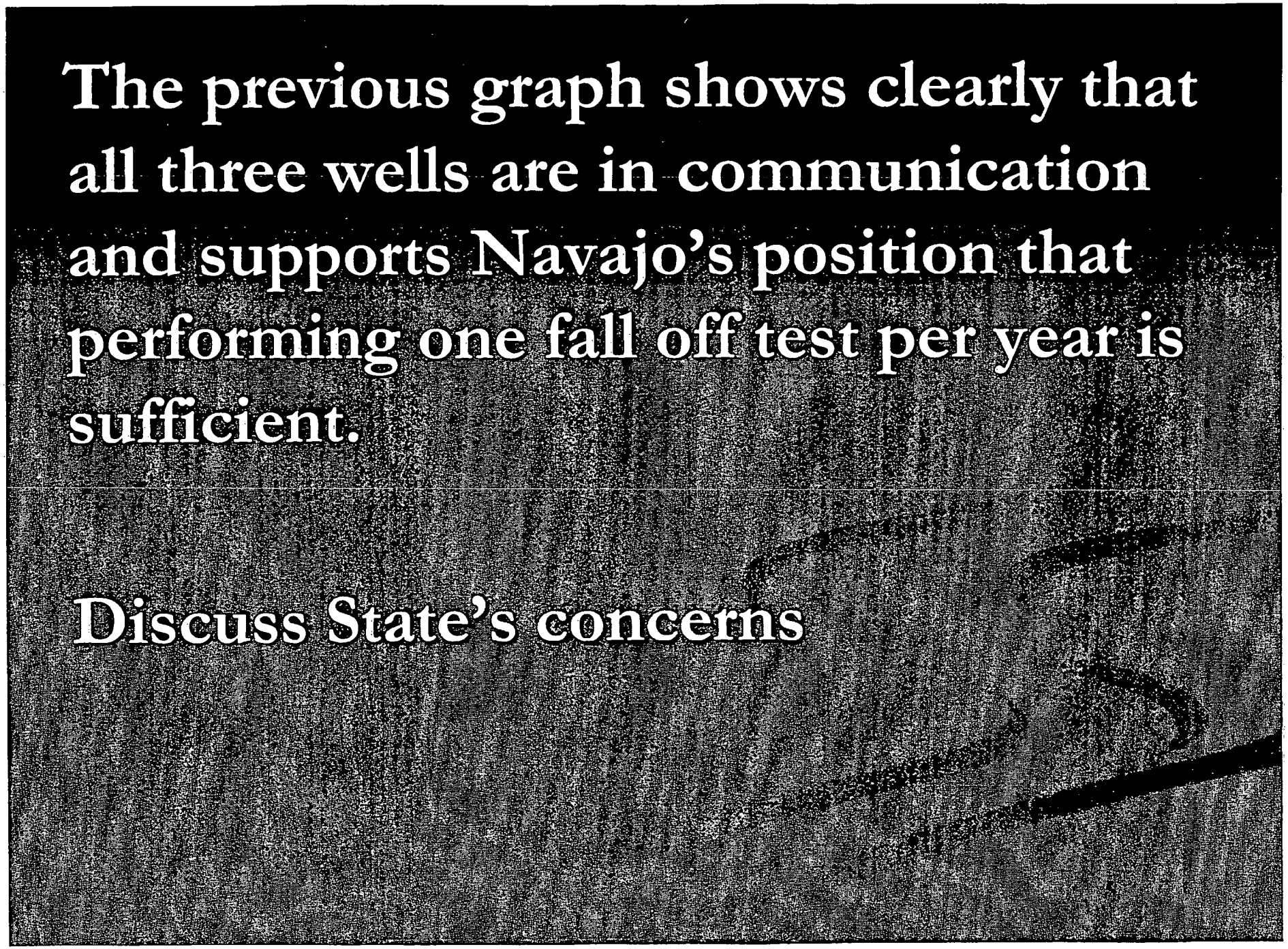
1. One well per year
2. All 3 wells inject into the same formation
3. View graph

A brief PowerPoint presentation during discussion


Fall Off Test


Bottom Hole Pressure for Mewbourne, Chukka, and Gains at Datum Depth of 7660 feet
Bottom Hole Pressure (psia)
3800
3700
3600
3500
3400
3300
3200
3100
3000
2900
2800
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Date of Testing


The previous graph shows clearly that all three wells are in communication and supports Navajo's position that performing one fall off test per year is sufficient.
Discuss State's concerns

## Chavez, Carl J, EMNRD

**From:** Chavez, Carl J, EMNRD
**Sent:** Friday, July 22, 2011 1:58 PM
**To:** 'Lackey, Johnny'
**Cc:** Sanchez, Daniel J., EMNRD; Dade, Randy, EMNRD; Moore, Darrell; Ken Davis; rsmith@subsurfacegroup.com; Boans, Robert; Ironmonger, Byron; Newton, Kevin
**Subject:** RE: NAVAJO ARTESIA FOT SCHEDULE

Johnny:

Good afternoon.

Please submit a C-103 Sundry Notice with details for well work (each well) for OCD approval. Please send Sundries to the OCD in Santa Fe with a copy to the Artesia District Office. This should also include the type of MIT(s) that will be performed. The OCD Artesia District Office recently relocated to the following address:

811 South First
Artesia, NM 88210
575-748-1283
575-748-9720 (Fax)

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
"Why not Prevent Pollution; Minimize Waste; Reduce the Cost of Operations; & Move Forward with the Rest of the Nation?" To see how, go to "Pollution Prevention & Waste Minimization" at:
http://www.emnrd.state.nm.us/ocd/environmental.htm#environmental)

---

**From:** Lackey, Johnny [mailto:Johnny.Lackey@hollyfrontier.com]
**Sent:** Friday, July 22, 2011 10:06 AM
**To:** Chavez, Carl J, EMNRD
**Cc:** Sanchez, Daniel J., EMNRD; Dade, Randy, EMNRD; Moore, Darrell; Ken Davis; rsmith@subsurfacegroup.com; Boans, Robert; Ironmonger, Byron; Newton, Kevin
**Subject:** NAVAJO ARTESIA FOT SCHEDULE

Carl:

As requested in a letter Navajo received from Daniel Sanchez on July 18, 2011, following is the proposed schedule for the annual Fall Off Test's for each of the three injection wells that Navajo operates:

- October 17, 2011
- November 14, 2011
- December 12, 2011

These dates are contingent on equipment and contractor availability and the Refinery's ability to shut in the wells during the proposed months. As we get closer to the dates and get firm commitment from the contractor, Navajo will notify the OCD to allow scheduling for witnessing the tests.

Johnny Lackey

Sr. Environmental Manager
The HollyFrontier Companies
P.O. Box 159
501 E. Main St.
Artesia, NM 88211-0159
Office - 575-746-5490
Cell - 972-261-8075
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Johnny.Lackey@hollycorp.com

## Chavez, Carl J, EMNRD

**From:** Chavez, Carl J, EMNRD [CarlJ.Chavez@state.nm.us]
**Sent:** Friday, July 01, 2011 4:35 PM
**To:** Moore, Darrell; Lackey, Johnny
**Cc:** Sanchez, Daniel J., EMNRD; Dade, Randy, EMNRD
**Subject:** RE: UICI-8 MIT Explanation Due

**Follow Up Flag:** Follow up
**Flag Status:** Flagged

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
"Why not Prevent Pollution; Minimize Waste; Reduce the Cost of Operations; & Move Forward with the Rest of the Nation?" To see how, go to "Pollution Prevention & Waste Minimization" at:
http://www.emnrd.state.nm.us/ocd/environmental.htm#environmental)

---

**From:** Moore, Darrell [mailto:Darrell.Moore@hollyfrontier.com]
**Sent:** Friday, July 01, 2011 3:13 PM
**To:** Chavez, Carl J, EMNRD; Lackey, Johnny
**Cc:** Sanchez, Daniel J., EMNRD; Dade, Randy, EMNRD
**Subject:** RE: UICI-8 MIT Explanation Due

Carl

Subsurface was here at the plant this week running APT tests on the wells. Those results, along with the PE certification, should be to you during the middle of July. We are shooting for the same time frame for the FOT follow-up since the same people (Subsurface) are doing that.

Due to Subsurface's schedule, that's the soonest we could get all this done.

---

**From:** Chavez, Carl J, EMNRD [mailto:CarlJ.Chavez@state.nm.us]
**Sent:** Friday, July 01, 2011 8:48 AM
**To:** Lackey, Johnny; Moore, Darrell
**Cc:** Sanchez, Daniel J., EMNRD; Dade, Randy, EMNRD
**Subject:** FW: UICI-8 MIT Explanation Due

Johnny and Darrell:

Good morning. The OCD has not received a response to its request for a signed PE opinion on the anomalous differential annulus pressures occurring in WDWs 1, 2 and 3. At the /31 meeting in Santa Fe OCD requested this information by COB on 6/10. Was this sent? If not, when can Navajo Refining Company have its down hole PE Expert provide an opinion for OCD review?

Also, OCD requested a response to the annual Fall-Off Test (FOT) performed in 2010 related to your request for a reduced FOT schedule for the aforementioned WDWs. The response was expected by 6/30 or early July 2011 (5/31 Mtg. in Santa Fe). When can OCD expect to receive this?

Please contact me if you have questions. Thank you.

File: OCD Online WDWs "Annual Report" and "FOT" Thumbnails

Carl J. Chavez, CHMM
New Mexico Energy, Minerals & Natural Resources Dept.
Oil Conservation Division, Environmental Bureau
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"Why not Prevent Pollution; Minimize Waste; Reduce the Cost of Operations; & Move Forward with the Rest of the Nation?" To see how, go to "Pollution Prevention & Waste Minimization" at:
http://www.emnrd.state.nm.us/ocd/environmental.htm#environmental)

---

# NAVAJO REFINING COMPANY, LLC

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January 20, 2011

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: 2010 ANNUAL FALL-OFF PRESSURE TESTS**
**NAVAJO REFINING COMPANY**

Carl,

Enclosed, please find the results for the Annual Fall Off tests on Navajo Refining Company's three injection wells (Mewbourne WWD-#1), (Chukka WWD-#2), and (Gaines WWD-#3). If there are any questions concerning this submission, please call me at 575-746-5281.

Sincerely,
**NAVAJO REFINING COMPANY, LLC**

Darrell Moore
Environmental Manager for Water and Waste

Encl:

SUBSURFACE

# 2010 ANNUAL BOTTOM-HOLE PRESSURE SURVEY AND PRESSURE FALLOFF TEST FOR MEWBOURNE WELL NO. 1

NAVAJO REFINING COMPANY
ARTESIA, NEW MEXICO
PROJECT NO. 70A6516

REPORT SUBMITTED:
JANUARY 2011

PREPARED BY:

SUBSURFACE CONSTRUCTION CORP.
6925 PORTWEST DRIVE, SUITE 110
HOUSTON, TEXAS 77024
pfh@subsurfacegroup.com

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## FIGURES

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## APPENDICES

## EXECUTIVE SUMMARY

Subsurface Construction Corp (Subsurface) was contracted by Navajo Refining Company (Navajo) to perform a pressure falloff test and bottom-hole pressure survey on Navajo's Mewbourne Well No. 1. The test was performed according to New Mexico Oil Conservation Division (OCD) falloff test guidelines (*New Mexico Oil Conservation Division UIC Class I Well Fall-Off Test Guidance, December 3, 2007*).

The test provides the state regulatory agency with the necessary information to access the validity of requested or existing injection well permit conditions and satisfy the permitting objective of protecting the underground sources of drinking water (USDW). Specifically, 40 CFR Part 146 states "the Director shall require monitoring of the pressure buildup in the injection zone annually, including at a minimum, a shutdown of the well for a time sufficient to conduct a valid observation of the pressure fall-off curve" (40 CFR§146.13 for Non-hazardous Class I Wells).

The falloff testing was conducted according to the test plan submitted and approved by the OCD. The test plan stated that, all offset wells that inject into the injection interval would be shut-in for the duration of the test period. The testing consisted of a 30-hour injection period and a 30-hour falloff period. Bottom-hole pressure gauges were also placed in the offset wells Gaines Well No. 3 and Chukka Federal Well No. 2. These wells are owned by Navajo and are used to inject plant waste into the same intervals as the Mewbourne Well No. 1.

As prescribed by the guidelines, the report discusses supporting and background information in Sections 1 through 9. The one mile area of review (updated since the 2009 falloff testing) is discussed in Section 10 and geology in Section 11. Information on the offset wells is discussed in Section 12, daily testing activities in Section 13, and point of shut-in, in Section 14. The pressure falloff testing and analysis results are discussed in Section 15. The OCD required record keeping statement is discussed in Section 16.

## 1. FACILITY INFORMATION

a. Name: Navajo Refining Company (subsidiary of the Holly Corporation)
b. Facility Location: Highway 82 East, Artesia, New Mexico 88211
c. Operator's Oil and Gas Remittance Identifier (OGRID) Number: 223518

## 2. WELL INFORMATION

a. OCD UIC Permit Number: UIC-CLI-008-1
b. Well Classification: Class I Non-hazardous
c. Well Name and Number: Mewbourne Well No. 1
d. API Number: 30-015-27592
e. Well Legal Location: 660 FSL, 2310 FEL

## 3. CURRENT WELLBORE SCHEMATIC

The Mewbourne Well No. 1 wellbore schematic is presented in Figure 1. The schematic has all data as requested by the guidelines and includes the following:

a. Tubing: 4-1/2-inch, 11.6 pound per foot, steel construction, API grade N-80, with long thread connections (LTC).

b. Packer: Arrow X-1, 7-inch by 3-1/2-inch set in tension at 7,879 feet.

c. Tubing Length: 7,879 feet. There are no profile nipples in the tubing or the packer as this was not a requirement of the permit.

d. Size, Type, and Depth of Casing: There are three casing strings in the well. The information for these casing strings was obtained from OCD records on file with the state and geophysical logs. The casing strings are:

   i. 13-3/8-inch, 48 pound per foot, steel construction, API grade J-55, with short thread connections (STC), set at a depth of 390 feet. The casing was cemented to the surface with 525 sacks of cement. The casing was set in open hole with a diameter of 17.5 inches. This information was obtained from OCD records.

ii. 9-5/8-inch, 36 pound per foot, steel construction, API grade J-55, STC, set at a depth of 2,555 feet. The casing was cemented to the surface with 1,000 sacks of cement. The casing was set in open hole with a diameter of 12.25 inches. This information was obtained from OCD records.

iii. 7-inch, 26 pound per foot and 29 pound per foot, steel construction, API grade N-80 and P-110, LTC, set at a depth of 9,094 feet. The casing was cemented to surface in two stages with 1,390 sacks of cement. The casing was set in open hole with a diameter of 8.75 inches. The top cement was verified with a CBL run on July 23, 1998. The remainder of the information was obtained from OCD records.

iv. A cement plug at 9,004 feet isolates the lower section of the original borehole. This information was obtained from OCD records.

e. The top of cement was determined from a CBL run in the 7-inch casing string on July 23, 1998. The top of cement in the 7-inch casing was found at the surface. The top of cement in the 9-5/8-inch and 13-3/8-inch casing strings was verified through OCD records and volume calculations.

f. The 7-inch casing was perforated on July 24 and July 27, 1998. The casing was perforated with a 0.5-inch diameter hole at 2 shots per foot on a 60° phasing. The perforations are located between 7,924 feet and 8,188 feet and from 8,220 feet to 8,476 feet.

g. The total depth of the well is 10,200 feet with the plug back depth at 9,004 feet. On October 29, 2009 fill was tagged at 9,001 feet.

h. The bottom-hole pressure gauges run in the Mewbourne Well No. 1 for the pressure falloff testing consisted of two memory (top of the perforations) (MRO) pressure gauges were placed at 7,922 feet and the other was placed two feet lower at 7,924 feet.

## 4. ELECTRIC LOG ENCOMPASSING THE COMPLETED INTERVAL

The dual induction log is presented in Appendix A and encompasses the completed interval between 7,924 feet and 8,476 feet. The dual induction log was submitted to the OCD with the original permit after the well was drilled by the Mewbourne Oil Company. The log was resubmitted to the OCD when the well was re-permitted as a Class I injection well.

## 5. RELEVANT PORTIONS OF THE POROSITY LOG USED TO ESTIMATE FORMATION POROSITY

The neutron density log is presented in Appendix B and encompasses the completed interval between 7,924 feet and 8,476 feet. The neutron density log was submitted to the OCD with the original permit after the well was drilled by Mewbourne Oil Company. The log was resubmitted to the OCD when the well was re-permitted as a Class I injection well. The porosity of the formation, 10%, and the reservoir thickness, 175 feet, were determined from this log. These values were used in the analysis of the pressure falloff data (Section 15). Additional information concerning the geology of the injection reservoir is discussed in Section 11.

## 6. PVT DATA OF THE FORMATION AND INJECTION FLUID

The Mewbourne Well No. 1 was recompleted in July 1998, prior to the issuance of the current well testing guidelines (December 3, 2007). At the time, no directives were in place to test formation fluids or derive formation characteristics from cores. However, reservoir fluid samples were obtained during the recompletion and the average density and average total dissolved solids (TDS) were measured at 1.03 g/l and 26,500 mg/l, respectively. The analytical results of the analysis of the formation fluid are summarized in Table I.

The viscosity of the formation fluid, formation water compressibility, and total system compressibility were estimated in reference to bottom-hole temperature using industry accepted correlations. These correlations are found in the Society of Petroleum Engineer's "Advances in Well Test Analysis, Monograph Volume 5" and "Pressure Buildup and Flow Tests in Wells, Monograph Volume 1".

a. Estimation of formation fluid and reservoir rock compressibility:

   The fluid compressibility of the formation brine was estimated for a sodium chloride solution (26,500 mg/l) at the bottom-hole temperature of 127°F using Appendix C (Figure D.16 SPE Monograph 5). This value was $2.9 \times 10^{-6}$ $psi^{-1}$. The formation pore volume compressibility was estimated using Appendix D (Figure G.5 SPE Monograph 1). This value was $5.5 \times 10^{-6}$ $psi^{-1}$. The total system compressibility is the sum of the fluid compressibility and the pore volume compressibility, $8.4 \times 10^{-6}$ $psi^{-1}$. The temperature used with the correlations was recorded during the temperature survey conducted in the Mewbourne Well No. 1 on July 23, 1998, and included in this report as Appendix E.

b. Formation fluid viscosity with reference temperature:

   The formation fluid had a TDS concentration of 26,500 mg/l. This equates to an approximate equivalent percentage of NaCl of 4.5%. The average viscosity of the formation fluid was estimated using Appendix F (Figure D.35 SPE Monograph 5). This value was 0.57 centipoise (cp) at 127°F.

c. Formation fluid specific gravity/density with reference temperature:

   The average formation fluid density was measured at 1.03 g/l at 70°F (Table I).

d. Injection fluid specific gravity, viscosity and compressibility with reference temperature:

The specific gravity and pH of the refinery waste water were measured during the injection portion of the reservoir testing. The specific gravity was 1.01 (8.41 pounds per gallon). This equates to an approximate equivalent percentage of NaCl of 4%. Using the same methodology described above, the viscosity of the injected fluid was 0.54 cp at 127°F. The compressibility of the injected plant waste was $2.9 \times 10^{-6}$ $psi^{-1}$ at 127°F.

## 7. DAILY RATE HISTORY DATA (MINIMUM OF ONE MONTH PRECEDING THE FALLOFF TEST)

The rate history used in the analysis of the pressure falloff data began on November 13, 2010 (37 days prior to initiating the falloff test). The daily rate history is summarized in Appendix G.

## 8. CUMULATIVE INJECTION INTO THE FORMATION FROM TEST WELL AND OFFSET WELLS

The total volume of fluid injected into all three well as of December 19, 2010, was 2,366,167,212 gallons. The volume of fluid injected into the Mewbourne Well No. 1 was 1,340,321,727 gallons. The volume of fluid injected into the Chukka Well No. 2 was 747,934,752 gallons. The volume of fluid injected into the Gaines Well No. 3 was 277,910,733 gallons. The area of review (AOR) indicates that there are no other wells injecting into the intervals in which the Navajo wells inject. The volumes injected were obtained from plant records.

## 9. PRESSURE GAUGES

Two (2) downhole pressure gauges and one surface pressure gauge were used for the Mewbourne Well No. 1 buildup and falloff testing. The downhole pressure gauges were set at 7,922 feet and 7,924 feet. Bottom-hole pressure gauges were also placed in each of the offset wells: Gaines Well No. 3 and Chukka Well No. 2. The pressure gauges were set at 7,660 feet in the Gaines Well No. 3 and at 7,570 feet in the Chukka Well No. 2.

a. Describe the type of down hole surface pressure readout gauge used including manufacture and type:

In the Mewbourne Well No. 1, two MRO pressure gauges were used to record the pressure and temperature data during the injection/falloff testing. Both gauges were sapphire crystal gauges. The manufacturer of the MRO pressure gauges (Serial Nos. 75871 and 76173) is Spartek Systems. The surface pressure gauge was a quartz crystal gauge (Serial No. 10579) manufactured by Spartek Systems.

In the Gaines Well No. 3, two MRO pressure gauges were used to monitor the bottom-hole pressure and temperature during the testing of the Mewbourne Well No. 1. Both gauges were sapphire crystal gauges with Serial Nos. 76585 and 76648. Both gauges are manufactured by Spartek Systems.

In the Chukka Well No. 2, two MRO pressure gauges were used to monitor the bottom-hole pressure and temperature during the testing of the Mewbourne Well No. 1. Both gauges were sapphire crystal gauges with Serial Nos. 76169 and 76182. Both gauges are manufactured by Spartek Systems.

b. List the full range, accuracy and resolution of the gauge:

In Mewbourne Well No. 1, the MRO pressure gauges, Serial Nos. 75871 and 76173, has a full range of 0 psi to 6,000 psi, an accuracy of 0.022% of full scale, and a resolution of 0.0003% of full scale. The surface pressure gauge (Serial No. 10579) has a full range of 0 psi to 6,000 psi, an accuracy of 0.03% of full scale, and a resolution of 0.0003% of full scale.

In Gaines Well No. 3, the MRO pressure gauge, Serial No. 76585, has a full range of 0 psi to 6,000 psi, an accuracy of 0.022% of full scale, and a resolution of 0.0003% of full scale. The MRO pressure gauge, Serial No. 76648, has a full range of 0 psi to 6,000 psi, and accuracy of 0.022% of full scale, and a resolution of 0.0003% of full scale.

In Chukka Well No. 2, the MRO pressure gauge, Serial No. 76169, has a full range of 0 psi to 6,000 psi, an accuracy of 0.022% of full scale, and a resolution of 0.0003% of full scale. The MRO pressure gauge, Serial No. 76182, has a full range of 0 psi to 6,000 psi, an accuracy of 0.022% of full scale, and a resolution of 0.0003% of full scale.

c. Provide the manufacturer's recommended frequency of calibration and a calibration certificate showing date the gauge was last calibrated:

The certificate of calibration for each of the pressure gauges used during the testing are included as Appendix H. The manufacturer's recommended calibration frequency is one year.

## 10. ONE MILE AREA OF REVIEW (AOR)

Federal Abstract Company was contracted by Subsurface and instructed to undertake a review of well changes made within a one-mile area of review (AOR) of the Mewbourne Well No. 1, Chukka Well No. 2, and Gaines Well No. 3. In 2009, an update of the original AOR, submitted with the Discharge Application Permit 2003, was completed within the one-mile AOR for all three wells. The current update includes all existing wells within the one-mile AOR and any changes that have occurred to these wells since the 2009 update.

No new fresh water wells were reported within the search area since the submittal of the 2009 report. The discharge application lists the water wells located in the Area of Review.

a. Identify wells located within the one mile AOR:

Table II also contains a listing of all wells within the one-mile AOR of Mewbourne Well No. 1, Chukka Well No. 2, and Gaines Well No. 3. Figure 6 is a Midland Map Company base map of the area containing the one mile AOR.

b. Ascertain the status of wells within the one mile AOR:

Table II contains a listing of all wells within the one-mile AOR, with their current status. Tables III through XIII contain a list of all wells within the one-mile AOR that have had modifications to the current permit or have had new drilling and/or completion permits issued since the 2009 annual report submittal.

Six (6) wells were found in which ownership had changed. Thirteen (13) new plugged and abandoned oil and gas wells were found. Three (3) wells were placed in temporarily abandoned status. One (1) well was found that was returned to production status. Three (3) wells were found that had been recompleted in an upper interval. There were five (5) new drills, none of which penetrated the Wolfcamp interval. All plugged and abandoned wells were successfully plugged and isolated from the Mewbourne Well No. 1, Chukka Well No. 2, and Gaines Well No. 3 injection intervals according to current OCD records.

c. Provide details on any offset producers and injectors completed in the same interval:

Navajo has two injection wells in the same interval. Mewbourne Well No. 1 is listed as ID No. 59 in Table II and no changes have occurred to this well. Chukka Well No. 2 is listed as ID No. 120 in Table II and no changes have occurred to this well. The wellbore schematics for the Gaines Well No. 3 and Chukka Well No. 2 are presented as Figure 3 and Figure 4, respectively.

## 11. GEOLOGY

The injection zones are porous carbonates of the lower portion of the Wolfcamp Formation, the Cisco Formation, and the Canyon Formation. These formations occur in the Mewbourne Well No. 1, the Chukka Well No. 2, and the Gaines Well No. 3 at the depths shown in the table below.

| Injection Zone Formation | Mewbourne Well No. 1 (KB = 3,693 ft) | | Chukka Well No. 2 (KB = 3,623 ft) | | Gaines Well No. 3 (KB = 3,625 ft) | |
|---|---|---|---|---|---|---|
| | MD below KB (ft) | SS Depth (ft) | MD below KB (ft) | SS Depth (ft) | MD below KB (ft) | SS Depth (ft) |
| Lower Wolfcamp | 7,450 | -3,757 | 7,270 | -3,647 | 7,303 | -3,678 |
| Cisco | 7,816 | -4,123 | 7,645 | -4,022 | 7,650 | -4,025 |
| Canyon | 8,475 | -4,782 | 8,390 | -4,767 | 8,390 | -4,765 |
| Base of Injection Zone (base of Canyon) | 9,016 | -5,323 | 8,894 | -5,271 | 8,894 | -5,269 |

a. Description of the geological environment of the injection interval:

The lower portion of the Wolfcamp Formation (Lower Wolfcamp) is the shallowest porous unit in the proposed injection interval. The Wolfcamp Formation (Permian-Wolf campaign age) consists of light brown to tan, fine to medium-grained, fossiliferous limestones with variegated shale interbeds (Meyer, 1966, page 69). The top of the Wolfcamp Formation was correlated for this study to be below the base of the massive, dense dolomites of the overlying Abo Formation. The base of the Wolfcamp coincides with the top of the Cisco Formation. The thickness of log porosity greater than 5% in the entire Wolfcamp Formation ranges from 0 feet to 295 feet in a band three miles wide that trends northeast-southwest across the study area.

The Cisco Formation (Pennsylvanian-Virgilian age) of the Northwest Shelf is described by Meyer (1966, page 59) as consisting of uniform, light colored, chalky, fossiliferous limestones interbedded with variegated shales. Meyer (1966, page 59) also describes the Cisco at the edge of the Permian basin as consisting of biothermal (mound) reefs composed of thick, porous, coarse-grained dolomites. Locally, the Cisco consists of porous dolomite that is 745 feet thick in Chukka Well No. 2, 659 feet thick in Mewbourne Well No. 1, and 720 feet in Gaines Well No. 3.

The total thickness of intervals with log porosity greater than 5% is approximately 310 feet in Mewbourne Well No. 1, 580 feet in Chukka Well No. 2, and 572 feet in Gaines Well No. 3. The total thickness with log porosity greater than 10% is approximately 100 feet in Mewbourne Well No. 1, 32 feet in Chukka Well No. 2, and 65 feet in Gaines Well No. 3. The thickness of the porous intervals in the Cisco ranges from 0 feet in the northwestern part of the study area to nearly 700 feet in a band three miles wide that trends northeast-southwest.

The Canyon Formation (Pennsylvanian-Missourian age) consists of white to tan to light brown fine grained, chalky, fossiliferous limestone with gray and red shale interbeds (Meyer, 1966, page 53). Locally, the Canyon occurs between the base of the Cisco dolomites and the top of the Strawn Formation (Pennsylvanian-Desmoinesian age). The total thickness of intervals with log porosity greater than 5% is 34 feet in Mewbourne Well No. 1, 30 feet in Chukka Well No. 2, and 10 feet in Gaines Well No. 3. No intervals appear to have log porosity greater than 10% in any of the three injection wells.

b. Discuss the presence of geological features, i.e., pinchouts, channels, and faults, if applicable:

From the geological study completed and submitted in the Discharge Plan Application and Application for Authorization to Inject, the reservoir appears to be continuous, with the possibility of anisotropic conditions extending to the west-southwest. The injection intervals that were studied are well confined by the Abo and Yeso low porosity carbonate beds, Tubbs shale, and Salado salt. The Cisco and Wolfcamp formations follow the Vacuum arch and have a southeasterly dip. No faults existed in the study area although, the study also shows that faulting occurs via the K-M fault located 6 miles northwest of Artesia and trends northeast-southwest. The distance to this fault line occurs no closer than 16 miles. No faults are known to exist in the confining zone within the AOR.

c. Provide a portion of relevant structure map, if necessary:

The structure map for Strawn is presented as Appendix I. The structure map for the Wolfcamp presented as Appendix J. The structure map for the Cisco is presented as Appendix K.

## 12. OFFSET WELLS

There are only two offset wells identified in the AOR that inject into the same interval: the Gaines Well No. 3 and the Chukka Well No. 2. Both wells were shut-in during the buildup and falloff portions of the testing.

a. Identify the distance between the test well and any offset well completed in the same injection interval:

The Mewbourne Well No. 1 is approximately 7,900 feet from Gaines Well No. 3, the test well. The Chukka Well No. 2 is approximately 10,860 feet from the Mewbourne Well No. 1.

b. Report the status of the offset wells during both the injection and shut-in portions of the test:

Both the Gaines Well No. 3 and Chukka Well No. 2 were shut-in during the buildup and falloff portions of the testing. Bottom-hole pressure gauges were lowered into each well approximately 48 hours before shutting in the Mewbourne Well No. 1. The bottom-hole pressure and temperature data are graphically depicted in Figure 5 for the Gaines Well No. 3 and Figure 2 for the Chukka Well No. 2.

c. Describe the impact, if any, the offset wells had on the testing:

The offset wells were shut in prior to beginning the 30-hour injection period and remained shut-in during the falloff portion of the testing.

## 13. CHRONOLOGICAL LISTING OF THE DAILY TESTING ACTIVITIES (OPERATIONS LOG)

Appendix L contains the formal Chronology of Field Activities. This chronology was developed from the field activity reports.

a. Date of the testing:

The buildup portion of the testing started on December 18, 2010, at 12:08 p.m. and continued until December 19, 2010, at 8:58 p.m., when the Mewbourne Well No. 1 was shut-in. The falloff test ended on December 21, 2010, at 7:06 a.m. The total depth of the well was tagged at 9,001 feet and five-minute gradient stops were made while pulling the pressure gauges out of the wellbore. At 1:00 p.m., on December 21, 2010, the well was turned over to Navajo plant operations personnel.

b. Time of the injection period:

The buildup portion of the testing began on December 18, 2010, when the injection rate was set at an average injection rate of 136.61 gallons per minute (gpm). The injection rate was held constant for 31.5 hours. The total injection period used in the pressure falloff analysis was 37 days.

c. Type of injection fluid:

The injected fluid was non-hazardous waste water from the plant. The density of the injection fluid was periodically measured and averaged 8.37 pounds per gallon during the 31.5-hour injection period.

d. Final injection pressure and temperature prior to shutting in the well:

The final flowing pressure ($P_{wf}$) and temperature ($T_{wf}$) were 4,145.27 psia and 87.3°F, respectively.

e. Total shut-in time:

The Mewbourne Well No. 1 was shut-in for a total of 34.15 hours.

f. Final static pressure and temperature at the end of the fall-off portion of the test:

The final static pressure at 7,924 feet was 3,722.48 psia. The final temperature was 94.7°F.

## 14. DESCRIBE THE LOCATION OF THE SHUT-IN VALVE USED TO CEASE FLOW TO THE WELL FOR THE SHUT-IN PORTION OF THE TEST

On the pipeline to the Mewbourne Well No. 1, there are two, 4-inch motor controlled valves installed on the incoming pipeline before the pod filters. Two 4-inch valves are installed between the pod filters and the wellhead. There is one 6-inch valve installed in the main line between the pod filters and the wellhead. A 4-1/16-inch wing valve is installed on the wellhead. All valves were closed during the falloff portion of the testing. A diagram of the wellhead is shown in Figure 7 and a diagram of the valve locations are shown in Figure 8.

## 15. PRESSURE FALLOFF ANALYSIS

The following discussion of the analysis of the pressure data recorded during the falloff testing of the Mewbourne Well No. 1 satisfies Sections 15 through 19 of Section IX, Report Components, of the OCD's falloff test guidelines. Where appropriate, the specific guideline addressed is annotated. Specific parameters used in the equations and discussed previously in this report are also annotated. The plots included with this report are summarized in Table IX. The inclusion of these plots in this report satisfies OCD Guideline Section IX.18.

The pressure data obtained during the falloff test were analyzed using the commercially available pressure transient analysis software program PanSystem©. Appendix M contains the output from this software program. Figure 9 shows the

pressure data recorded by the bottom-hole pressure gauge from the time the tool was in place through the 34 hour shut-in period. Figure 10 shows the pressure and temperature data recorded by the bottom-hole pressure gauge from the time the tool was in place through the 34 hour shut-in period. Figure 11 is a Cartesian plot of the injection rates versus time for the injection period used in the pressure falloff analysis. The superposition time function was used to account for all rate changes during the injection period. Figure 12 is a plot of the surface pressures and injection rates versus time for the stabilized injection period of the testing. Figure 13 is a plot of the historical injection rates and surface pressures versus calendar time.

Figure 14 is a log-log diagnostic plot of the falloff data, showing change in pressure and pressure derivative versus equivalent shut in time. The different flow regimes, wellbore storage, radial flow and change in reservoir characteristics, are indicated on the log-log plot and the superposition Horner plot (OCD Guideline Section IX.18.c and IX.18.d)

Wellbore storage begins at the beginning of the falloff test and continues to an elapsed shut in time of 0.035 hours. Radial flow begins at an elapsed shut in time of 7.204 hours and continues until 13.282 hours (OCD Guideline Section IX.15.b).

The reservoir permeability was determined from the radial flow region of the superposition Horner plot, Figure 15. The radial flow regime begins at a Horner time of 81.134 and continues until a Horner time of 45.099, at which time the pressure data departs the semi-log straight-line. Figure 16 shows an expanded view of the radial flow regime. The slope of the radial flow period, as calculated by the analysis software, was 4.760555 psi/cycle (OCD Guideline Section IX.15.c). The average injection rate prior to shut in was 136.61 gpm which is equivalent to 4,683.83 barrels per day (bbl/day).

An estimate of mobility-thickness (transmissibility, OCD Guideline Section IX.15.d), $kh/\mu$, for the reservoir was determined to be 159,979 md-ft/cp using the following equation:

$$\frac{k\ h}{\mu} = 162.6 \frac{q\ B}{m}$$

where,

| | | |
|---|---|---|
| $kh/\mu$ | = | formation mobility-thickness, millidarcy-feet/centipoise |
| q | = | rate prior to shut in, bpd |
| B | = | formation volume factor, reservoir volume/surface volume |
| m | = | slope of radial flow period, psi/cycle |

$$\frac{kh}{\mu} = 162.6 \frac{(4{,}683.83)(1.0)}{4.760555}$$

$$= 159{,}979 \text{ md-ft/cp}$$

The permeability-thickness (flow capacity, OCD Guideline Section IX.15.i), kh, was determined to be 91,188 md-ft by multiplying the mobility-thickness, $kh/\mu$, by the viscosity of the reservoir fluid (see Section 6), $\mu_{reservoir}$, of 0.57 centipoise:

$$kh = \left( \frac{kh}{\mu} \right) \mu_{reservoir}$$

$$= 159{,}979 \times 0.57$$

$$= 91{,}188 \text{ md-ft}$$

The reservoir permeability (OCD Guideline Section IX.15.e) using the total thickness (see Section 5 and Section 11) of 175 feet was 521 md:

$$k = \frac{(k\ h)}{h}$$

$$= \frac{91{,}188}{175}$$

$$= 521\text{md}$$

To determine whether the proper viscosity was used in arriving at this permeability, the travel time for a pressure transient to pass beyond the waste front needs to be calculated (OCD Guideline Section VIII.5). The distance to the waste front is determined from the following equation:

$$r_{waste} = \left( \frac{0.13368\ V}{\pi h\ \phi} \right)^{1/2}$$

where,

| | | |
|---|---|---|
| $r_{waste}$ | = | radius to waste front, feet |
| V | = | total volume injected into the injection interval, gallons |
| h | = | formation thickness, feet |
| $\phi$ | = | formation porosity, fraction |
| 0.13368 | = | constant |

A cumulative volume of approximately 1,340,321,727 gallons of waste has been injected into Mewbourne Well No. 1 (see Section 8). The formation has a porosity of 0.10 (see Section 5 and Section 11).

The distance to the waste front was determined to be 1,805 feet:

$$r_{waste} = \left( \frac{(0.13368)(1,340,321,727)}{(\pi)(175)(0.10)} \right)^{1/2}$$

$$= 1,805 \text{ feet}$$

The time necessary for a pressure transient to traverse this distance is calculated from the following equation:

$$t_{waste} = 948 \frac{\phi \mu_{waste} c_t r^2_{waste}}{k}$$

where,

| | | |
|---|---|---|
| $t_{waste}$ | = | time for pressure transient to reach waste front, hours |
| $\phi$ | = | formation porosity, fraction |
| $\mu_{waste}$ | = | viscosity of the waste at reservoir conditions, centipoise |
| $r_{waste}$ | = | radius to waste front, feet |
| $c_t$ | = | total compressibility of the formation and fluid, psi |
| k | = | formation permeability, millidarcies |
| 948 | = | constant |

The pore volume compressibility is $8.4 \times 10^{-6}$ $psi^{-1}$ (see Section 6). The time necessary for a pressure transient to traverse the distance from the wellbore to the leading edge of the waste front would be 2.69 hours:

$$t_{waste} = 948 \frac{(0.10)(0.54)(8.4 \times 10^{-6})(1,805)^2}{521}$$

$$= 2.69 \text{ hours}$$

Since the time required to pass through the waste is less than the 7.204 hours required to reach the beginning of the radial flow period, the assumption that the pressure transient was traveling through reservoir fluid during the period of the semi-log straight line was correct.

The near wellbore skin damage (OCD Guideline Section IX.15.f) was determined from the following equation:

$$s = 1.151\left[\frac{p_{wf} - p_{1hr}}{m_1} - \log\left(\frac{k}{\phi \mu c_t r_w^2}\right) + 3.23\right]$$

where,

| | | |
|---|---|---|
| s | = | formation skin damage, dimensionless |
| 1.151 | = | constant |
| $p_{wf}$ | = | flowing pressure immediately prior to shut in, psi |
| $p_{1hr}$ | = | pressure determined from extrapolating the first radial flow semi-log line to a $\Delta t$ of one hour, psi |
| $m_1$ | = | slope of the first radial flow semi-log line, psi/cycle |
| k | = | permeability of the formation, md |
| $\phi$ | = | porosity of the injection interval, fraction |
| $\mu$ | = | viscosity of the fluid the pressure transient is traveling through, cp |
| $c_t$ | = | total compressibility of the formation plus fluid, $psi^{-1}$ |
| $r_w$ | = | radius of the wellbore, feet |
| 3.23 | = | constant |

The final measured flowing pressure was 4,145.27 psia. The pressure determined by extrapolating the radial flow semi-log line to a $\Delta t$ of one hour, $p_{1hr}$, was 3,730.04 psia (calculated from the analysis software). The wellbore radius, $r_w$, is 0.3646 feet (completion records). Using these values in addition to the previously discussed parameters results in a skin of 92.7:

$$s = 1.151\left[\frac{4{,}145.27-3{,}730.04}{4.760555} - \log\left(\frac{521}{(0.10)(0.57)(8.4\times10^{-6})(0.3646)^2}\right) + 3.23\right]$$

$$= 92.7$$

The change in pressure, $\Delta p_{skin}$, in the wellbore associated with the skin factor (OCD Guideline Section IX.15.g) was calculated using the following equation:

$$\Delta p_{skin} = 0.869(m)(s)$$

where,

| | | |
|---|---|---|
| 0.869 | = | constant |
| m | = | slope from superposition plot of the well test, psi/cycle |
| s | = | skin factor calculated from the well test |

The change in pressure, $\Delta p_{skin}$, using the previously calculated and defined values was determined to be 383.5 psi:

$$\Delta p_{skin} = 0.869(m)(s)$$

$$= 0.869(4.760555)(92.7)$$

$$= 383.5 \text{ psi}$$

The flow efficiency (E, OCD Guideline Section IX.15.h) was determined from the following equation:

$$E = \frac{p_{wf} - \Delta p_{skin} - p_{static}}{p_{wf} - p_{static}}$$

where,

| | | |
|---|---|---|
| E | = | flow efficiency, fraction |
| $p_{wf}$ | = | flowing pressure prior to shutting in the well for the fall-off test, |
| $p_{static}$ | = | final pressure from the pressure falloff test |
| $\Delta p_{skin}$ | = | pressure change due to skin damage |

Using the previously determined parameters, the flow efficiency was calculated to be 0.09:

$$E = \frac{4{,}145.27 - 383.5 - 3{,}722.48}{4{,}145.27 - 3{,}722.48}$$

$$= 0.09$$

The radius of investigation (OCD Guideline Section IX.15.a) was calculated using the following equation:

$$R_{inv} = 0.029\sqrt{\frac{k\,\Delta t_s}{\phi\,\mu\,C_t}}$$

where,

| | | |
|---|---|---|
| k | = | formation permeability, millidarcies |
| $\Delta t_s$ | = | elapsed shut-in time, hours |
| $\phi$ | = | formation porosity, fraction |
| $\mu$ | = | viscosity of the fluid the pressure transient is traveling through, cp |
| $c_t$ | = | total compressibility of the formation plus fluid, $psi^{-1}$ |
| 0.029 | = | constant |

The radius of investigation, $r_{inv}$, using the previously defined values was determined to be 5,590 feet:

$$R_{inv} = 0.029\sqrt{\frac{(521)(34.15)}{(0.10)(0.57)(8.4 \times 10^{6})}}$$

$$R_{inv} = 5,590 \text{ feet}$$

As indicated on Figure 14, the pressure data departs the radial flow region at an elapsed time from shut in of 13.282 hours. No pressure or temperature anomalies were noted that would cause this type of pressure response observed on the derivative log-log plot (OCD Guideline Section VIII.9). A review of the geology of the injection zones (see Section 11) indicates that all three of the formations in which the Mewbourne Well No. 1 injects into have varying thicknesses and porosities within the mapped area. Changes in formation thickness, porosity, and fluid viscosity can cause the slope changes seen on the derivative log-log plot. Because these changes occurred during the duration of the pressure falloff test, the reservoir analysis results are considered heterogeneous as opposed to homogeneous (OCD Guideline Section IX.17.b).

The Hall plot (OCD Guideline Section IX.18.h) is presented as Figure 17. No slope changes are seen in the plotted data.

A comparison of the current analysis results with previous analysis results as well as with the reservoir parameters submitted with the permit application is presented in Table X (OCD Guideline Section IX.19).

On December 21, 2010, a static pressure gradient survey was conducted while pulling the pressure gauges out of the well. Static gradient stops were conducted at 9,000 feet, 8,000 feet, 7,924 feet, 7,000 feet, 6,000 feet, 5,000 feet, 4,000 feet, 3,000 feet, 2,000 feet, 1,000 feet, and at the surface. The bottom-hole pressure and temperature, after 34.15 hours of shut-in at 7,924 feet, were 3,722.48 psia and 94.8°F, respectively. The gradient survey is summarized in Table XI. The data are graphically depicted in Figure 18.

## 16. NEW MEXICO OIL CONSERVATION DIVISION THREE YEAR RECORDING KEEPING STATEMENT

Navajo will keep the raw test data, generated during the testing, on file for a minimum of three years. The raw test data will be made available to OCD upon request.

# TABLES

## TABLE I

## FORMATION WATER ANALYSIS SUMMARY

| 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 |

*The data in the above table was referenced from "Discharge Plan Application and Application for Authorization to Inject per Oil Conservation Division Form C-108, into Class I Wells WDW-1 and Proposed WDW-2 and WDW-3" and the "Discharge Permit Approval Conditions", "Reentry and Completion Report Waste Disposal Well No. 2", and "Reentry and Completion Report Waste Disposal Well No. 3".*

TABLE II

TABULATION OF WELLS WITHIN TE ONE-MILE AREA OF REVIEW OF THE MEWBOURNE WELL #1, CHUKKA WELL #2, AND GAINES WELL #3

| DATE Comp or Plug | ID NO | API | OPERATOR | WELL NAME | OCD UL | SECT | TOWNSHIP | RANGE | NS FTG | EW FTG | TVD DEPTH | PLUG DATE | STATUS | WELL TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 30-015-36281 | MACK ENERGY CORPORATION | SUN DEVILS FEDERAL NO. 001 | J | 1 | 18S | 27E | 2193S | 1520W | 6000 | | PERMIT | O |
| 8/30/1941 | 1 | 30-015-00693 | GEORGE A CHASE & C SERVICE | DELHI #001 | A | 36 | 17S | 27E | 330N | 330E | 528 | | T/A | O |
| 6/24/1948 | 2 | 30-015-00694 | DELHI OIL CORP. | STATE #013 | A | 36 | 17S | 27E | 990N | 990E | 1993 | 6/24/1948 | P&A | O |
| 4/21/1950 | 3 | 30-015-00646 | GEORGE A CHASE & C SERVICE | DELHI #007 | A | 36 | 17S | 27E | 990N | 330E | 540 | | T/A | O |
| 12/6/1947 | 4 | 30-015-00668 | LEGACY RESERVES OPERATING, LP | SOUTH RED LAKE GRAYBURG UNIT #010 | G | 36 | 17S | 27E | 1650N | 2310E | 1736 | | SHUT IN | O |
| 3/6/1949 | 5 | 30-015-00690 | GEORGE A CHASE & C SERVICE | CONKLIN #002 | G | 36 | 17S | 27E | 1830N | 2205E | 532 | | ACTIVE | O |
| 3/23/1949 | 6 | 30-015-00667 | FAIRWAY RESOURCES OPERATING | SOUTH RED LAKE GRAYBURG UNIT #011 | G | 36 | 17S | 27E | 2310N | 2310E | 1733 | | ACTIVE | I |
| 1/10/1942 | 7 | 30-015-00666 | GEORGE A CHASE & C SERVICE | CONKLIN #001 | G | 36 | 17S | 27E | 2310N | 2310E | 533 | 9/10/2007 | ACTIVE | O |
| 8/4/1950 | 8 | 30-015-00689 | GEORGE A CHASE JR & C SERVICE | GATES STATE #001 | H | 36 | 17S | 27E | 1650N | 330E | 557 | | ACTIVE | O |
| 10/21/2003 | 9 | 30-015-00647 | ASPEN OIL INC | GATES STATE #002 | H | 36 | 17S | 27E | 1650N | 990E | 551 | 10/21/2003 | ACTIVE | O |
| 5/6/2008 | 10 | 30-015-00669 | GEORGE A CHASE JR & C SERVICE | HOMAN #001 | H | 36 | 17S | 27E | 2310N | 330E | 1804 | 5/6/2008 | P&A | O |
| 10/28/1941 | 11 | 30-015-00688 | KERSEY & CO | RAMAPO #001 | I | 36 | 17S | 27E | 2310S | 330E | 590 | 10/28/1941 | P&A | O |
| 1/3/1950 | 12 | 30-015-00670 | KERSEY & CO | RAMAPO #003 | I | 36 | 17S | 27E | 2970N | 330E | 1857 | 1/3/1950 | P&A | O |
| 5/7/1948 | 13 | 30-015-00687 | KERSEY & CO | RAMAPO #002 | I | 36 | 17S | 27E | 2310S | 990E | 1900 | 5/7/1948 | P&A | G |
| 7/10/1989 | 14 | 30-015-00685 | ARCO OIL & GAS | EMPIRE ABO UNIT G #020 | I | 36 | 17S | 27E | 1650S | 330E | 5980 | 7/10/1989 | P&A | O |
| 2/13/1942 | 15 | 30-015-00671 | ROJO GRANDE COMPANY LLC | RAMAPO #003 | J | 36 | 17S | 27E | 2310S | 2310E | 591 | 1/24/2000 | ZONE | O |
| 2/27/1948 | 16 | 30-015-01221 | MCQUADRANGLE, LC | SOUTH RED LAKE GRAYBURG UNIT #023 | J | 36 | 17S | 27E | 2300S | 2300E | 1790 | 8/13/2002 | ZONE | O |
| 4/22/1961 | 17 | | MARTIN YATES III | DOOLEY STATE #3 | J | 36 | 17S | 27E | | | 5865 | | | |
| 2/26/1961 | 18 | 30-015-05934 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #019A | J | 36 | 17S | 27E | 1650S | 1650E | 5970 | | ACTIVE | O |
| 2/3/1949 | 19 | 30-015-01220 | MCQUADRANGLE, LC | SOUTH RED LAKE GRAYBURG UNIT #022 | K | 36 | 17S | 27E | 2310S | 2330W | 1747 | 7/17/2002 | ZONE | O |
| 5/15/1947 | 20 | 30-015-00674 | ROJO GRANDE COMPANY LLC | RAMAPO #002 | K | 36 | 17S | 27E | 2310S | 2310W | 514 | | ACTIVE | O |
| 1/20/1948 | 21 | 30-015-01219 | MCQUADRANGLE, LC | SOUTH RED LAKE GRAYBURG UNIT #021 | K | 36 | 17S | 27E | 2310S | 1650W | 1710 | | ACTIVE | I |
| 12/11/1981 | 22 | 30-015-23913 | MCQUADRANGLE, LC | SOUTH RED LAKE GRAYBURG UNIT #043 | K | 36 | 17S | 27E | 1650S | 1650W | 1785 | | ACTIVE | O |
| 4/19/1961 | 23 | | MARTIN YATES III | DOOLEY STATE ABO #3 | K | 36 | 17S | 27E | | | 5865 | | ACTIVE | O |
| 1/24/2000 | 24 | 30-015-00673 | ROJO GRANDE COMPANY LLC | RAMAPO #001 | K | 36 | 17S | 27E | 1650S | 2310W | 510 | 1/24/2000 | ZONE | O |
| 1/24/2000 | 25 | 30-015-00682 | ROJO GRANDE COMPANY LLC | RAMAPO #004 | N | 36 | 17S | 27E | 990S | 1650W | 541 | 1/24/2000 | ZONE | O |
| 4/16/1948 | 26 | 30-015-00683 | FAIRWAY RESOURCES OPERATING | SOUTH RED LAKE GRAYBURG UNIT #028 | N | 36 | 17S | 27E | 965S | 1650W | 1812 | | ACTIVE | I |
| 3/11/2009 | 27 | 30-015-01218 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #018 | N | 36 | 17S | 27E | 330S | 2310W | 5925 | 3/11/2009 | P&A | O |
| 5/13/1947 | 28 | 30-015-00684 | BURNHAM OIL COMPANY | STATE B-6961 NO. 1-A | O | 36 | 17S | 27E | 990S | 2310E | 1500 | 5/13/1947 | P&A | O |
| 9/8/1959 | 29 | 30-015-01251 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #019 | O | 36 | 17S | 27E | 660S | 1980E | 6200 | 4/27/2009 | P&A | O |
| | 30 | | | | I | 36 | 17S | 27E | | | | | MISPLOT | |
| 4/13/2009 | 31 | 30-015-00677 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #020 | P | 36 | 17S | 27E | 330S | 990E | 6013 | 4/10/2009 | P&A | O |
| 3/7/1953 | 32 | 30-015-01616 | C F M OIL CO | BLAKE STATE #001 | P | 30 | 17S | 28E | 330S | 990E | 615 | | ACTIVE | O |
| 7/15/1952 | 33 | 30-015-01638 | BEDINGFIELD, MALCO, RESLER | STATE NO. 1 | A | 31 | 17S | 28E | 330N | 990E | 2004 | 7/15/1952 | P&A | O |
| 11/15/1975 | 34 | 30-015-21594 | FINNEY OIL COMPANY | POWCO STATE #001 | B | 31 | 17S | 28E | 330N | 1650E | 652 | | ACTIVE | O |
| 12/23/1952 | 35 | 30-015-01636 | BEDINGFIELD, J E | DELHI-STATE NO. 1 | C | 31 | 17S | 28E | 330N | 2310E | 637 | 12/23/1952 | P&A | O |
| 7/15/1986 | 36 | 30-015-25621 | FINNEY OIL COMPANY | POWCO STATE #002 | B | 31 | 17S | 28E | 980N | 1620E | 747 | | ACTIVE | O |
| 6/23/1942 | 37 | 30-015-01633 | GEORGE A CHASE JR DBA G AND C | ASTON & FAIR A #001 | D | 31 | 17S | 28E | 330N | 330W | 531 | | ACTIVE | O |
| 1/5/1946 | 38 | 30-015-01634 | ASTON & FAIR | STATE 31 NO. 1X | D | 31 | 17S | 28E | 350N | 345W | 525 | | NO | O |
| 2/16/1950 | 39 | 30-015-01645 | MCLAUGHLIN, C T | BEDINGFIELD STATE 1 NO. 1 | F | 31 | 17S | 28E | 990N | 990W | 2307 | 2/16/1950 | P&A | O |
| 5/29/1948 | 40 | 30-015-02666 | DORAL ENERGY CORP. | HUDSON SAIKIN STATE #001 | E | 31 | 17S | 28E | 2310N | 330W | 1816 | | ACTIVE | O |
| 7/7/1984 | 41 | 30-015-24887 | DORAL ENERGY CORP. | HUDSON SAIKIN STATE #002 | E | 31 | 17S | 28E | 2310N | 990W | 1950 | | ACTIVE | O |
| 6/7/1960 | 42 | 30-015-01643 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #022 | F | 31 | 17S | 28E | 2310N | 2260W | 5971 | 7/10/2009 | P&A | O |
| 5/8/1948 | 43 | 30-015-01635 | GEORGE A CHASE JR DBA G AND C | ASTON & FAIR #001Y | F | 31 | 17S | 28E | 2310N | 2310W | 1926 | | ACTIVE | O |
| 10/12/1953 | 44 | 30-015-01637 | GEORGE A CHASE JR DBA G AND C | MALCO STATE #001 | G | 31 | 17S | 28E | 2310N | 2310E | 1852 | | ACTIVE | O |
| 8/10/1960 | 45 | 30-015-01652 | KERSEY & CO | BOLING #001 | G | 31 | 17S | 28E | 2288N | 1625E | 6025 | | ACTIVE | O |

TABLE II

TABULATION OF WELLS WITHIN TE ONE-MILE AREA OF REVIEW OF THE MEWBOURNE WELL #1, CHUKKA WELL #2, AND GAINES WELL #3

| DATE Comp or Plug | ID NO | API | OPERATOR | WELL NAME | OCD UL | SECT | TOWNSHIP | RANGE | NS FTG | EW FTG | TVD DEPTH | PLUG DATE | STATUS | WELL TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9/23/1965 | 46 | 30-015-10537 | LIME ROCK RESOURCES A, L.P. | NORTHWEST ARTESIA UNIT #004 | H | 31 | 17S | 28E | 2277N | 330E | 6180 | | ACTIVE | O |
| 6/17/1966 | 47 | 30-015-10833 | LIME ROCK RESOURCES A, LP | NORTHWEST ARTESIA UNIT #010 | I | 31 | 17S | 28E | 1980S | 660E | 1945 | | ACTIVE | O |
| 4/29/1960 | 48 | 30-015-01644 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #024A | I | 31 | 17S | 28E | 1650S | 330E | 6106 | 6/12/2009 | P&A | O |
| 12/23/1962 | 49 | 30-015-01642 | DORAL ENERGY CORP. | STATE FW #001 | J | 31 | 17S | 28E | 1650S | 2310E | 1937 | | ACTIVE | O |
| 9/17/2003 | 50 | 30-015-01650 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #023A | J | 31 | 17S | 28E | 1650S | 1958E | 6094 | 9/17/2003 | P&A | O |
| 4/10/1960 | 51 | 30-015-01651 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #022B | K | 31 | 17S | 28E | 1650S | 2387W | 6046 | 10/22/2009 | P&A | O |
| 7/16/1955 | 52 | 30-015-01640 | DORAL ENERGY CORP. | RAMPO #002 | L | 31 | 17S | 28E | 2310S | 330W | 1996 | | ACTIVE | O |
| 8/24/2002 | 53 | 30-015-01648 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #021A | L | 31 | 17S | 28E | 1651S | 1089E | 5971 | 8/24/2002 | ZONE | O |
| 5/1/1948 | 54 | 30-015-01639 | DORAL ENERGY CORP. | RAMPO #001 | M | 31 | 17S | 28E | 990S | 330W | 1975 | | ACTIVE | O |
| 1/31/1960 | 55 | 30-015-01647 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #021 | M | 31 | 17S | 28E | 660S | 660W | 6006 | 7/23/2005 | P&A | O |
| 1/22/1960 | 56 | 30-015-01646 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #022A | N | 31 | 17S | 28E | 660S | 2082W | 6050 | | P&A | O |
| 3/1/1963 | 57 | 30-015-10118 | DORAL ENERGY CORP. | STATE FV #001 | N | 31 | 17S | 28E | 766S | 2188W | 1938 | | ACTIVE | O |
| 1/18/1942 | 58 | 30-015-01653 | OTIS A ROBERTS | PARKER-STATE NO. 1 | O | 31 | 17S | 28E | 990S | 1650E | 742 | 1/18/1942 | P&A | O |
| 8/4/1998 | 59 | 30-015-27592 | NAVAJO REFINING CO. PIPELINE | WDW #001 | | 31 | 17S | 28E | 660S | 2310E | 10200 | | ACTIVE | I |
| 2/24/1960 | 60 | 30-015-01649 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #023 | O | 31 | 17S | 28E | 660S | 1939E | 6094 | 8/14/2009 | P&A | O |
| 5/8/1967 | 61 | 30-015-20042 | LIME ROCK RESOURCHES A, LP | NORTHWEST ARTESIA UNIT #011 | P | 31 | 17S | 28E | 990S | 660E | 2012 | | ACTIVE | O |
| 3/12/1960 | 62 | 30-015-01641 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #024 | P | 31 | 17S | 28E | 660S | 660E | 6122 | | ACTIVE | O |
| 5/12/1953 | 63 | 30-015-01654 | BEDINGFIELD, J E | ASTON-STATE NO. 1 | D | 32 | 17S | 28E | 330N | 330W | 651 | 5/12/1953 | P&A | O |
| 9/13/1960 | 64 | 30-015-01671 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #025B | E | 32 | 17S | 28E | 2280N | 978W | 6013 | 8/14/2008 | P&A | O |
| 8/24/1960 | 65 | 30-015-01657 | MARBOB ENERGY CORP | AA STATE NO. 1 | F | 32 | 17S | 28E | 2280N | 1980W | 6171 | | ACTIVE | O |
| 11/6/2006 | 66 | 30-015-10818 | SDX RESOURCES INC | NORTHWEST ARTESIA UNIT #008 | K | 32 | 17S | 28E | 2310S | 2105W | 2003 | 11/6/2006 | P&A | O |
| 3/27/1960 | 67 | 30-015-01661 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #026B | K | 32 | 17S | 28E | 1650S | 2310W | 6083 | | ACTIVE | O |
| 5/15/1966 | 68 | 30-015-10795 | LIME ROCK RESOURCES A, LP | NORTHWEST ARTESIA UNIT #009 | L | 32 | 17S | 28E | 2310S | 660W | 1930 | 5/28/2008 | P&A | O |
| 4/13/1960 | 69 | 30-015-01662 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #025A | L | 32 | 17S | 28E | 1650S | 990W | 6075 | | ACTIVE | O |
| 5/9/1967 | 70 | 30-015-20043 | LIME ROCK RESOURCES A, LP | NORTHWEST ARTESIA UNIT #012 | M | 32 | 17S | 28E | 990S | 760W | 1998 | | T/A | O |
| 3/5/1960 | 71 | 30-015-01660 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #025 | M | 32 | 17S | 28E | 660S | 660W | 6132 | 1/14/2009 | P&A | O |
| 9/15/2006 | 72 | 30-015-10834 | SDX RESOURCES INC | NORTHWEST ARTESIA UNIT #013 | N | 32 | 17S | 28E | 990S | 2030W | 1954 | 9/15/2006 | P&A | O |
| 2/14/1960 | 73 | 30-015-01659 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #026A | N | 32 | 17S | 28E | 660S | 1980W | 6172 | | ACTIVE | O |
| 7/25/1975 | 74 | 30-015-21539 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #261 | N | 32 | 17S | 28E | 150S | 1400W | 6220 | | ACTIVE | O |
| 7/18/1977 | 75 | 30-015-22009 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #272 | O | 32 | 17S | 28E | 330S | 2481E | 6370 | | ACTIVE | O |
| 7/18/1960 | 76 | 30-015-02606 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #026E | C | 5 | 18S | 28E | 330N | 1941W | 6254 | | ACTIVE | O |
| 1/4/1979 | 77 | 30-015-22697 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #261A | C | 5 | 18S | 28E | 1080N | 1914W | 6350 | 6/16/2009 | P&A | O |
| 3/27/1960 | 78 | 30-015-02607 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #025C | D | 5 | 18S | 28E | 660N | 660W | 6273 | | ACTIVE | O |
| 1/12/1979 | 79 | 30-015-22750 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #251 | D | 5 | 18S | 28E | 660N | 150W | 6250 | | SHUT IN | O |
| 1/13/2006 | 80 | 30-015-02608 | CONOCOPHILLIPS COMPANY | STATE E AI #001 | E | 5 | 18S | 28E | 1660N | 330W | 6265 | 1/13/2006 | P&A | O |
| 8/10/1983 | 81 | 30-015-24485 | CONOCOPHILLIPS COMPANY | ILLINOIS CAMP A COM #001 | E | 5 | 18S | 28E | 1980N | 990W | 10450 | | ACTIVE | G |
| 12/30/1959 | 82 | 30-015-02602 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #026D | F | 5 | 18S | 28E | 1650N | 1650W | 6265 | | ACTIVE | O |
| 8/12/1983 | 83 | 30-015-25522 | I & W INC | WALTER SOLT STATE #001 | L | 5 | 18S | 28E | 2240S | 400W | 8500 | | ACTIVE | S |
| 3/27/2001 | 84 | 30-015-10244 | MACK ENERGY CORP | STATE AG #001 | L | 5 | 18S | 28E | 2310S | 330W | 6365 | 3/27/2001 | ZONE | O |
| 3/14/1967 | 87 | 30-015-20019 | LIME ROCK RESOURCES A, LP | NORTHWEST ARTESIA UNIT #016 | A | 6 | 18S | 28E | 330N | 330E | 3280 | | ACTIVE | O |
| 2/29/1960 | 88 | 30-015-02615 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #024B | A | 6 | 18S | 28E | 660N | 660E | 6241 | | ACTIVE | O |
| 12/21/1959 | 89 | 30-015-02625 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #023C | B | 6 | 18S | 28E | 470N | 2170E | 6194 | | T/A | O |
| 11/1/1975 | 90 | 30-015-21542 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #231 | B | 6 | 18S | 28E | 1260N | 1580E | 6250 | | ACTIVE | O |
| 12/29/1959 | 91 | 30-015-02621 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #022E | C | 6 | 18S | 28E | 660N | 1980W | 6033 | | ACTIVE | O |
| 10/22/1975 | 92 | 30-015-21626 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #231A | G | 6 | 18S | 28E | 1361N | 2531E | 6380 | | SHUT IN | O |
| 12/30/1959 | 93 | 30-015-02613 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #021B | D | 6 | 18S | 28E | 990N | 660W | 6119 | | ACTIVE | O |

TABLE II

## TABULATION OF WELLS WITHIN TE ONE-MILE AREA OF REVIEW OF THE MEWBOURNE WELL #1, CHUKKA WELL #2, AND GAINES WELL #3

| DATE Comp or Plug | ID NO | API | OPERATOR | WELL NAME | OCD UL | SECT | TOWNSHIP | RANGE | NS FTG | EW FTG | TVD DEPTH | PLUG DATE | STATUS | WELL TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6/2/1980 | 94 | 30-015-23116 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #213 | E | 6 | 18S | 28E | 2050N | 100W | 6225 | | ACTIVE | O |
| 10/30/1959 | 95 | 30-015-02619 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #021C | E | 6 | 18S | 28E | 1990N | 660W | 6202 | | ACTIVE | O |
| 12/28/1978 | 96 | 30-015-22637 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #212 | E | 6 | 18S | 28E | 2450N | 400W | 6267 | | ACTIVE | O |
| 2/11/1975 | 97 | 30-015-21395 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #211 | E | 6 | 18S | 28E | 2630N | 1300W | 6200 | | ACTIVE | O |
| 3/13/1977 | 98 | 30-015-22012 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #222 | F | 6 | 18S | 28E | 1350N | 1572W | 6303 | | ACTIVE | O |
| 2/21/1942 | 99 | 30-015-02626 | SARKIN, DAVID C & OLIVER, HENRY | STATE NO. 1 | F | 6 | 18S | 28E | 1650N | 1650W | 705 | 2/21/1942 | P&A | O |
| 8/8/1963 | 100 | 30-015-10107 | DORAL ENERGY CORP | STATE FX #001 | F | 6 | 18S | 28E | 1874N | 1874W | 1985 | | ACTIVE | O |
| 11/26/1959 | 101 | 30-015-02620 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #022D | F | 6 | 18S | 28E | 1990N | 2082W | 6206 | | ACTIVE | O |
| 5/19/1978 | 102 | 30-015-22527 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #223 | F | 6 | 18S | 28E | 2630N | 1930W | 6250 | | ACTIVE | O |
| 4/23/1976 | 103 | 30-015-21746 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #221 | F | 6 | 18S | 28E | 2610N | 2713W | 6305 | | ACTIVE | O |
| 7/8/1979 | 104 | 30-015-22913 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #235 | G | 6 | 18S | 28E | 1750N | 1600E | 6300 | | ACTIVE | O |
| 8/27/1978 | 105 | 30-015-22593 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #234 | G | 6 | 18S | 28E | 1900N | 2441E | 6260 | 12/3/2008 | P&A | O |
| 1/26/1960 | 106 | 30-015-02614 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #023B | G | 6 | 18S | 28E | 1980N | 1980E | 6242 | | ACTIVE | O |
| 4/13/1976 | 107 | 30-015-21737 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #232 | G | 6 | 18S | 28E | 2253N | 1576E | 6345 | 5/7/2009 | P&A | O |
| | 108 | | | | H | 6 | 18S | 28E | | | | | MISPLOT | |
| 6/5/1978 | 109 | 30-015-22490 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #233 | G | 6 | 18S | 28E | 2550N | 2050E | 6300 | 4/3/2009 | P&A | O |
| 3/24/1960 | 110 | 30-015-02616 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #024C | H | 6 | 18S | 28E | 1650N | 990E | 6253 | | ACTIVE | O |
| 4/12/1981 | 111 | 30-015-23547 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #241 | H | 6 | 18S | 28E | 1950N | 660E | 6386 | 9/19/2008 | P&A | O |
| 12/12/2002 | 112 | 30-015-02617 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #024K | I | 6 | 18S | 28E | 2310S | 990E | 6350 | 12/12/2002 | P&A | O |
| 2/5/1979 | 113 | 30-015-22528 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #232A | J | 6 | 18S | 28E | 2300S | 1570E | 6350 | 4/7/2009 | P&A | O |
| 8/15/1949 | 114 | 30-015-02611 | BARNEY COCKBURN | STATE NO. 1 | J | 6 | 18S | 28E | 2310S | 2310E | 2095 | 8/15/1949 | P&A | O |
| 5/23/1979 | 115 | 30-015-02628 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #023D | J | 6 | 18S | 28E | 2260S | 2270E | 6310 | | ACTIVE | O |
| 8/13/1978 | 116 | 30-015-22491 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #231B | J | 6 | 18S | 28E | 1700S | 2350E | 6350 | 9/2/2009 | P&A | O |
| 3/21/1955 | 117 | 30-015-02618 | MILLER BROS OIL CO | CAPITOL STATE NO. 1 | J | 6 | 18S | 28E | 1647S | 2076E | 2396 | 3/21/1955 | P&A | G |
| 2/22/1960 | 118 | 30-015-02623 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #022F | K | 6 | 18S | 28E | 2248S | 2075W | 6210 | | ACTIVE | O |
| | 119 | | | | K | 6 | 18S | 28E | | | | | MISPLOT | |
| | 120 | | NAVAJO REFINING COMPANY | WDW-2 (ORIGINAL LOCATION) | L | 6 | 18S | 28E | | | | | | |
| 1/23/1960 | 121 | 30-015-02622 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #021D | L | 6 | 18S | 28E | 2219S | 660W | 6194 | | ACTIVE | O |
| 7/17/1980 | 122 | 30-015-23548 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #211A | L | 6 | 18S | 28E | 1950S | 1000W | 6312 | | ACTIVE | O |
| 10/21/1960 | 123 | 30-015-02627 | RUTH OIL CO, LLC | STATE M-AI #002 | M | 6 | 18S | 28E | 949S | 990W | 6225 | | ACTIVE | O |
| 4/16/1992 | 124 | 30-015-26943 | MEWBOURNE OIL CO | CHALK BLUFF 6 STATE #001 | M | 6 | 18S | 28E | 990S | 730W | 10200 | | ACTIVE | G |
| 8/5/1960 | 125 | 30-015-02610 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #022C | N | 6 | 18S | 28E | 955S | 1750W | 6243 | | ACTIVE | O |
| 5/1/1961 | 126 | 30-015-02624 | PAN AMERICAN PETROLEUM CO | STATE CD NO. 1 | O | 6 | 18S | 28E | 968S | 2270E | 6412 | 5/1/1961 | P&A | O |
| 12/30/1985 | 127 | 30-015-25503 | DICKSON PETROLEUM CO | KIMBERLY STATE NO. 1 | P | 6 | 18S | 28E | 660S | 330E | 1750 | 12/30/1985 | P&A | O |
| 5/13/1952 | 128 | 30-015-02612 | D & H OIL CO | STATE NO. 1 | P | 6 | 18S | 28E | 330S | 330E | 2246 | 5/13/1952 | P&A | O |
| 11/5/1959 | 129 | 30-015-01215 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #020D | A | 1 | 18S | 27E | 667N | 666E | 6118 | | ACTIVE | O |
| 7/7/1959 | 130 | 30-015-00708 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #019B | B | 1 | 18S | 27E | 660N | 1980E | 6078 | | ACTIVE | O |
| 5/10/1948 | 131 | | MALCO REFINERIES | HILL #4 | C | 1 | 18S | 27E | | | 1840 | 5/10/1948 | P&A | |
| | 132 | | | | C | 1 | 18S | 27E | | | | | MISPLOT | |
| 7/21/2004 | 133 | 30-015-00710 | MARBOB ENERGY CORP | AAO FEDERAL No. 013 | C | 1 | 18S | 27E | 660N | 1980W | 6173 | | ACTIVE | O |
| 8/24/1991 | 134 | 30-015-26741 | MEWBOURNE OIL CO | CHALK BLUFF FEDERAL COM #002 | F | 1 | 18S | 27E | 1650N | 1350W | 10140 | | ACTIVE | G |
| 5/31/1959 | 135 | 30-015-00706 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #018A | F | 1 | 18S | 27E | 2310N | 1980W | 6087 | | ACTIVE | O |
| 8/2/1959 | 136 | 30-015-00709 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #019C | G | 1 | 18S | 27E | 1980N | 1980E | 6205 | | ACTIVE | O |
| | 137 | | | | G | 1 | 18S | 27E | | | | | MISPLOT | |
| 9/7/1975 | 138 | 30-015-21552 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #191 | G | 1 | 18S | 27E | 2500N | 2500E | 6259 | | ACTIVE | O |
| 10/13/1959 | 139 | 30-015-00711 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #020C | H | 1 | 18S | 27E | 1980N | 660E | 6218 | | ACTIVE | O |

TABLE II

TABULATION OF WELLS WITHIN TE ONE-MILE AREA OF REVIEW OF THE MEWBOURNE WELL #1, CHUKKA WELL #2, AND GAINES WELL #3

| DATE Comp or Plug | ID NO | API | OPERATOR | WELL NAME | OCD UL | SECT | TOWNSHIP | RANGE | NS FTG | EW FTG | TVD DEPTH | PLUG DATE | STATUS | WELL TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5/13/1976 | 140 | 30-015-21783 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #202 | H | 1 | 18S | 27E | 2490N | 1299E | 6296 | | ACTIVE | O |
| 10/10/1978 | 141 | 30-015-22656 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #203 | H | 1 | 18S | 27E | 2400N | 700E | 6225 | | ACTIVE | O |
| 7/1/1927 | 142 | | MANHATTAN OIL | CRONIN #1 | H | 1 | 18S | 27E | | | 2900 | 7/1/2027 | P&A | |
| 7/19/1975 | 143 | 30-015-21553 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #201 | H | 1 | 18S | 27E | 2501N | 20E | 6225 | | ACTIVE | O |
| 1/16/1993 | 144 | 30-015-27163 | MEWBOURNE OIL CO | CHALK BLUFF FEDERAL COM #003 | I | 1 | 18S | 27E | 1980S | 990E | 10150 | | ACTIVE | G |
| 1/5/2003 | 145 | 30-015-00697 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #020K | I | 1 | 18S | 27E | 1980S | 660E | 6185 | 1/5/2003 | P&A | O |
| 10/26/1978 | 146 | 30-015-22657 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #193 | J | 1 | 18S | 27E | 2490S | 2200E | 6225 | | ACTIVE | O |
| 8/20/1959 | 147 | 30-015-00696 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #019Q | J | 1 | 18S | 27E | 1980S | 1980E | 6180 | | ACTIVE | O |
| 6/25/1978 | 148 | 30-015-22560 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #192 | J | 1 | 18S | 27E | 220S | 1390E | 6250 | | ACTIVE | O |
| 9/23/1976 | 149 | 30-015-21873 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #191A | J | 1 | 18S | 27E | 1526S | 1470E | 6350 | | ACTIVE | O |
| 11/14/1978 | 150 | 30-015-22658 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #194 | J | 1 | 18S | 27E | 1500S | 2130E | 6325 | | ACTIVE | O |
| 7/25/1978 | 151 | 30-015-22559 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #184 | K | 1 | 18S | 27E | 2290S | 2445W | 6200 | | SHUT IN | O |
| 7/24/1977 | 152 | 30-015-22096 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #183 | K | 1 | 18S | 27E | 2370S | 1510W | 6210 | | ACTIVE | O |
| 4/17/2003 | 153 | 30-015-21554 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #181 | K | 1 | 18S | 27E | 1367S | 1440W | 6203 | 4/17/2003 | P&A | O |
| 5/22/1959 | 154 | 30-015-00707 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #018B | K | 1 | 18S | 27E | 1980S | 1980W | 6163 | | ACTIVE | O |
| 6/1/1976 | 155 | 30-015-21792 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #182 | K | 1 | 18S | 27E | 1533S | 2370W | 6369 | | ACTIVE | O |
| 9/27/2003 | 156 | 30-015-00713 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #018D | N | 1 | 18S | 27E | 995S | 1644W | 6174 | 9/27/2003 | P&A | O |
| 3/7/1991 | 157 | 30-015-26575 | NAVAJO REFINING COMPANY | WDW-3 | N | 1 | 18S | 27E | 790S | 2250W | 10120 | | ACTIVE | I |
| 4/9/1971 | 158 | 30-015-20394 | HUMBLE OIL & REFINING CO | EMPIRE ABO FEDERAL NO. 5 | O | 1 | 18S | 27E | 953S | 2197E | 6300 | 4/9/1971 | P&A | O |
| 11/8/1959 | 159 | 30-015-00698 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #191 | O | 1 | 18S | 27E | 660S | 1980E | 6365 | | ACTIVE | S |
| 12/2/1961 | 160 | 30-015-00699 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #020B | P | 1 | 18S | 27E | 940S | 330E | 6250 | | ACTIVE | O |
| 9/13/1990 | 161 | 30-015-26404 | DEVON ENERGY PRODUCTION | FEDERAL T #001 | A | 12 | 18S | 27E | 660N | 990E | 10141 | | ACTIVE | I |
| 9/11/1985 | 162 | 30-015-25099 | HARLOW ENTERPRISES LLC | COMSTOCK FEDERAL #006 | H | 12 | 18S | 27E | 1809N | 990E | 1652 | | ACTIVE | O |
| 2/23/1987 | 165 | 30-015-25997 | EASTLAND OIL CO | LAUREL STATE #001 | C | 7 | 18S | 28E | 940N | 1757W | 1690 | | ACTIVE | O |
| 11/10/1988 | 166 | 30-015-25675 | EASTLAND OIL CO | LAUREL STATE #002 | E | 7 | 18S | 28E | 940N | 1757W | 1690 | | ACTIVE | O |
| 6/10/1985 | 167 | 30-015-25236 | MOREXCO INC | STATE BY #001 | F | 7 | 18S | 28E | 1980N | 1980W | 10400 | | ACTIVE | O |
| | 168 | 30-015-22636 | DYAD PE | PRE-ONGUARD WELL #213 | J | 7 | 18S | 28E | 1950N | 1300W | | | ABAN | O |
| | 169 | 30-015-22635 | DYAD PE | PRE-ONGUARD WELL #212 | J | 8 | 18S | 28E | 1900N | 100W | | | ABAN | O |
| | 170 | 30-015-24372 | DYAD PE | PRE-ONGUARD WELL #001 | J | 8 | 18S | 28E | 1980S | 990E | | | ABAN | O |
| | 171 | 30-015-27636 | PHILLIPS PETROLEUM | CHALK BLUFF 6 STATE #002 | H | 7 | 18S | 28E | 2310N | 810E | | | ABAN | O |
| 3/30/1993 | 353 | 30-015-27286 | MEWBOURNE OIL CO | CHALK BLUFF 36 STATE #001 | M | 36 | 17S | 27E | 660S | 990W | 10060 | | ACTIVE | O |
| 10/11/1983 | 354 | 30-015-24612 | PRONGHORN MANAGEMENT CORP | STATE M #001 | M | 36 | 17S | 27E | 790S | 990W | 1451 | 4/21/2009 | P&A | O |
| | 355 | 30-015-00676 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #017 | M | 36 | 17S | 27E | 330N | 990W | 5797 | | ACTIVE | O |
| | 356 | 30-015-10184 | ASPEN OIL INC | STATE #006 | M | 36 | 17S | 27E | 330S | 920W | 1343 | | ACTIVE | O |
| | 358 | 30-015-21623 | GEORGE A CHASE JR & C SERVICE | STATE #007 | M | 36 | 17S | 27E | 360S | 455W | 1366 | | ACTIVE | O |
| 10/15/1942 | 359 | 30-015-00662 | ACREY, B L & F D | STATE NO. 2 | M | 36 | 17S | 27E | 330S | 330W | 592 | 10/15/1942 | P&A | O |
| 3/30/1960 | 595 | 30-015-02605 | BP AMERICA PRODUCTION UNIT | EMPIRE ABO UNIT NO. 27 E | B | 5 | 18S | 28E | 930N | 2271E | 6261 | 6/12/2009 | P&A | O |
| | 748 | 30-015-00701 | FAIRWAY RESOURCES OPERATING | SOUTH RED LAKE GRAYBURG UNIT 37 WIW | D | 1 | 18S | 27E | 330N | 330W | 1835 | | ACTIVE | O |
| | 748 | 30-015-00715 | MCQUADRANGLE, LC | SOUTH RED LAKE GRAYBURG UNIT #037 | D | 1 | 18S | 27E | 330N | 330W | 1835 | | ACTIVE | I |
| 1/24/1987 | 749 | 30-015-00712 | ARCO OIL & GAS | EMPIRE ABO UNIT I NO. 17 | D | 1 | 18S | 27E | 647N | 667W | 5900 | 1/24/1987 | P&A | O |
| 5/10/1939 | 750 | | JONES | BRAINARD | E | 1 | 18S | 27E | 1650N | 330W | 481 | 5/10/1939 | P&A | O |
| 3/26/1959 | 751 | 30-015-00704 | ARCO OIL & GAS | EMPIRE ABO UNIT J NO. 17 | E | 1 | 18S | 27E | 1980N | 660W | 5960 | 3/26/1959 | P&A | O |
| 5/22/1995 | 752 | 30-015-00703 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #017A | L | 1 | 18S | 27E | 1980S | 660W | 6091 | 3/27/2009 | P&A | O |
| 5/22/1979 | 753 | 30-015-22815 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #171 | M | 1 | 18S | 27E | 670S | 330W | 6300 | | ACTIVE | O |
| | 754 | | | | M | 1 | 18S | 27E | | | | | MISPLOT | |
| 12/20/1943 | 755 | 30-015-00714 | VALLEY REFINING CO | HILL #1 | N | 1 | 18S | 27E | | | 2404 | 12/20/1943 | P&A | |

TABLE II

TABULATION OF WELLS WITHIN TE ONE-MILE AREA OF REVIEW OF THE MEWBOURNE WELL #1, CHUKKA WELL #2, AND GAINES WELL #3

| DATE Comp or Plug | ID NO | API | OPERATOR | WELL NAME | OCD UL | SECT | TOWNSHIP | RANGE | NS FTG | EW FTG | TVD DEPTH | PLUG DATE | STATUS | WELL TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6/25/1959 | 756 | 30-015-00705 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #017B | M | 1 | 18S | 27E | 990S | 660W | 6150 | 7/21/2004 | P&A | O |
| 1/31/1942 | 757 | | BRAINARD & GUY | STATE 2 | A | 2 | 18S | 27E | 330N | 610E | 530 | 1/31/1942 | NO | |
| 11/6/1947 | 758 | 30-015-00721 | FAIRWAY RESOURCES OPERATING | SOUTH RED LAKE GRAYBURG UNIT #036 | A | 2 | 18S | 27E | 330N | 990E | 1705 | | SHUT IN | O |
| | 765 | 30-015-00724 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #016B | A | 2 | 18S | 27E | 990N | 330E | 5920 | | ACTIVE | O |
| 5/23/1948 | 766 | 30-015-00737 | FAIRWAY RESOURCES OPERATING | SOUTH RED LAKE GRAYBURG UNIT #038 | B | 2 | 18S | 27E | 905N | 1601E | 1722 | | ACTIVE | O |
| 3/7/2008 | 772 | 30-015-00745 | MACK ENERGY CORPORATION | STATE H #001 | H | 2 | 18S | 27E | 1980N | 660E | 6140 | 3/7/2008 | P&A | O |
| 2/8/1991 | 773 | 30-015-00742 | S&J OPERATING COMPANY | SOUTH RED LAKE GRAYBURG UNIT 39 WIW | H | 2 | 18S | 27E | 1650N | 990E | 1742 | 2/8/1991 | P&A | O |
| 7/10/2002 | 774 | 30-015-00740 | MCQUADRANGLE, LC | SOUTH RED LAKE GRAYBURG UNIT #040 | G | 2 | 18S | 27E | 1650N | 2197E | 1707 | 7/10/2002 | P&A | I |
| 1/1/1957 | 778 | | RUTTER & WILBANKS | HUDSON #2 | G | 2 | 18S | 27E | 2310N | 1650E | | | | O |
| 6/6/1959 | 779 | 30-015-00741 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #015B | G | 2 | 18S | 27E | 2310N | 1980E | 5880 | | ACTIVE | O |
| 1/1/1947 | 781 | | MALCO REFINING CO | STATE B-2 | J | 2 | 18S | 27E | 2310S | 2310E | 4164 | 1/1/1947 | P&A | O |
| 2/6/1995 | 785 | 30-015-00717 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #016 | I | 2 | 18S | 27E | 1980S | 660E | 6114 | | ACTIVE | O |
| 3/23/1959 | 786 | 30-015-00716 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #015 | J | 2 | 18S | 27E | 1980S | 1830E | 6100 | | ACTIVE | O |
| 5/13/1979 | 789 | 30-015-22896 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #143A | K | 2 | 18S | 27E | 1820S | 2550W | 6108 | | ACTIVE | O |
| 9/13/1979 | 791 | 30-015-22914 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #161 | I | 2 | 18S | 27E | 1310S | 590E | 6225 | | ACTIVE | O |
| | 792 | | | | O | 2 | 18S | 27E | | | | | MISPLOT | |
| 12/20/1978 | 793 | 30-015-22609 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #143 | N | 2 | 18S | 27E | 1200S | 1900W | 6093 | | ACTIVE | O |
| | 795 | | | | P | 2 | 18S | 27E | | | | | MISPLOT | |
| 11/4/1975 | 796 | 30-015-21544 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #151 | O | 2 | 18S | 27E | 1110S | 1322E | 6285 | | T/A | O |
| 5/1/1979 | 797 | 30-015-22885 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #155 | O | 2 | 18S | 27E | 1040S | 2025E | 6202 | | T/A | O |
| 1/20/1959 | 799 | 30-015-00722 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #016A | P | 2 | 18S | 27E | 660S | 660E | 6115 | 2/24/2009 | P&A | O |
| 4/12/1979 | 800 | 30-015-22808 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #156 | O | 2 | 18S | 27E | 600S | 1330E | 6225 | 2/5/2009 | P&A | O |
| 11/19/1958 | 801 | 30-015-00731 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #015A | O | 2 | 18S | 27E | 660S | 1980E | 6220 | 2/11/2009 | P&A | O |
| 12/4/1978 | 802 | 30-015-22669 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #154 | O | 2 | 18S | 27E | 800S | 2500E | 6200 | 1/27/2009 | P&A | O |
| 4/20/1977 | 805 | 30-015-22013 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #153 | O | 2 | 18S | 27E | 90S | 1456E | 6303 | 10/30/2008 | P&A | O |
| 6/17/1976 | 806 | 30-015-21825 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #152 | O | 2 | 18S | 27E | 320S | 2602E | 6335 | | T/A | O |
| | 807 | 30-015-22608 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #142 | N | 2 | 18S | 27E | 100S | 1950W | 6200 | | P&A (No | O |
| 7/1/1976 | 808 | 30-015-21807 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #132 | M | 2 | 18S | 27E | 275S | 1243W | 6200 | | ACTIVE | O |
| 10/21/1958 | 812 | 30-015-00730 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #014 | N | 2 | 18S | 27E | 660S | 1980W | 6112 | | ACTIVE | O |
| 10/21/1959 | 813 | 30-015-00720 | BP AMERICA PRODUCTION | RIVERWOLF UNIT #004 | A | 2 | 18S | 27E | 990N | 1650E | 5881 | 12/12/2008 | P&A | O |
| 5/17/1977 | 814 | 30-015-22051 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #141A | K | 2 | 18S | 27E | 1370S | 2445W | 6203 | | ACTIVE | O |
| 10/25/2004 | 836 | 30-015-00869 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #016C | A | 11 | 18S | 27E | 330N | 653E | 6211 | 10/25/2004 | P&A | O |
| 8/16/2006 | 837 | 30-015-22568 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #151B | B | 11 | 18S | 27E | 400N | 1450E | 6310 | 8/16/2006 | P&A | O |
| 5/6/1979 | 838 | 30-015-22838 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #153B | B | 11 | 18S | 27E | 200N | 1925E | 6252 | 1/4/2009 | P&A | O |
| 7/16/2004 | 839 | 30-015-00868 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #015C | B | 11 | 18S | 27E | 660N | 1980E | 6260 | 7/16/2004 | P&A | O |
| 8/23/1978 | 840 | 30-015-22569 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #152B | B | 11 | 18S | 27E | 560N | 2588E | 6300 | 9/24/2008 | P&A | O |
| 5/21/1979 | 841 | 30-015-22834 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #141B | C | 11 | 18S | 27E | 225N | 2280W | 6225 | | ACTIVE | O |
| 9/5/1957 | 842 | 30-015-00864 | ARCO OIL & GAS | EMPIRE ABO UNIT M NO. 14 | C | 11 | 18S | 27E | 660N | 1980W | 6315 | 9/5/1957 | P&A | O |
| 5/23/1979 | 843 | 30-015-22833 | BP AMERICA PRODUCTION | EMPIRE ABO UNIT #133B | D | 11 | 18S | 27E | 450N | 1175W | 6225 | | ACTIVE | O |
| 4/26/1958 | 844 | 30-015-00867 | ARCO OIL & GAS | EMPIRE ABO UNIT M NO. 13 | D | 11 | 18S | 27E | 660N | 660W | 6114 | 4/26/1958 | P&A | O |
| 7/10/1978 | 846 | 30-015-22556 | ARCO OIL & GAS | EMPIRE ABO UNIT M NO. 131 | D | 11 | 18S | 27E | 1100N | 1200W | 6325 | 7/10/1978 | P&A | O |
| 10/16/1971 | 848 | 30-015-20510 | AMOCO PRODUCTION CO | MALCO S NO. 1 | F | 11 | 18S | 27E | 1650N | 1653W | 10168 | 10/16/1971 | P&A | O |
| 2/3/1961 | 849 | 30-015-00865 | ARCO OIL & GAS | EMPIRE ABO UNIT N NO. 14 | F | 11 | 18S | 27E | 1650N | 1980W | 6208 | 2/3/1961 | P&A | O |
| 3/27/1958 | 850 | 30-015-00866 | ARCO OIL & GAS | EMPIRE ABO UNIT N NO. 131 | E | 11 | 18S | 27E | 1980N | 660W | 6120 | 3/27/1958 | P&A | O |
| 9/1/1956 | 851 | 30-015-00870 | AMOCO PRODUCTION CO | SMITH-MCPHERSON NO. 1 | J | 11 | 18S | 27E | 1980S | 1980E | 7270 | 9/1/1956 | P&A | O |
| | 852 | 30-015-01201 | OSCAR HOWARD | AN ETZ #3 | N | 11 | 18S | 27E | | | 1828 | 4/15/2027 | P&A | |

TABLE II

## TABULATION OF WELLS WITHIN TE ONE-MILE AREA OF REVIEW OF THE MEWBOURNE WELL #1, CHUKKA WELL #2, AND GAINES WELL #3

| DATE Comp or Plug | ID NO | API | OPERATOR | WELL NAME | OCD UL | SECT | TOWNSHIP | RANGE | NS FTG | EW FTG | TVD DEPTH | PLUG DATE | STATUS | WELL TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 853 | 30-015-01202 | OSCAR HOWARD | AN ETZ #2 | O | 11 | 18S | 27E | | | 1827 | 2/4/2027 | P&A | |
| 10/14/1949 | 854 | 30.015-00863 | B.R. POLK, JR. | VICKERS #1 | N | 11 | 18S | 27E | | | 1794 | 10/14/1949 | P&A | |
| 5/18/1984 | 855 | 30-015-24857 | CHESAPEAKE OPERATING INC | FEDERAL DH GAS COM #001 | M | 11 | 18S | 27E | 700S | 990W | 11915 | | ACTIVE | G |
| 8/7/1973 | 856 | 30-015-20535 | ROBERT G COX | FEDERAL EA 2 | D | 12 | 18S | 27E | 330N | 455W | 6248 | 8/7/1973 | P&A | O |
| 4/12/1994 | 857 | 30-015-00871 | RHONDA OPERATING CO | FEDERAL EA #001 | D | 12 | 18S | 27E | 330N | 330W | 6253 | 4/12/1994 | P&A | O |
| 3/16/1980 | 858 | 30-015-23115 | RHONDA OPERATING CO | FEDERAL EA NO. 3 | D | 12 | 18S | 27E | 330N | 380W | 6295 | 3/16/1980 | D&A | O |
| 4/25/1987 | 859 | 30-015-25738 | HARLOW ENTERPRISES LLC | COMSTOCK FEDERAL #009 | G | 12 | 18S | 27E | 2310N | 2310E | 1586 | | ACTIVE | O |
| 4/23/1985 | 860 | 30-015-25270 | BILL MILLER | CHUKKA FEDERAL #001 | F | 12 | 18S | 27E | 2310N | 2310W | 1600 | | ACTIVE | O |
| 7/18/1973 | 861 | 30-015-20894 | NAVAJO REFINING COMPANY | WDW #002 | E | 12 | 18S | 27E | 1980N | 660W | 10372 | | ACTIVE | I |
| 6/29/1948 | 862 | 30-015-00874 | HARLOW ENTERPRISES LLC | COMSTOCK FEDERAL #007 | J | 12 | 18S | 27E | 2310S | 2355E | 3664 | | ACTIVE | O |
| | 863 | 30-015-00872 | MCKEE-JONES | MAGRUDER NO. 1 | L | 12 | 18S | 27E | 310S | 990W | 594 | 2/18/1943 | D&A | O |
| 3/16/1985 | 864 | 30-015-25201 | HARLOW ENTERPRISES LLC | COMSTOCK FEDERAL #002 | K | 12 | 18S | 27E | 1650S | 1770W | 1600 | | ACTIVE | O |
| | 865 | 30-015-25649 | FRED POOL DRILLING CO | COMSTOCK FEDERAL NO. 8 | L | 12 | 18S | 27E | 1650S | 990W | 2000 | 10/10/1986 | D&A | O |
| 5/19/1986 | 866 | 30-015-25545 | HARLOW ENTERPRISES LLC | COMSTOCK FEDERAL #003 | M | 12 | 18S | 27E | 990S | 990W | 1530 | | ACTIVE | O |
| 2/27/1945 | 867 | 30.015-00873 | R.E. McKEE ET AL | MAGRUDER #2 | M | 12 | 18S | 27E | | | 2510 | 2/27/1945 | P&A | |
| 1/23/2003 | 868 | 30-015-26017 | EASTLAND OIL CO | COMSTOCK FEDERAL #010 | N | 12 | 18S | 27E | 990S | 1650W | 2040 | 1/23/2003 | P&A | O |
| 12/10/1984 | 869 | 30-015-25100 | HARLOW ENTERPRISES LLC | COMSTOCK FEDERAL #001 | N | 12 | 18S | 27E | 330S | 1650W | 2400 | | ACTIVE | O |
| 4/19/1985 | 870 | 30-015-25202 | HARLOW ENTERPRISES LLC | COMSTOCK FEDERAL #005 | O | 12 | 18S | 27E | 330S | 2310E | 1625 | | ACTIVE | O |
| | 871 | 30-015-06171 | PILCHER OIL & GAS | MICHAEL CRONIN NO. 3 | I | 12 | 18S | 27E | 1069S | 251E | 2200 | 5/20/2026 | P&A | O |
| 2/15/1932 | 872 | | PILCHER OIL & GAS | MICHAEL CRONIN #1 | P | 12 | 18S | 27E | | | 2002 | 2/15/1932 | P&A | |
| 7/30/1952 | 873 | 30-015-00875 | CITIES SERVICE OIL CO | MAGRUDER NO. B-4 | P | 12 | 18S | 27E | 330S | 330E | 2000 | 7/30/1952 | P&A | O |
| 2/8/1954 | 874 | 30-015-00876 | ROBERT E MCKEE | MAGRUDER NO. 5 | P | 12 | 18S | 27E | 100S | 500E | 1994 | 2/8/1954 | P&A | O |
| | 875 | 30-015-06170 | PILCHER OIL & GAS | MICHAEL CRONIN NO. 2 | P | 12 | 18S | 27E | 200S | 200E | 2004 | 2/22/2026 | P&A | O |
| | 876 | 30-015-01200 | HASSENFUSH-DONNELLY | STATE NO. 1 | A | 13 | 18S | 27E | 0 | 0 | 2030 | 1/1/2026 | P&A | O |
| | 877 | 30-015-06137 | EASTLAND OIL CO | STATE NO. 2 | A | 13 | 18S | 27E | 250N | 990E | 2696 | 1/1/2026 | D&A | O |
| 9/28/1985 | 878 | 30-015-25394 | BILL MILLER | ARTESIA STATE #002 | C | 13 | 18S | 27E | 330N | 2310W | 1613 | | ACTIVE | O |
| 4/13/1985 | 879 | 30-015-25241 | BILL MILLER | ARTESIA STATE #001 | C | 13 | 18S | 27E | 330N | 1650W | 1575 | | ACTIVE | O |
| 1/29/1945 | 880 | 30-015-00884 | DALE RESLER | STATE NO. 3 | C | 13 | 18S | 27E | 990N | 1650W | 2047 | 1/29/1945 | P&A | O |
| 8/27/1985 | 881 | 30-015-25370 | CBS OPERATING CORP | ARTESIA STATE UNIT #002A | D | 13 | 18S | 27E | 480N | 940W | 1608 | | ACTIVE | O |
| 12/11/1944 | 882 | 30-015-00883 | CBS OPERATING CORP | ARTESIA STATE UNIT #001 | D | 13 | 18S | 27E | 990N | 990W | 1950 | | ACTIVE | O |
| 1/26/1945 | 883 | 30-015-00880 | DALE RESLER - JONES | STATE NO. 1 | E | 13 | 18S | 27E | 1650N | 990W | 2353 | 1/26/1945 | P&A | O |
| 6/18/1984 | 884 | 30-015-24881 | DAVID G HAMMOND | ANADARKO 13 FEDERAL #001 | F | 13 | 18S | 27E | 1880N | 1830W | 3020 | | ACTIVE | O |
| 11/28/1954 | 885 | 30-015-00888 | RALPH NIX & JERRY CURTIS | PAGE NO. 1 | F | 13 | 18S | 27E | 1980N | 1650W | 2000 | 11/28/1954 | P&A | O |
| 3/14/1945 | 886 | 30-015-00879 | DALE RESLER | JONES-GOVT NO. 1 | F | 13 | 18S | 27E | 2310N | 1650W | 2000 | 3/14/1945 | D&A | O |
| 12/30/1984 | 888 | 30-015-25078 | DICKSON PETROLEUM, INC | ANADARKO 13 FEDERAL NO. 1 | G | 13 | 18S | 27E | 1724N | 2279E | 2150 | 12/30/1984 | D&A | O |
| 6/30/1944 | 895 | 30-015-00891 | ANADARKO PETROLEUM CORP | ARTESIA STATE UNIT TRACT 4 NO. 1 | A | 14 | 18S | 27E | 990N | 330E | 2060 | 6/30/1944 | P&A | O |
| 1/2/1900 | 896 | 30-015-00893 | RESLER | STATE NO. 1 | G | 14 | 18S | 27E | 1650N | 1650E | 2375 | 1/2/1900 | D&A | O |
| 2/8/1945 | 897 | 30-015-00895 | CBS OPERATING CORP | ARTESIA STATE UNIT #001B | H | 14 | 18S | 27E | 1650N | 330E | 1888 | | ACTIVE | O |
| 6/18/1948 | 901 | 30-015-00695 | WILLIAM & EDWARD HUDSON | HILL NO. 1 | L | 1 | 18S | 27E | 1650S | 330W | 1763 | 6/18/1948 | D&A | O |
| | 910 | 30-015-00744 | COMPTON-SMITH | STATE 1 | J | 2 | 18S | 27E | 2310S | 1640E | 1080 | | P&A | O |
| | 911 | 30-015-31123 | LIME ROCK RESOURCES A, LP | NO BLUFF 36 STATE COM #002 | H | 36 | 17S | 27E | 1980N | 760E | 10050 | | ACTIVE | G |
| | 912 | 30-015-31036 | GEORGE A CHASE JR & C SERVICE | GATES STATE #003 | H | 36 | 17S | 27E | 2310N | 990E | 614 | | ACTIVE | O |
| 12/21/2001 | 916 | 30-015-31592 | ROJO GRANDE COMPANY LLC | RAMAPO #007 | N | 36 | 17S | 27E | 330S | 2310E | 612 | 12/21/2001 | P&A | O |
| | 917 | 30-015-30784 | LIME ROCK RESOURCES A, LP | NW STATE #012 | A | 31 | 17S | 28E | 330N | 480E | 3300 | | ACTIVE | O |
| | 918 | 30-015-30893 | LIME ROCK RESOURCES A, LP | NW STATE #028 | A | 31 | 17S | 28E | 973N | 959E | 2808 | | ACTIVE | O |
| 4/3/2003 | 919 | 30-015-32162 | LIME ROCK RESOURCES A, LP | ENRON STATE #004 | D | 31 | 17S | 28E | 460N | 990W | 3460 | | ACTIVE | O |

TABLE II

## TABULATION OF WELLS WITHIN TE ONE-MILE AREA OF REVIEW OF THE MEWBOURNE WELL #1, CHUKKA WELL #2, AND GAINES WELL #3

| DATE Comp or Plug | ID NO | API | OPERATOR | WELL NAME | OCD UL | SECT | TOWNSHIP | RANGE | NS FTG | EW FTG | TVD DEPTH | PLUG DATE | STATUS | WELL TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 920 | 30-015-30783 | LIME ROCK RESOURCES A, LP | NW STATE #011 | H | 31 | 17S | 28E | 1650N | 330E | 3205 | | ACTIVE | O |
| | 921 | 30-015-30849 | LIME ROCK RESOURCES A, LP | NW STATE #009 | I | 31 | 17S | 28E | 2310S | 270E | 3195 | | ACTIVE | O |
| | 922 | 30-015-30760 | LIME ROCK RESOURCES A, LP | NW STATE #010 | P | 31 | 17S | 28E | 735S | 330E | 3210 | | ACTIVE | O |
| | 923 | 30-015-31920 | LIME ROCK RESOURCES A, LP | ENRON STATE #002 | D | 32 | 17S | 28E | 990N | 990W | 4030 | | ACTIVE | O |
| | 924 | 30-015-30781 | LIME ROCK RESOURCES A, LP | NW STATE #005 | K | 32 | 17S | 28E | 1900S | 2146W | 3190 | | ACTIVE | I |
| | 925 | 30-015-30777 | LIME ROCK RESOURCES A, LP | NW STATE #006 | L | 32 | 17S | 28E | 2310S | 990W | 3204 | | ACTIVE | O |
| | 926 | 30-015-30685 | LIME ROCK RESOURCES A, LP | NW STATE #007 | M | 32 | 17S | 28E | 990S | 990W | 3220 | | ACTIVE | O |
| | 927 | 30-015-30815 | LIME ROCK RESOURCES A, LP | NW STATE #008 | N | 32 | 17S | 28E | 1090S | 2126W | 3310 | | ACTIVE | I |
| 5/4/2004 | 928 | 30-015-32310 | MARBOB ENERGY CORP | AAO FEDERAL #004 | A | 1 | 18S | 27E | 990N | 990E | 4000 | | ACTIVE | O |
| 4/10/2003 | 929 | 30-015-32309 | MARBOB ENERGY CORP | AAO FEDERAL #003 | B | 1 | 18S | 27E | 330N | 1690E | 4125 | | ACTIVE | O |
| 9/19/2002 | 930 | 30-015-32308 | MARBOB ENERGY CORP | AAO FEDERAL #002 | C | 1 | 18S | 27E | 430N | 2310W | 4150 | | ACTIVE | O |
| 12/10/2002 | 931 | 30-015-32307 | MARBOB ENERGY CORP | AAO FEDERAL #001 | D | 1 | 18S | 27E | 330N | 990W | 3851 | | ACTIVE | O |
| 6/28/1980 | 932 | 30-015-22816 | ARCO OIL & GAS | EMPIRE ABO UNIT L #192 | O | 1 | 18S | 27E | 1120S | 1440E | 6350 | 6/23/1980 | ABAN | O |
| | 933 | 30-015-20388 | ARCO OIL & GAS | EMPIRE ABO #5 | N | 1 | 18S | 27E | 990S | 2297E | 6300 | 12/31/9999 | SAME AS | O |
| | 934 | 30-015-27719 | MEWBOURNE OIL CO | CHALK BLUFF 12 FED #001 | | 12 | 18S | 27E | 1650S | 990E | | | ABAN | G |
| | 935 | 30-015-27437 | YATES PETROLEUM CORPORATION | BEAUREGARD ANP STATE COM #001 | B | 14 | 18S | 27E | 660N | 1980E | 0 | | ABAN | G |
| 3/11/2008 | 936 | 30-015-31086 | MARBOB ENERGY CORP | LP STATE #001 | E | 5 | 18S | 28E | 1650N | 990W | 4503 | 3/11/2008 | P&A | O |
| | 937 | 30-015-31109 | MARBOB ENERGY CORP | LP STATE #002 | E | 5 | 18S | 28E | 2301N | 230W | 0 | | PROPOS | O |
| | 938 | 30-015-30785 | LIME ROCK RESOURCES A, LP | NW STATE #015 | A | 6 | 18S | 28E | 430N | 330E | 3225 | | ACTIVE | O |
| 5/23/1979 | 939 | 30-015-00264 | BARNEY COCKBURN | CAPITAL STATE NO. 1 | J | 6 | 18S | 28E | 2310S | 2310E | 2095 | | SAME AS | O |
| 7/15/2000 | 940 | 30-015-31087 | MARBOB ENERGY CORP | LP STATE #003 | M | 6 | 18S | 28E | 990S | 330W | 4466 | 3/17/2008 | P&A | O |
| | 941 | 30-015-31088 | MARBOB ENERGY CORP | LP STATE #004 | M | 6 | 18S | 28E | 330S | 990W | 0 | | PROPOS | O |
| | 942 | 30-015-06250 | BP AMERICA PRODUCTION | | O | 6 | 18S | 28E | 470S | 2170E | 0 | | SAME AS | O |
| 1/31/2001 | 943 | 30-015-31319 | EASTLAND OIL CO | LAUREL STATE #003 | E | 7 | 18S | 28E | 2310N | 330W | 1630 | | ACTIVE | O |
| | 944 | 30-015-26575 | NAVAJO REFINING COMPANY | WDW-3 (ORIGINAL LOC.) | D | 6 | 18S | 28E | 778N | 995W | | | ACTIVE | I |
| 10/12/2004 | 945 | 30-015-32959 | MARBOB ENERGY CORP | AAO FEDERAL #005 | E | 1 | 18S | 27E | 1650N | 875W | 3900 | | ACTIVE | O |
| 4/4/2005 | 946 | 30-015-33473 | MARBOB ENERGY CORP | AAO FEDERAL #007 | G | 1 | 18S | 27E | 1750N | 1650S | 4100 | | ACTIVE | O |
| 2/25/2005 | 947 | 30-015-33784 | MARBOB ENERGY CORP | AAO FEDERAL #008 | H | 1 | 18S | 27E | 1650N | 330W | 4310 | | ACTIVE | O |
| 8/5/2005 | 948 | 30-015-34071 | MARBOB ENERGY CORP | AAO FEDERAL #006 | F | 1 | 18S | 27E | 2169N | 1963W | 4000 | | ACTIVE | O |
| 1/17/2006 | 949 | 30-015-34387 | MARBOB ENERGY CORP | AAO FEDERAL #009 | L | 1 | 18S | 27E | 1980S | 630W | 3950 | | ACTIVE | O |
| 3/9/2006 | 950 | 30-015-34555 | MARBOB ENERGY CORP | AAO FEDERAL #011 | M | 1 | 18S | 27E | 890S | 660W | 4100 | | ACTIVE | O |
| 10/26/2006 | 951 | 30-015-34576 | MARBOB ENERGY CORP | AAO FEDERAL #010 | K | 1 | 18S | 27E | 2060S | 2160W | 4000 | | ACTIVE | O |
| 9/21/2006 | 952 | 30-015-34998 | MARBOB ENERGY CORP | AAO FEDERAL #012 | N | 1 | 18S | 27E | 890S | 1650W | 4075 | | ACTIVE | O |
| 12/17/2006 | 953 | 30-015-34028 | BP AMERICA PRODUCTION | SLIDER 6 STATE NO. 001 | G | 6 | 18S | 28E | 2285N | 1366E | 10433 | 12/17/2006 | P&A | O |
| 12/21/2006 | 954 | 30-015-35050 | LIME ROCK RESOURCES A, LP | ENRON STATE NO 012 | D | 32 | 17S | 28E | 330N | 500W | 3810 | | ACTIVE | O |
| 2/20/2009 | 955 | 30-015-36939 | YATES PETROLEUM CORP | VIOLET BIV STATE COM #1 | A | 14 | 18S | 27E | 660N | 990E | 10500 | | EXT | O |
| 4/20/2005 | 956 | 30-015-33994 | EDGE PETROLEUM OPERATING | RED LAKE 36 A STATE #2 | A | 36 | 17S | 27E | 915N | 420E | 3650 | | ACTIVE | O |
| 6/6/2008 | 957 | 30-015-36116 | LEGACY RESERVES OPERATING LP | SOUTH RED LAKE UNIT II #57 | G | 36 | 17S | 27E | 2305N | 1650E | 2100 | | ACTIVE | O |
| 4/26/2005 | 958 | 30-015-32946 | MARBOB ENERGY CORPORATION | SCBP STATE #1 | J | 2 | 18S | 27E | 2210S | 1650E | 3880 | | ACTIVE | O |
| 1/11/2008 | 959 | 30-015-35814 | MACK ENERGY CORPORATION | STATE H NO 2 | H | 2 | 18S | 27E | 2063N | 441E | 7545 | | ACTIVE | O |
| 7/9/2008 | 960 | 30-015-36343 | GEORGE A CHASE JR DBA G AND C | MALCO STATE NO. 002 | G | 31 | 17S | 28E | 1650N | 2310E | 633 | | ACTIVE | O |
| 7/3/2009 | 961 | 30-015-36978 | LIME ROCK RESOURCES A, LP | ENRON STATE NO. 015 | D | 31 | 17S | 28E | 990N | 330W | 3700 | | ACTIVE | O |
| 1/30/2009 | 962 | 30-015-36554 | LIME ROCK RESOURCES A, LP | NW STATE NO. 029 | L | 32 | 17S | 28E | 1770S | 550W | 3450 | | ACTIVE | O |
| 7/14/2009 | 963 | 30-015-36989 | LIME ROCK RESOURCES A, LP | NW STATE NO. 030 | K | 32 | 17S | 28E | 1630S | 1710W | 3405 | | NO | O |
| 7/28/2009 | 964 | 30-015-37057 | LIME ROCK RESOURCES A, LP | NW STATE NO. 031 | N | 32 | 17S | 28E | 330S | 1750W | 3500 | | NO | O |
| 8/23/2009 | 965 | 30-015-37058 | LIME ROCK RESOURCES A, LP | NW STATE NO. 032 | M | 32 | 17S | 28E | 330S | 330W | 3425 | | NO | O |

TABLE II

TABULATION OF WELLS WITHIN TE ONE-MILE AREA OF REVIEW OF THE MEWBOURNE WELL #1, CHUKKA WELL #2, AND GAINES WELL #3

| DATE Comp or Plug | ID NO | API | OPERATOR | WELL NAME | OCD UL | SECT | TOWNSHIP | RANGE | NS FTG | EW FTG | TVD DEPTH | PLUG DATE | STATUS | WELL TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *2/10/2010* | *966* | *30-015-37428* | *G&C SERVICE* | *MALCO STATE NO. 3* | *G* | *31* | *17S* | *28E* | *1980N* | *1980E* | *650* | | ACTIVE | O |
| | 967 | 30-015-38203 | COG OPERATING LLC | MAPLE STATE 008 | N | 30 | 17S | 28E | 330S | 990W | 4750 | | PERMIT | O |

## TABLE III

### Well Changes in the Combined One Mile Area of Review Since the 2009 Annual Report for Navajo's WDW-1, WDW-2, and WDW-3

| ID | API No. | Unit | Sect | Town | Range | Footages | Well Name | Operator | Changes |
|---|---|---|---|---|---|---|---|---|---|
| 4 | 30 015 00668 | G | 36 | 17S | 27E | 1650 FNL & 2310 FEL | South Red Lake II Unit #10 | Legacy Reserves Operating, LP | Change of Owner: McQuadrangle LC to Fairway Resources Operating LLC to Legacy Reserves Operating, LP |
| 27 | 30 015 01218 | N | 36 | 17S | 27E | 330 FSL & 2310 FWL | Empire Abo Unit No. 18 | BP America Production Company | P&A Well: No P&A Info; Tested Casing to 500 psi w/CIBP 5846'+35' cmt, bad casing 5552'-5560' |
| 29 | 30 015 01251 | O | 36 | 17S | 27E | 660 FSL & 1980 FEL | Empire ABO Unit No. 19 | BP America Production Company | P&A Well: Set CIBP 5600' with 25 sks cmt on top (TOC at 5360'), spot 9.5 ppg mud from 5360' to 3359', spot 50 sk cmt plug from 3359' to 2849', spot 9.5 mud from 2849' to 1172', circulated cmt from 1172' to surface.. |
| 31 | 30 015 00677 | P | 36 | 17S | 27E | 330 FSL & 990 FEL | Empire Abo Unit No. 20 | BP America Production Company | P&A Well: CIBP 5457', Spot 25 sk cmt plug 5474' to 5100', spot 9 ppg mud from 5100' to 3350', perf at 3350' inj 100 sk cmt and spot plug at 2980', perf at 1150' and circulate to surface 400 sks cmt |
| 42 | 30 015 01643 | F | 31 | 17S | 28E | 2310 FNL & 2260 FWL | Empire Abo Unit No. 022 | BP America Production Company | P&A Well: CIBP 5615' + 25 sks Class C cmt; bottom plug set from 5365'-5615'; 145 sks Class C cmt from 0-1320'; Top plug set at 297' |
| 48 | 30 015 01644 | I | 31 | 17S | 28E | 1650 FSL & 330 FEL | Empire Abo Unit No. 024A | BP America Production Company | P&A Well: CIBP 5750' + 25 sks Class C cmt ; 25 sks Class C cmt from 3370' to 1187';135 sks Class C cmt from 1187'-surface. |
| 51 | 30 015 01651 | K | 31 | 17S | 28E | 1650 FSL & 2387 FWL | Empire Abo Unit No. 022B | BP America Production Company | P&A Well: Proposal to P&A as of 9/18/2009; Extended P&A Deadline for 30 days Spot 25 sks cmt at 5310'; Cir 9.5 ppg Mud 35-40 vis; Spot cmt 3485'-3125' 25 sks; TOC at 1500'; Perf 1345' and Cir Cmt to Surface 365 sks. |
| 56 | 30 015 01646 | N | 31 | 17S | 28E | 660 FSL & 2082 FEL | Empire ABO Unit No. 22A | BP America Production Company | P&A Well: No Info Submitted Pit Closing Documents Only after P&A |
| 65 | 30 015 01657 | F | 32 | 17S | 28E | 2280 FNL & 1980 FWL | AA State No. 001 | Marbob Energy Corp. | Recomp: BP America Production Company to Marbob Energy Corp 2009.; Recomplete: Proposal to plug back and perforate, acidize, test, and possibly frac the Yeso 1 (4288'-4525'), Yeso 2 (3880'-4173'), and Yeso 3 (3523'-3715'). |
| 70 | 30 015 20043 | M | 32 | 17S | 28E | 990 FSL & 760 FWL | Northwest Artesia Unit No. 012 | Lime Rock Resources A, LP | T&A Well: Well request for 1yr for T&A extension, Change of Owner in 2008 SDX Resources Inc. to Lime Rock Resources A, LP |
| 81 | 30 015 24485 | E | 05 | 18S | 28E | 1980 FNL & 990 FWL | Illinois Camp A Com No. 001 | Conoco Phillips Company | |
| 595 | 30 015 02605 | B | 05 | 18S | 28E | 330 FNL & 2271 FEL | Empire Abo Unit No. 027E | BP America Production Company | P&A Well: CIBP set at 5700'and pump 25 sks cmt to 3760', Pump 150 sks cmt at 204'. |
| 758 | 30 015 00721 | A | 02 | 18S | 27E | 330 FNL & 990 FEL | Red Lake Unit II No 36 | Fairway Resources Operating LLC | Change of Owner: McQuadrangle LC to Fairway Resources Operating LLC to Legacy Reserves Operating LP |
| 797 | 30 015 22885 | O | 02 | 18S | 27E | 1040 FSL & 2025 FEL | Empire Abo Unit "L" | BP America Production Company | T&A Well: Extend to 9/18/2011 TD 6202' Perf 6065' - 6074' |
| 799 | 30 015 00722 | P | 02 | 18S | 27E | 660 FSL & 660 FEL | Empire Abo Unit No. 016A | BP America Production Company | P&A Well: CIBP set at 5940'. Spot 280' cmt plug on top of CIBP using 30 sks Class C. Set cmt retainer at 800' and pumped 200 sks cmt to retainer. Spot 35 sks cmt from 320' to surf. |
| 800 | 30 015 22808 | O | 02 | 18S | 27E | 600 FSL & 1330 FEL | Empire Abo Unit No. 156 | BP America Production Company | P&A Well: CIBP set at 5870' and spot 25 sks cmt from 5870'-5623'; spot 25 sks Class C cmt from 4129'-3882'; spot 25 sks Class C cmt from 3450'-3203'; spot 25 sks cmt from 1120' and tag at 920'; spot 25 sks cmt from 250' to surface. |
| 801 | 30 015 00731 | O | 02 | 18S | 27E | 660 FSL & 1980 FEL | Empire Abo Unit No. 015A | BP America Production Company | P&A Well: CIBP set at 5840'. Spot 30 sks cmt plug from 5840'-5564'. Set CIBP at 5815' and spot 80 sks cmt from 5815'-5045'. Spot 30 sks cmt from 3319'-3031'. Spot 30 sks cmt from 1040'-764'. |
| 806 | 30 015 21825 | O | 02 | 18S | 27E | 2602 FEL & 320 FSL | Empire Abo Unit "L" | BP America Production Company | T&A Well: 2 year T&A extension to 9/15/2011 |
| 807 | 30 015 22608 | N | 02 | 18S | 27E | 100 FSL & 1950 FWL | Empire Abo Unit No. 142 | BP America Production Company | P&A Well: No Info on File with New perfs in the Abo: 5927'-5930', 5938'-5956', 6123', 6130'-6140'. |
| 812 | 30 015 00730 | N | 02 | 18S | 27E | 660 FSL & 1980 FWL | Empire Abo Unit No. 14 | BP America Production Company | Production: Returned to production 5/5/10 |
| 813 | 30 015 00720 | B | 02 | 18S | 27E | 990 FNL & 1650 FEL | Riverwolf Unit No. 004 | BP America Production Company | P&A Well: CIBP set at 5590'. Spot 250' cement plug on top of CIBP using 25 sks Class C. Cement perfs at 3130' with 50 sks Class C + 2% CaCl2. Spot 300' cement plug from 1100' to 800' using 30 sks Class C + 2% CaCl2. Fill 5 1/2" casing from 250' to surface using 25 sks Class C + 2% CaCl2. |
| 918 | 30 015 30893 | A | 31 | 17S | 28E | 973 FNL & 959 FEL | NW State No. 028 | Lime Rock Resources A, LP | Change of Owner: SDX Resources Inc. to Lime Rock Resources A, LP |
| 921 | 30 015 30849 | I | 31 | 17S | 28E | 2310 FSL & 270 FEL | NW State No. 009 | Lime Rock Resources A, LP | Change of Owner: SDX Resources Inc. to Lime Rock Resources A, LP |
| 925 | 30 015 30777 | L | 32 | 17S | 28E | 2310 FSL & 990 FWL | NW State No. 006 | Lime Rock Resources A, LP | Change of Owner: SDX Resources Inc. to Lime Rock Resources A, LP |

## TABLE III

### Well Changes in the Combined One Mile Area of Review Since the 2009 Annual Report for Navajo's WDW-1, WDW-2, and WDW-3

| ID | API No. | Unit | Sect | Town | Range | Footages | Well Name | Operator | Changes |
|---|---|---|---|---|---|---|---|---|---|
| **957** | 30 015 36116 | G | 36 | 17S | 27E | 2305 FNL & 1650 FEL | South Red Lake II Unit No 57 | Legacy Reserves Operating, LP | Change of Owner: Fairway Resources Operating, LLC to Legacy Reserves Operating, LP; TD 2081' Well completed in the Queen, Grayburg, San Andres from 1535' to 1805', 32 perforations |
| **961** | 30 015 36978 | D | 31 | 17S | 28E | 990 FNL & 330 FWL | Enron State No. 015 | Lime Rock Resources A, LP | NEW: 3700' in the Glorietta-Yeso; Perforated at 3285'-3524' with 74 holes; TD 3683' |
| **962** | 30 015 36554 | L | 32 | 17S | 28E | 1770 FSL & 550 FWL | NW State No. 029 | Lime Rock Resources A, LP | Recomp: 3450'. Well completed in the San Andres from 2453'-2719', 54 perforations and 2788'-3102', 63 perforations. |
| **963** | 30 015 36989 | K | 32 | 17S | 28E | 1630 FSL & 1710 FWL | NW State No. 030 | Lime Rock Resources A, LP | NEW: 3405'. Well not completed yet. |
| **964** | 30 015 37057 | N | 32 | 17S | 28E | 330 FSL & 1750 FWL | NW State No. 031 | Lime Rock Resources A, LP | NEW: TD at 3489'. Completed in the San Andres 2546'-2934', 72 perforations. |

## TABLE IV
## Wells that have been Plugged and Abandoned since the 2009 Annual Report
## Well Changes in the Combined One Mile Area of Review for Navajo's WDW-1, WDW-2, and WDW-3

| ID | API No. | Unit | Sect | Town | Range | Footages | Well Name | Operator | Changes |
|---|---|---|---|---|---|---|---|---|---|
| 27 | 30 015 01218 | N | 36 | 17S | 27E | 330 FSL & 2310 FWL | Empire Abo Unit No. 18 | BP America Production Company | P&A Well: No P&A Info; Tested Casing to 500 psi w/CIBP 5846'+35' cmt, bad casing 5552'-5560' |
| 29 | 30 015 01251 | O | 36 | 17S | 27E | 660 FSL & 1980 FEL | Empire ABO Unit No. 19 | BP America Production Company | P&A Well: Set CIBP 5600' with 25 sks cmt on top (TOC at 5360'), spot 9.5 ppg mud from 5360' to 3359', spot 50 sk cmt plug from 3359' to 2849', spot 9.5 mud from 2849' to 1172', circulated cmt from 1172' to surface.. |
| 31 | 30 015 00677 | P | 36 | 17S | 27E | 330 FSL & 990 FEL | Empire Abo Unit No. 20 | BP America Production Company | P&A Well: CIBP 5457', Spot 25 sk cmt plug 5474' to 5100', spot 9 ppg mud from 5100' to 3350', perf at 3350' inj 100 sk cmt and spot plug at 2980', perf at 1150' and circulate to surface 400 sks cmt |
| 42 | 30 015 01643 | F | 31 | 17S | 28E | 2310 FNL & 2260 FWL | Empire Abo Unit No. 022 | BP America Production Company | P&A Well: CIBP 5615' + 25 sks Class C cmt; bottom plug set from 5365'-5615'; 145 sks Class C cmt from 0-1320'; Top plug set at 297' |
| 48 | 30 015 01644 | I | 31 | 17S | 28E | 1650 FSL & 330 FEL | Empire Abo Unit No. 024A | BP America Production Company | P&A Well: CIBP 5750' + 25 sks Class C cmt ; 25 sks Class C cmt from 3370' to 1187';135 sks Class C cmt from 1187'-surface. |
| 51 | 30 015 01651 | K | 31 | 17S | 28E | 1650 FSL & 2387 FWL | Empire Abo Unit No. 022B | BP America Production Company | P&A Well: Proposal to P&A as of 9/18/2009; Extended P&A Deadline for 30 days Spot 25 sks cmt at 5310'; Cir 9.5 ppg Mud 35-40 vis; Spot cmt 3485'-3125' 25 sks; TOC at 1500'; Perf 1345' and Cir Cmt to Surface 365 sks. |
| 56 | 30 015 01646 | N | 31 | 17S | 28E | 660 FSL & 2082 FEL | Empire ABO Unit No. 22A | BP America Production Company | P&A Well: No Info Submitted Pit Closing Documents Only after P&A |
| 595 | 30 015 02605 | B | 05 | 18S | 28E | 330 FNL & 2271 FEL | Empire Abo Unit No. 027E | BP America Production Company | P&A Well: CIBP set at 5700'and pump 25 sks cmt to 3760', Pump 150 sks cmt at 204'. |
| 799 | 30 015 00722 | P | 02 | 18S | 27E | 660 FSL & 660 FEL | Empire Abo Unit No. 016A | BP America Production Company | P&A Well: CIBP set at 5940'. Spot 280' cmt plug on top of CIBP using 30 sks Class C. Set cmt retainer at 800' and pumped 200 sks cmt to retainer. Spot 35 sks cmt from 320' to surf. |
| 800 | 30 015 22808 | O | 02 | 18S | 27E | 600 FSL & 1330 FEL | Empire Abo Unit No. 156 | BP America Production Company | P&A Well: CIBP set at 5870' and spot 25 sks cmt from 5870'-5623'; spot 25 sks Class C cmt from 4129'-3882'; spot 25 sks Class C cmt from 3450'-3203'; spot 25 sks cmt from 1120' and tag at 920'; spot 25 sks cmt from 250' to surface. |
| 801 | 30 015 00731 | O | 02 | 18S | 27E | 660 FSL & 1980 FEL | Empire Abo Unit No. 015A | BP America Production Company | P&A Well: CIBP set at 5840'. Spot 30 sks cmt plug from 5840'-5564'. Set CIBP at 5815' and spot 80 sks cmt from 5815'-5045'. Spot 30 sks cmt from 3319'-3031'. Spot 30 sks cmt from 1040'-764'. |
| 807 | 30 015 22608 | N | 02 | 18S | 27E | 100 FSL & 1950 FWL | Empire Abo Unit No. 142 | BP America Production Company | P&A Well: No Info on File with New perfs in the Abo: 5927'-5930', 5938'-5956', 6123', 6130'-6140'. |
| 813 | 30 015 00720 | B | 02 | 18S | 27E | 990 FNL & 1650 FEL | Riverwolf Unit No. 004 | BP America Production Company | P&A Well: CIBP set at 5590'. Spot 250' cement plug on top of CIBP using 25 sks Class C. Cement perfs at 3130' with 50 sks Class C + 2% CaCl2. Spot 300' cement plug from 1100' to 800' using 30 sks Class C + 2% CaCl2. Fill 5 1/2" casing from 250' to surface using 25 sks Class C + 2% CaCl2. |

## TABLE V
## Wells that have been Temporally Abandoned since the 2009 Annual Report
## Well Changes in the Combined One Mile Area of Review for Navajo's WDW-1, WDW-2, and WDW-3

| ID | API No. | Unit | Sect | Town | Range | Footages | Well Name | Operator | Changes |
|---|---|---|---|---|---|---|---|---|---|
| **70** | 30 015 20043 | M | 32 | 17S | 28E | 990 FSL & 760 FWL | Northwest Artesia Unit No. 012 | Lime Rock Resources A, LP | T&A Well: Well request for 1yr for T&A extension, Change of Owner in 2008 SDX Resources Inc. to Lime Rock Resources A, LP |
| **797** | 30 015 22885 | O | 02 | 18S | 27E | 1040 FSL & 2025 FEL | Empire Abo Unit "L" | BP America Production Company | T&A Well: Extend to 9/18/2011 TD 6202' Perf 6065' - 6074' |
| **806** | 30 015 21825 | O | 02 | 18S | 27E | 2602 FEL & 320 FSL | Empire Abo Unit "L" | BP America Production Company | T&A Well: 2 year T&A extension to 9/15/2011 |

## TABLE VI
## Wells that have been put back into Production Since the 2009 Annual Report
## Well Changes in the Combined One Mile Area of Review for Navajo's WDW-1, WDW-2, and WDW-3

| ID | API No. | Unit | Sect | Town | Range | Footages | Well Name | Operator | Changes |
|---|---|---|---|---|---|---|---|---|---|
| 812 | 30 015 00730 | N | 02 | 18S | 27E | 660 FSL & 1980 FWL | Empire Abo Unit No. 14 | BP America Production Company | Production: Returned to production 5/5/10 |

## TABLE VII
## Wells that have been Recompleted in Upper Zones since the 2009 Annual Report
## Well Changes in the Combined One Mile Area of Review for Navajo's WDW-1, WDW-2, and WDW-3

| ID | API No. | Unit | Sect | Town | Range | Footages | Well Name | Operator | Changes |
|---|---|---|---|---|---|---|---|---|---|
| 65 | 30 015 01657 | F | 32 | 17S | 28E | 2280 FNL & 1980 FWL | AA State No. 001 | Marbob Energy Corp. | Recomp: BP America Production Company to Marbob Energy Corp 2009.; Recomplete: Proposal to plug back and perforate, acidize, test, and possibly frac the Yeso 1 (4288'-4525'), Yeso 2 (3880'-4173'), and Yeso 3 (3523'-3715'). |
| 957 | 30 015 36116 | G | 36 | 17S | 27E | 2305 FNL & 1650 FEL | South Red Lake II Unit No 57 | Legacy Reserves Operating, LP | Change of Owner: Fairway Resources Operating, LLC to Legacy Reserves Operating, LP; TD 2081' Well completed in the Queen, Grayburg, San Andres from 1535' to 1805', 32 perforations |
| 962 | 30 015 36554 | L | 32 | 17S | 28E | 1770 FSL & 550 FWL | NW State No. 029 | Lime Rock Resources A, LP | Recomp: 3450'. Well completed in the San Andres from 2453'-2719', 54 perforations and 2788'-3102', 63 perforations. |

## TABLE VIII
## Newly Drilled Wells in the Area of Review since the 2009 Annual Report
## Well Changes in the Combined One Mile Area of Review for Navajo's WDW-1, WDW-2, and WDW-3

| ID | API No. | Unit | Sect | Town | Range | Footages | Well Name | Operator | Changes |
|---|---|---|---|---|---|---|---|---|---|
| 961 | 30 015 36978 | D | 31 | 17S | 28E | 990 FNL & 330 FWL | Enron State No. 015 | Lime Rock Resources A, LP | NEW: 3700' in the Glorietta-Yeso; Perforated at 3285'-3524' with 74 holes; TD 3683' |
| 963 | 30 015 36989 | K | 32 | 17S | 28E | 1630 FSL & 1710 FWL | NW State No. 030 | Lime Rock Resources A, LP | NEW: 3405'. Well not completed yet. |
| 964 | 30 015 37057 | N | 32 | 17S | 28E | 330 FSL & 1750 FWL | NW State No. 031 | Lime Rock Resources A, LP | NEW: TD at 3489'. Completed in the San Andres 2546'-2934', 72 perforations. |
| 965 | 30 015 37058 | M | 32 | 17S | 28E | 330 FSL & 330 FWL | NW State No. 032 | Lime Rock Resources A, LP | NEW: TD at 3408'. Completed in the San Andres 2572'-2741', 72 perforations. |
| 966 | 30 015 37428 | G | 31 | 17S | 28E | 1980 FNL & 1980 FWL | Malco State No. 3 | G and C Service | NEW: TD at 650'. Completed in Yates Seven Rivers with Open Hole |
| | 30 015 36281 | J | 01 | 18S | 27E | 2193 FSL & 1520 FEL | Sun Devils Federal No. 001 | Mack Energy Corporation | Permit to Drill - 6000' TVD |

## TABLE IX

## FIGURES INCLUDED IN THE REPORT

| Figure | Description | OCD Reference |
|---|---|---|
| 1 | Mewbourne Well #1 Schematic | Section VI.1 and IX.3 |
| 2 | Plot of Bottom Hole Pressure and Temperature Data Chukka Well #2 | n/a |
| 3 | Gaines Well #3 Schematic | n/a |
| 4 | Chukka Well #2 Schematic | n/a |
| 5 | Plot of Bottom Hole Pressure and Temperature Data Gaines Well #3 | n/a |
| 6 | Midland Map of One Mile Area of Review | n/a |
| 7 | Mewbourne Well #1 Wellhead Schematic | Section IX.14 |
| 8 | Diagram of Valve Locations for Shut-in on Mewbourne Well #1 | Section IX.14 |
| 9 | Mewbourne Well #1 Test Overview | Section IX.18.f |
| 10 | Mewbourne Well #1 Cartesian Plot of Bottom-Hole Pressure and Temperature vs. Time | Section IX.18.a |
| 11 | Mewbourne Well #1 Cartesian Plot of Injection Rate vs. Time | Section IX.18.b |
| 12 | Mewbourne Well #1 Cartesian Plot of Surface Pressure and Injection Rates vs. Time | Section IX.18.e |
| 13 | Historical Surface Pressure and Injection Rates vs. Calendar Time | Section IX.18.g |

**TABLE IX (cont.)**

| Figure | Description | OCD Reference |
|---|---|---|
| 14 | Mewbourne Well #1 Derivative Log-Log Plot | Section IX.18.c |
| 15 | Mewbourne Well #1 Superposition Horner (Semi-Log) Plot | Section IX.18.d |
| 16 | Mewbourne Well #1 Expanded Superposition Horner (Semi-Log) Plot | Section IX.18.d |
| 17 | Mewbourne Well #1 Hall Plot | Section IX.18.h |
| 18 | Mewbourne Well #1 Static Pressure Gradient Survey | n/a |

# TABLE X

## Comparison of Permeability, Transmissibility, Skin, False Extrapolated Pressure, and Fill Depth

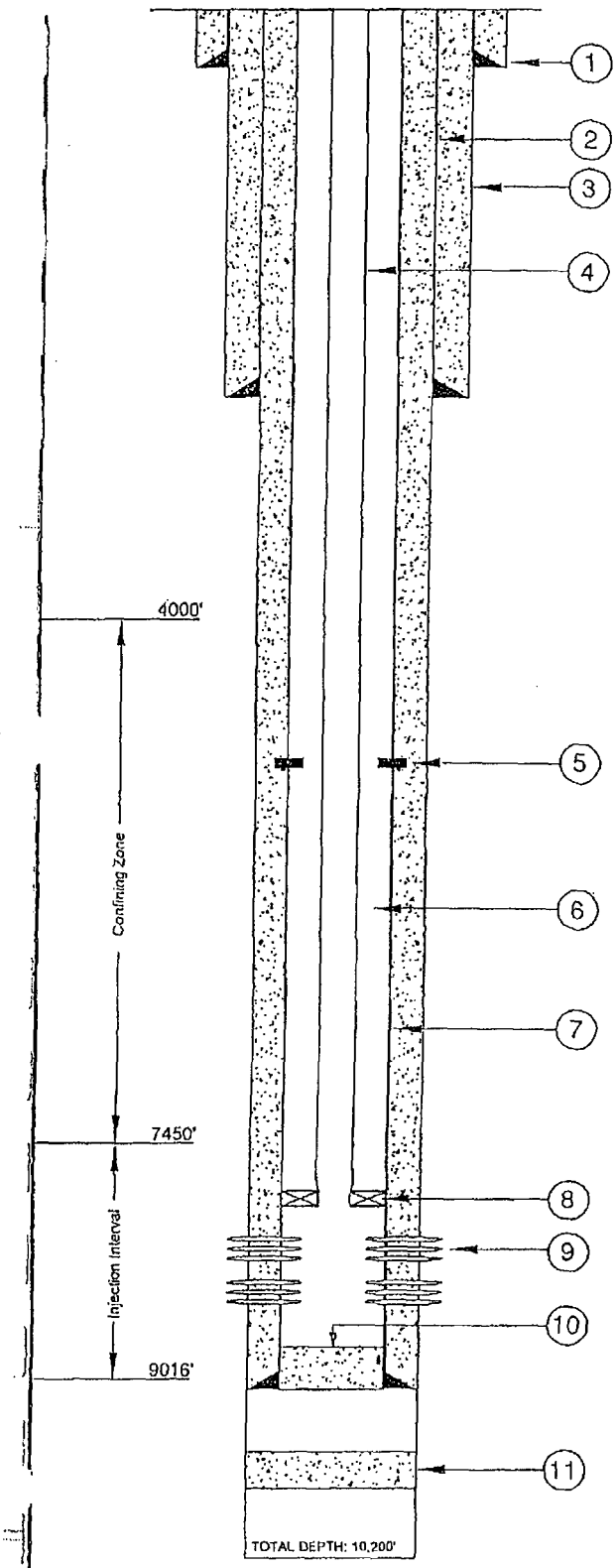
| Date of Test | Permeability (k) | Transmissibility (kh/u) | Skin (s) | False Extrapolated Pressure (p*) | Fill Depth |
|---|---|---|---|---|---|
| December 16-21, 2010 | 521 md | 159,979 md-ft/cp | 92.7 | 3716.9 psia | 9,001 feet |
| October 26-29, 2009 | 883 md | 271,155 md-ft/cp | 77 | 3,591.62 psia | 9,001 feet |
| April 3-4, 2008 | 1,592 md | 488,655 md-ft/cp | 262 | 3,527.37 psia | N/A |
| Permit Parameters | 250 md | 40,094 md-ft-cp | 0 | N/A | N/A |

## TABLE XI

## NAVAJO REFINING COMPANY
## STATIC PRESSURE GRADIENT SURVEY – MEWBOURNE WELL #1
## DECEMBER 21, 2010

| Depth (ft) | Pressure (psia) | Pressure Gradient (psi/ft) | Temperature (°F) |
|---|---|---|---|
| 7924 | 3722.48 | | 94.88 |
| 7000 | 3322.23 | 0.433 | 102.55 |
| 6000 | 2887.59 | 0.435 | 99.53 |
| 5000 | 2453.29 | 0.434 | 95.14 |
| 4000 | 2018.61 | 0.435 | 91.11 |
| 3000 | 1583.90 | 0.435 | 87.62 |
| 2000 | 1150.43 | 0.434 | 84.09 |
| 1000 | 716.79 | 0.434 | 80.40 |
| 0 | 275.49 | 0.441 | 67.80 |

# 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: |

FIGURE 1

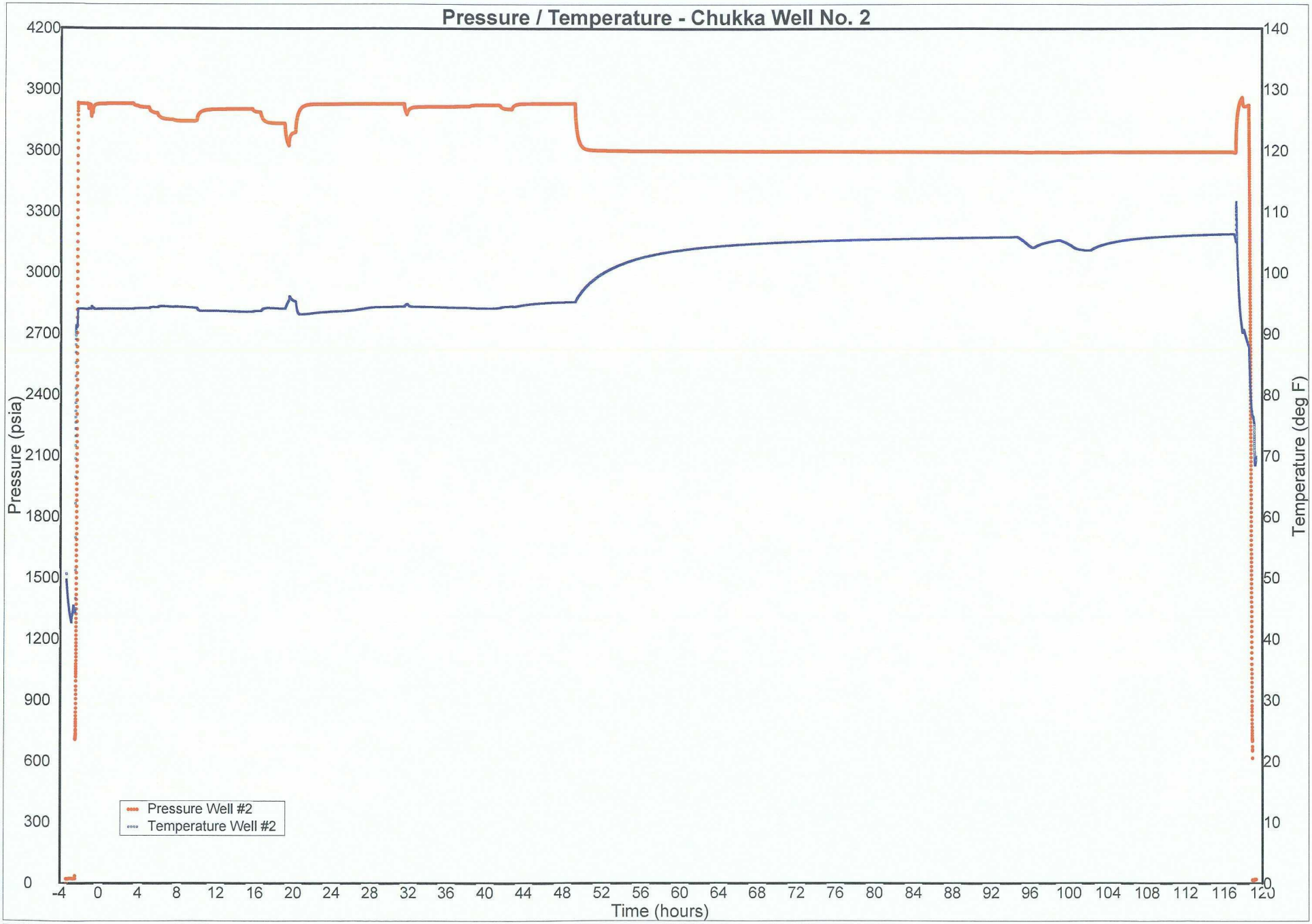

Pressure / Temperature - Chukka Well No. 2
Pressure (psia)
Temperature (deg F)
Time (hours)
Pressure Well #2
Temperature Well #2
4200
3900
3600
3300
3000
2700
2400
2100
1800
1500
1200
900
600
300
0
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-4 0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120

FIGURE 2

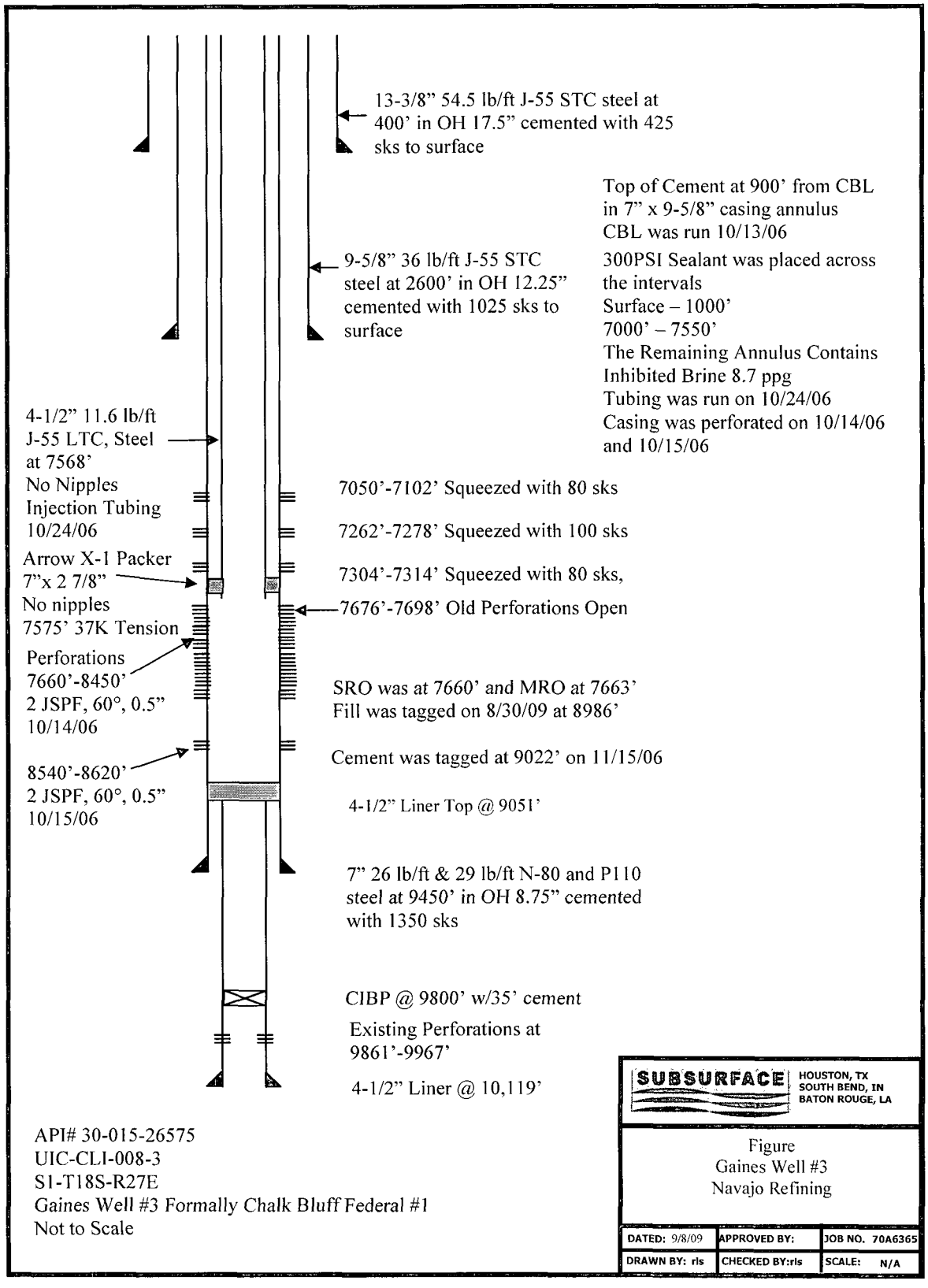
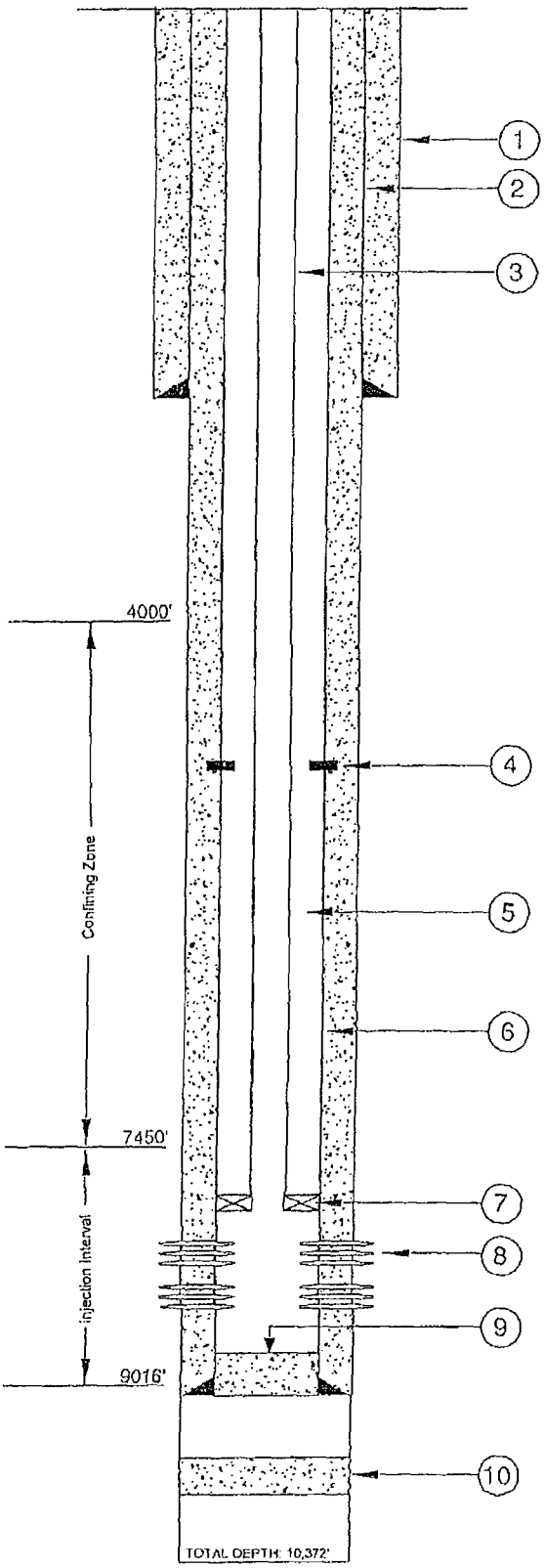

13-3/8" 54.5 lb/ft J-55 STC steel at 400' in OH 17.5" cemented with 425 sks to surface
Top of Cement at 900' from CBL in 7" x 9-5/8" casing annulus CBL was run 10/13/06
9-5/8" 36 lb/ft J-55 STC steel at 2600' in OH 12.25" cemented with 1025 sks to surface
300PSI Sealant was placed across the intervals
Surface – 1000'
7000' – 7550'
The Remaining Annulus Contains Inhibited Brine 8.7 ppg
Tubing was run on 10/24/06
Casing was perforated on 10/14/06 and 10/15/06
4-1/2" 11.6 lb/ft J-55 LTC, Steel at 7568'
No Nipples
Injection Tubing 10/24/06
7050'-7102' Squeezed with 80 sks
7262'-7278' Squeezed with 100 sks
Arrow X-1 Packer 7"x 2 7/8"
7304'-7314' Squeezed with 80 sks,
No nipples
7575' 37K Tension
7676'-7698' Old Perforations Open
Perforations 7660'-8450' 2 JSPF, 60°, 0.5" 10/14/06
SRO was at 7660' and MRO at 7663'
Fill was tagged on 8/30/09 at 8986'
Cement was tagged at 9022' on 11/15/06
8540'-8620' 2 JSPF, 60°, 0.5" 10/15/06
4-1/2" Liner Top @ 9051'
7" 26 lb/ft & 29 lb/ft N-80 and P110 steel at 9450' in OH 8.75" cemented with 1350 sks
CIBP @ 9800' w/35' cement
Existing Perforations at 9861'-9967'
4-1/2" Liner @ 10,119'
API# 30-015-26575
UIC-CLI-008-3
S1-T18S-R27E
Gaines Well #3 Formally Chalk Bluff Federal #1
Not to Scale
SUBSURFACE
HOUSTON, TX
SOUTH BEND, IN
BATON ROUGE, LA
Figure
Gaines Well #3
Navajo Refining
DATED: 9/8/09
APPROVED BY:
JOB NO. 70A6365
DRAWN BY: rls
CHECKED BY:rls
SCALE: N/A

FIGURE 3




## 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: 7005256 |
| DRAWN BY: WOL | APPROVED BY: | DWG. NO: |

FIGURE 4

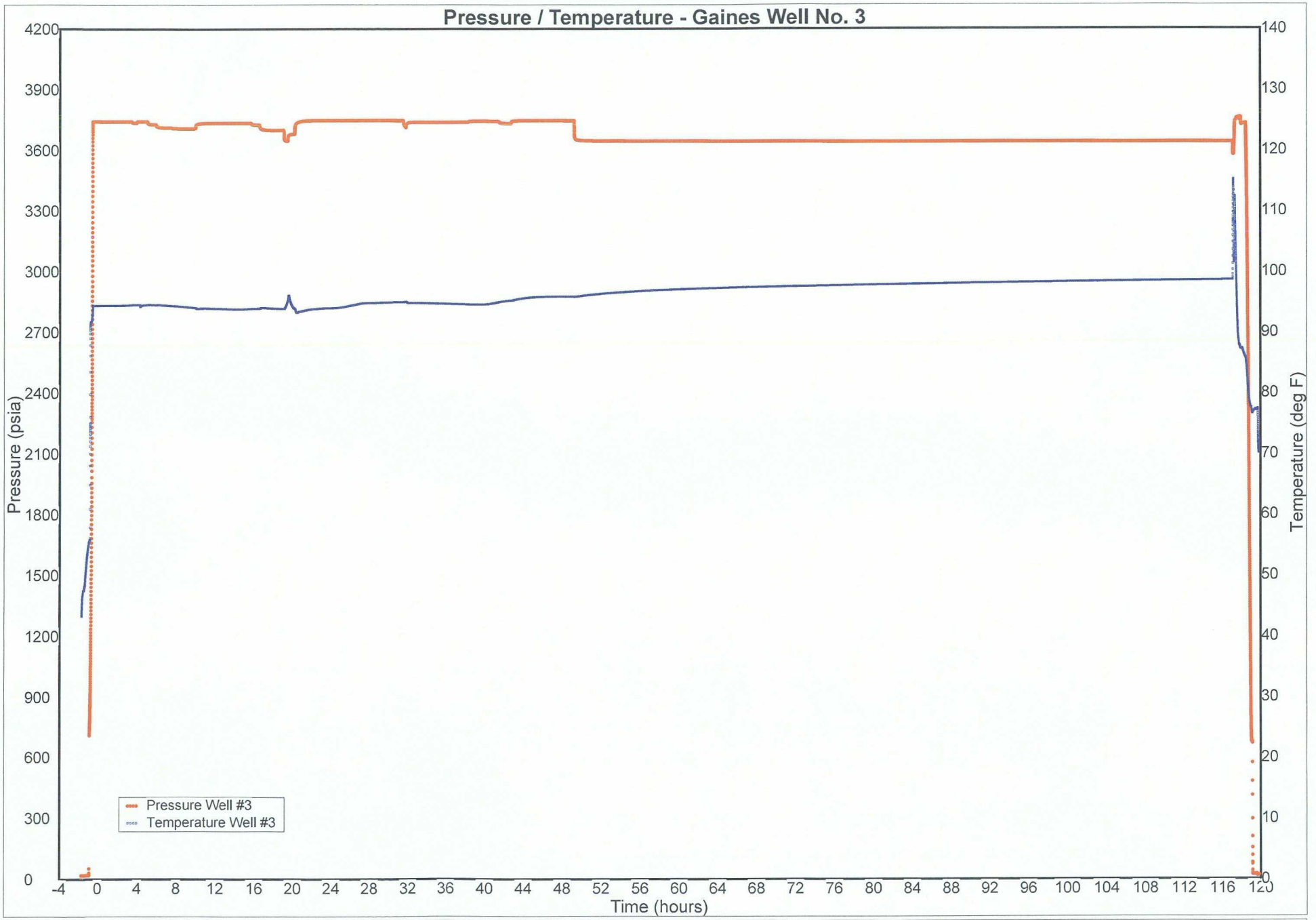

Pressure / Temperature - Gaines Well No. 3
Pressure (psia)
Temperature (deg F)
Time (hours)
Pressure Well #3
Temperature Well #3
4200
3900
3600
3300
3000
2700
2400
2100
1800
1500
1200
900
600
300
0
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-4 0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120

FIGURE 5

# SUBSURFACE TECHNOLOGY

FIGURE 7

WELL: NAVAJO REFINING MEWBOURNE WELL NO. 1

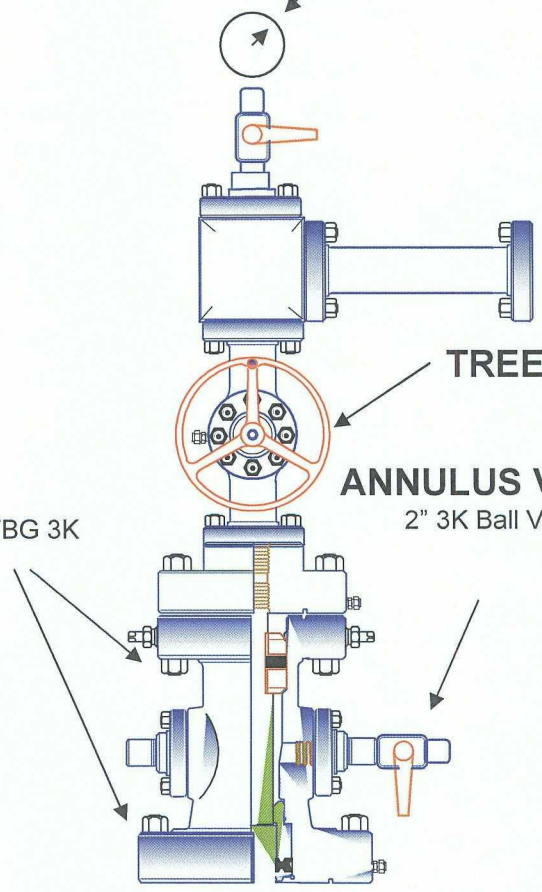
**TOP CONNECTION**
2-3/8" 8rd x 4-1/16" 3K
2" x 2-3/8" Ball Valve
2-3/8" Bull Plug 1/2" NPT
5000 LB Pressure Guage

**UPPER TREE ASSEMBLY**
A5PP,4-1/2" 3K X 4-1/16" 3K

**TREE GATE VALVE**
4-1/16" 3K

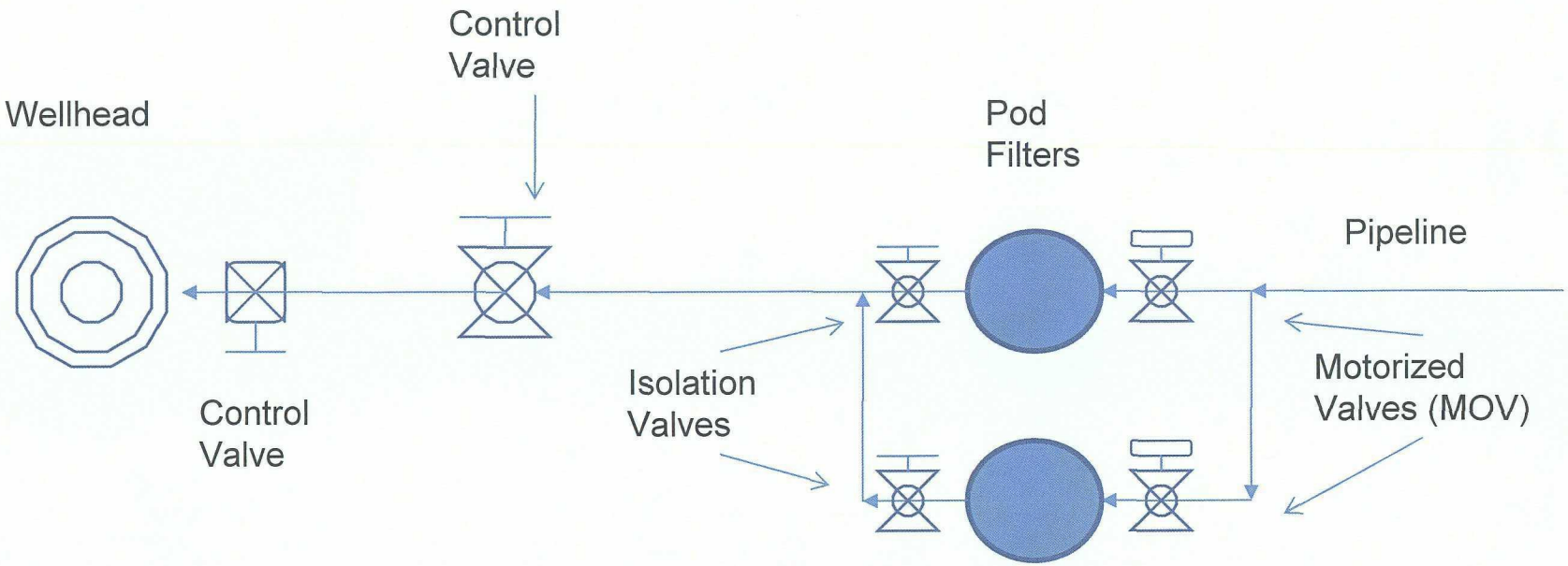
**ANNULUS VALVE**
2" 3K Ball Valve

**FLANGE**
7-1/16", 3-1/2" 3K X 4-1/16" UPTBG 3K



SUPERIOR WELLHEAD

FIGURE 8
Mewbourne Well No. 1
Diagram of Shut-in Valve Control




At Shut-in
- Close MOV
- Close Control Valve
- Close Isolation Valves
- Close Control Valve
- Drain POD Filters

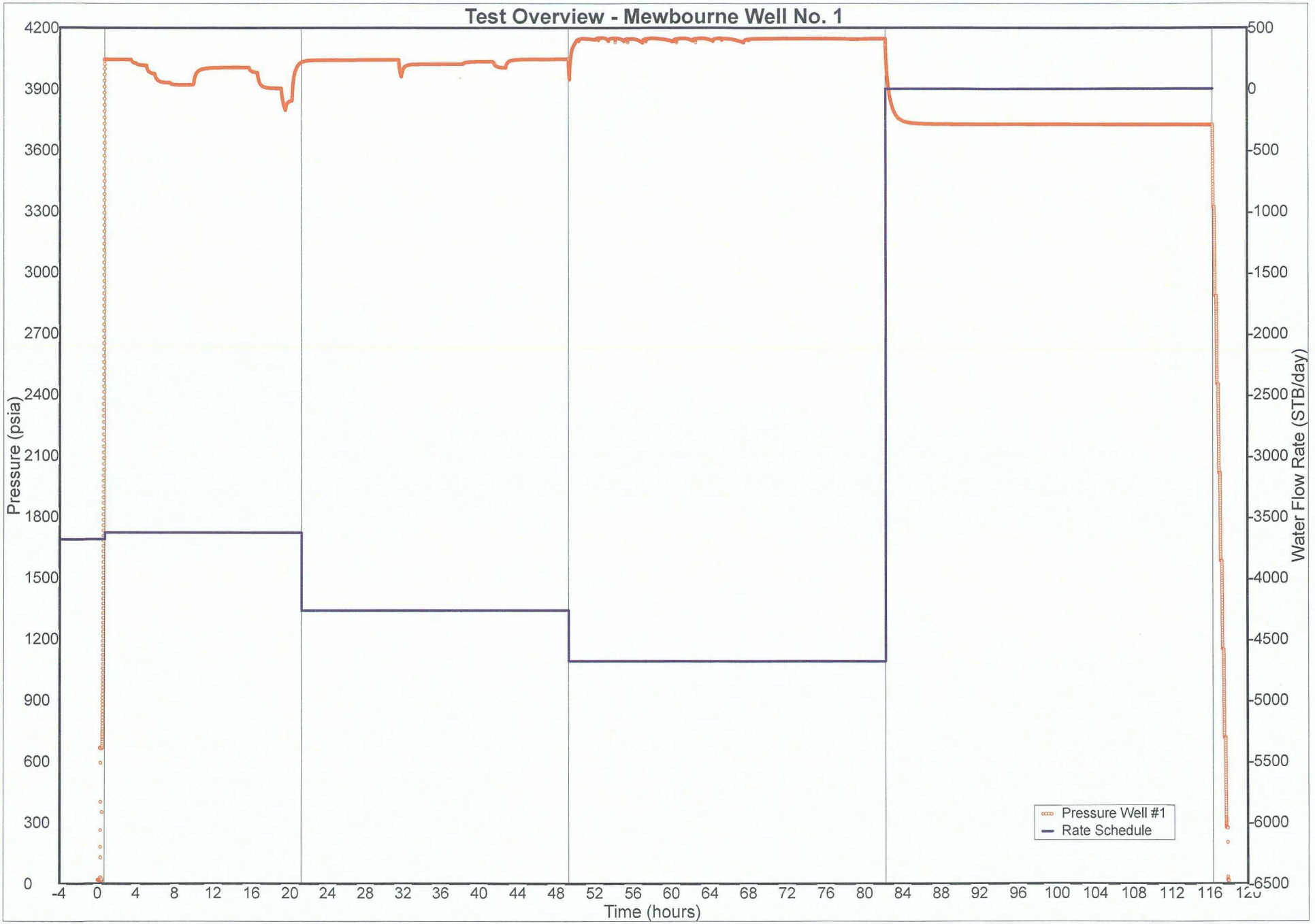

Test Overview - Mewbourne Well No. 1
Pressure (psia)
Water Flow Rate (STB/day)
Time (hours)
Pressure Well #1
Rate Schedule
4200
3900
3600
3300
3000
2700
2400
2100
1800
1500
1200
900
600
300
0
500
0
-500
-1000
-1500
-2000
-2500
-3000
-3500
-4000
-4500
-5000
-5500
-6000
-6500
-4 0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116

FIGURE 9

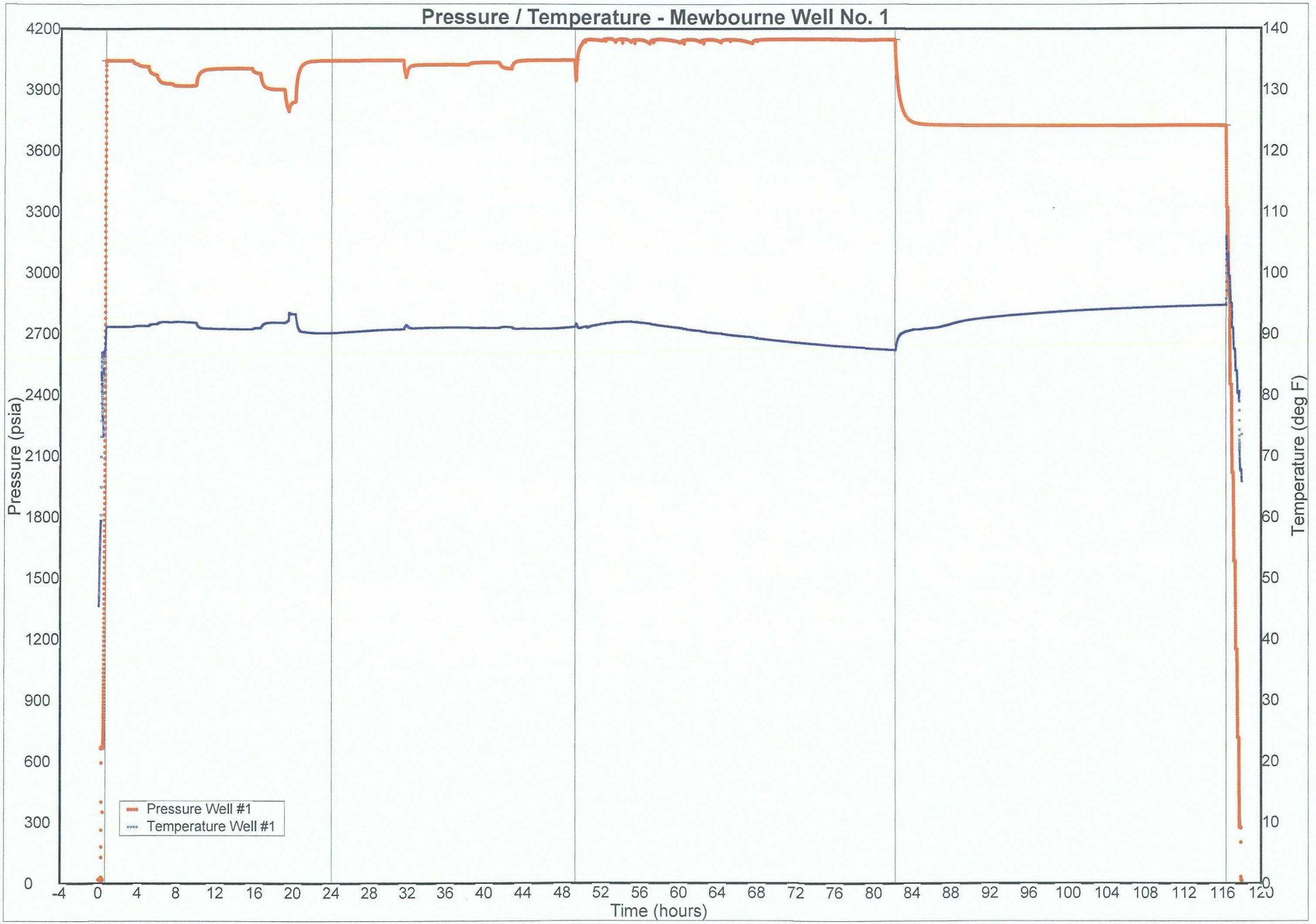

Pressure / Temperature - Mewbourne Well No. 1
Pressure (psia)
Temperature (deg F)
Time (hours)
Pressure Well #1
Temperature Well #1
4200
3900
3600
3300
3000
2700
2400
2100
1800
1500
1200
900
600
300
0
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
-4 0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116 120

FIGURE 10

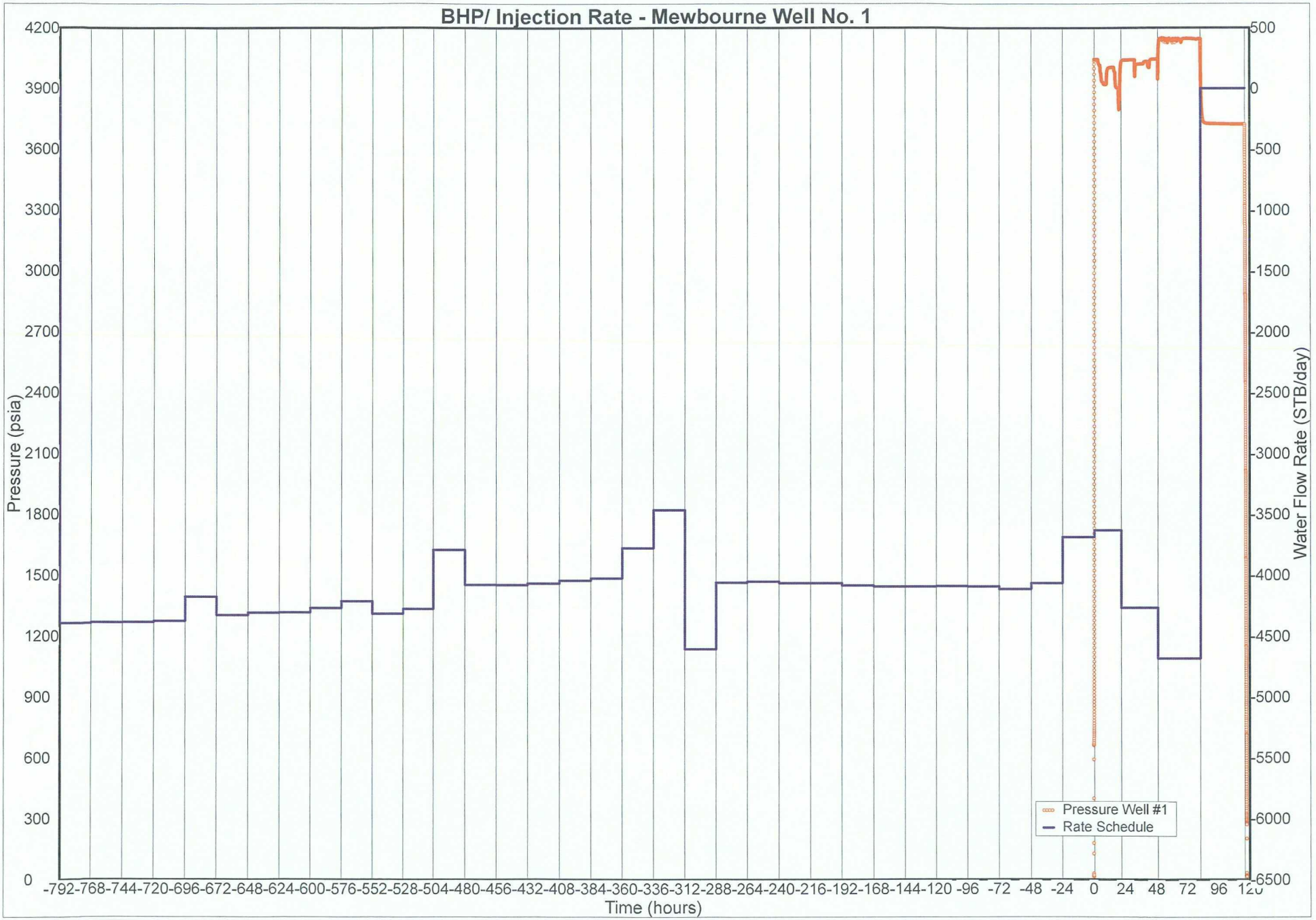

BHP/ Injection Rate - Mewbourne Well No. 1
Pressure (psia)
Water Flow Rate (STB/day)
Time (hours)
Pressure Well #1
Rate Schedule
4200
3900
3600
3300
3000
2700
2400
2100
1800
1500
1200
900
600
300
0
500
0
-500
-1000
-1500
-2000
-2500
-3000
-3500
-4000
-4500
-5000
-5500
-6000
-6500
-792 -768 -744 -720 -696 -672 -648 -624 -600 -576 -552 -528 -504 -480 -456 -432 -408 -384 -360 -336 -312 -288 -264 -240 -216 -192 -168 -144 -120 -96 -72 -48 -24 0 24 48 72 96 120

FIGURE 11

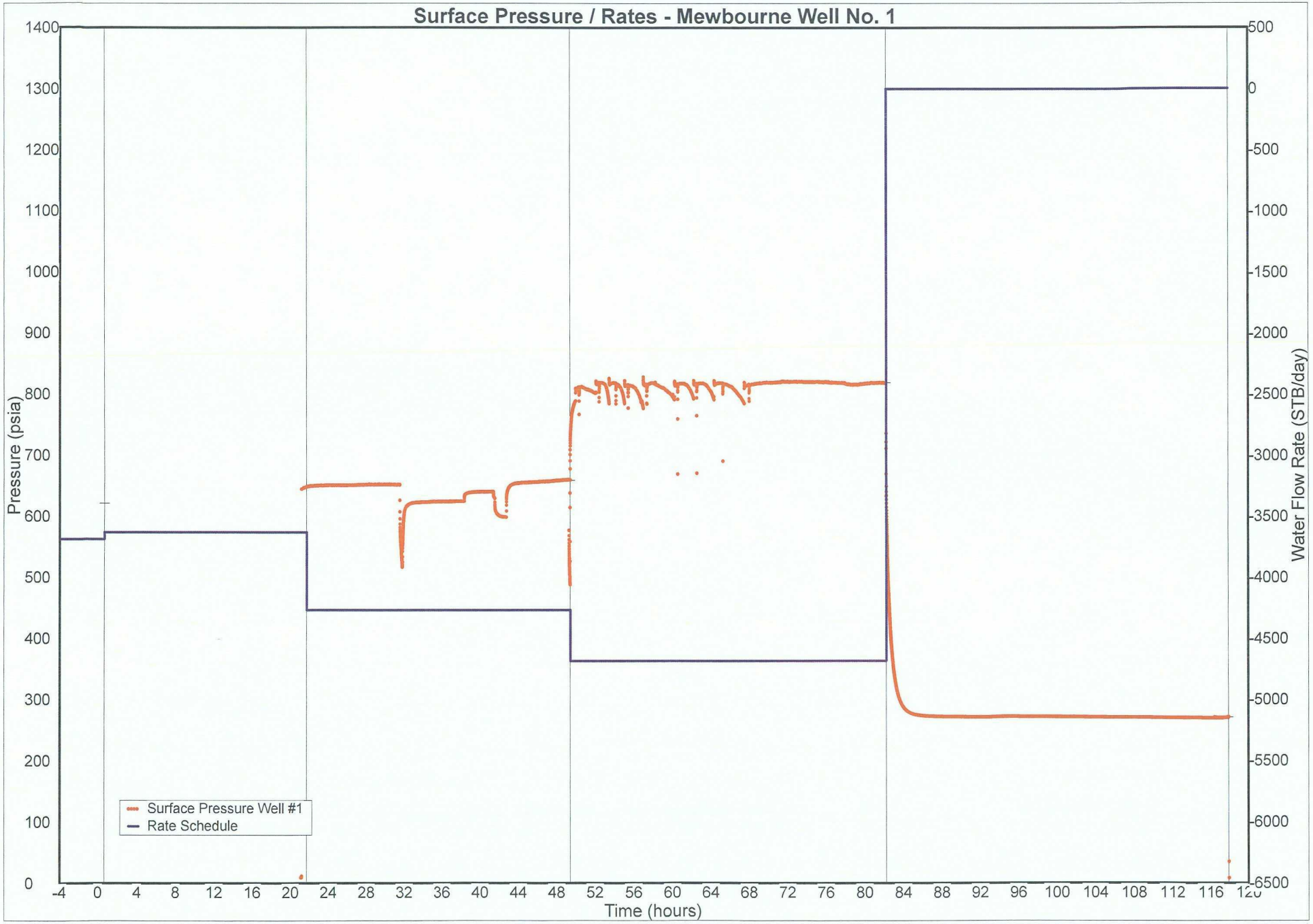

Surface Pressure / Rates - Mewbourne Well No. 1
Pressure (psia)
Water Flow Rate (STB/day)
Time (hours)
Surface Pressure Well #1
Rate Schedule
1400
1300
1200
1100
1000
900
800
700
600
500
400
300
200
100
0
500
0
-500
-1000
-1500
-2000
-2500
-3000
-3500
-4000
-4500
-5000
-5500
-6000
-6500
-4 0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96 100 104 108 112 116

FIGURE 12

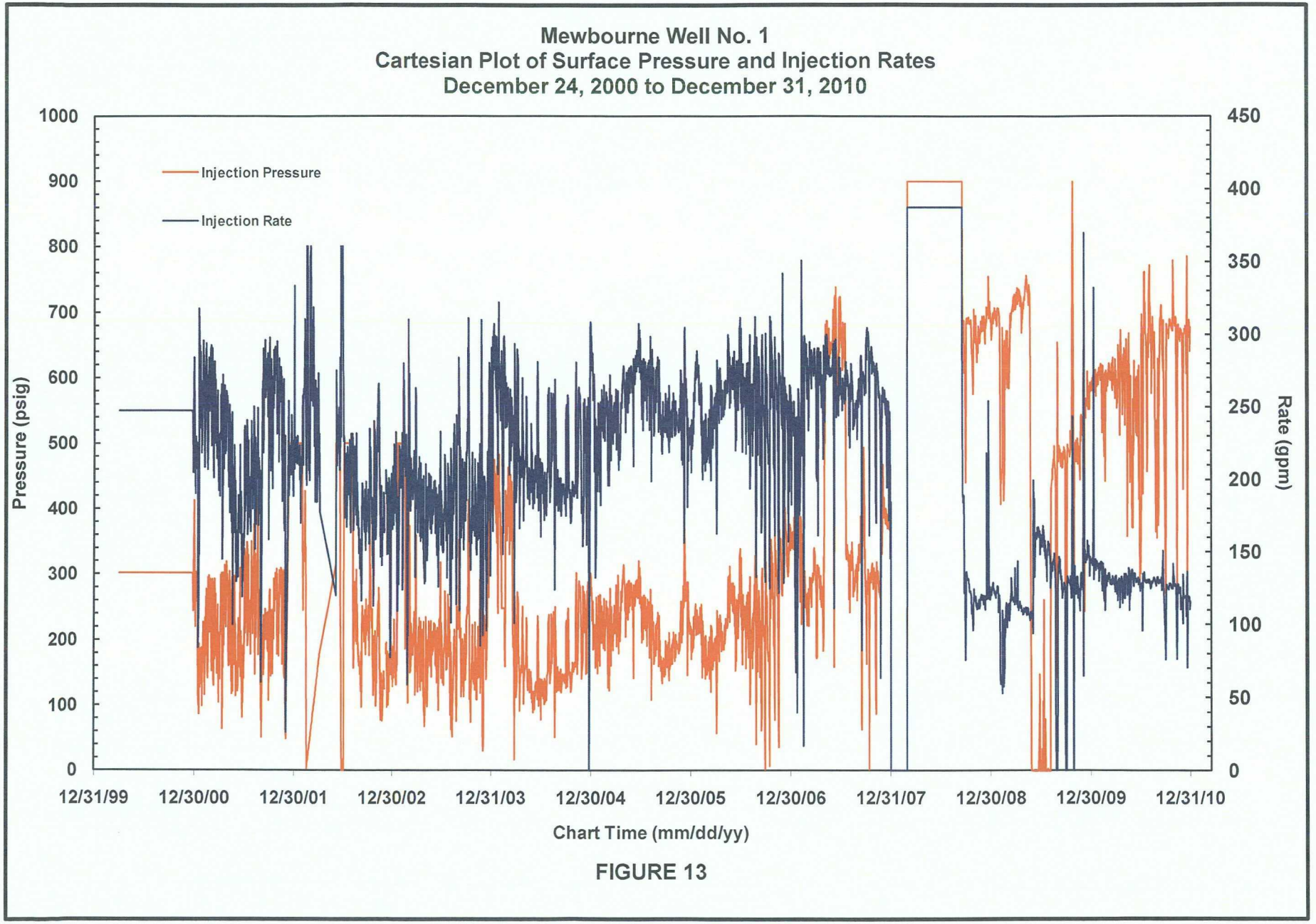

Mewbourne Well No. 1
Cartesian Plot of Surface Pressure and Injection Rates
December 24, 2000 to December 31, 2010
Injection Pressure
Injection Rate
Pressure (psig)
Rate (gpm)
1000
900
800
700
600
500
400
300
200
100
0
450
400
350
300
250
200
150
100
50
0
12/31/99
12/30/00
12/30/01
12/30/02
12/31/03
12/30/04
12/30/05
12/30/06
12/31/07
12/30/08
12/30/09
12/31/10
Chart Time (mm/dd/yy)

FIGURE 13

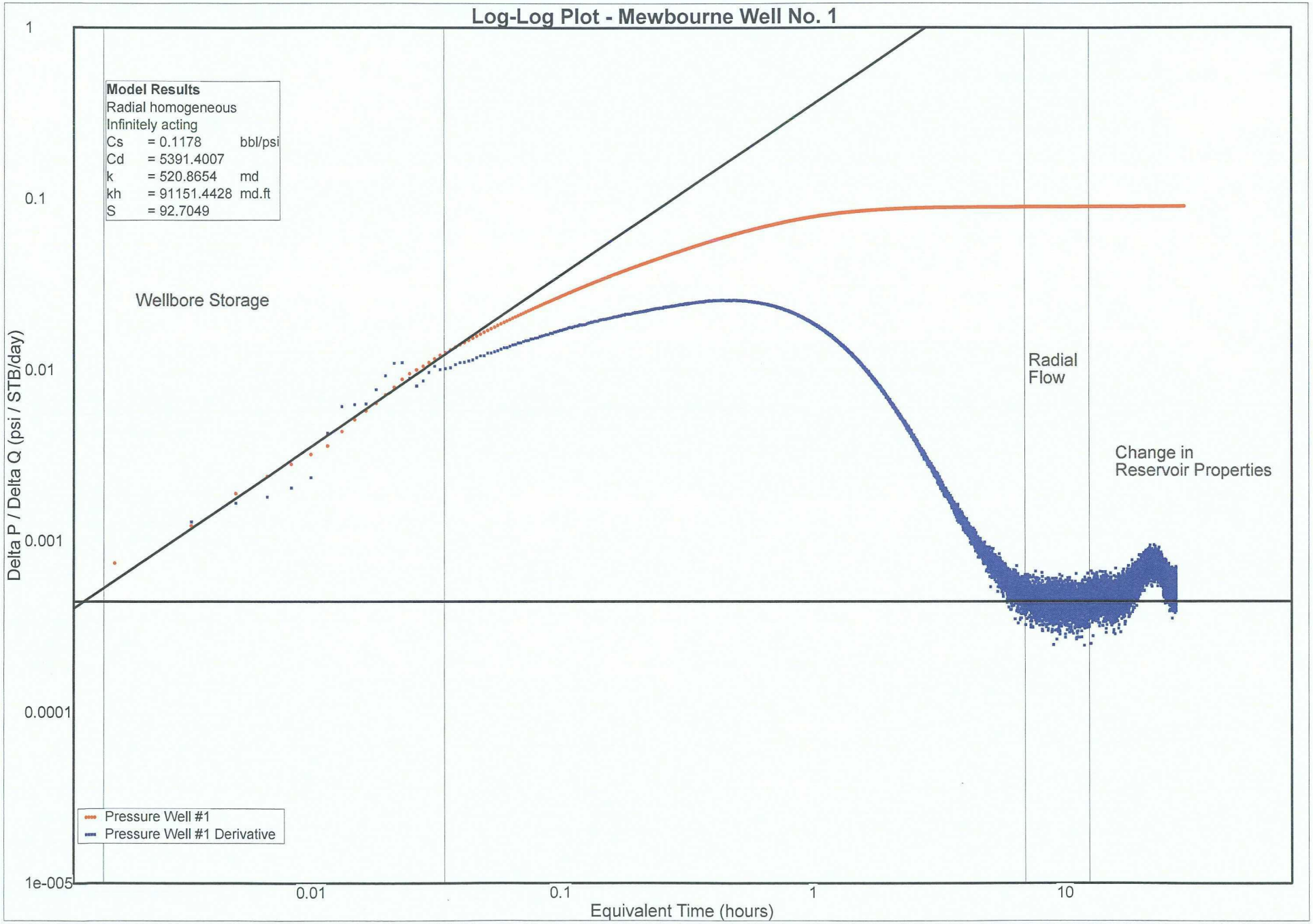

Log-Log Plot - Mewbourne Well No. 1
Model Results
Radial homogeneous
Infinitely acting
Cs = 0.1178 bbl/psi
Cd = 5391.4007
k = 520.8654 md
kh = 91151.4428 md.ft
S = 92.7049
Wellbore Storage
Radial Flow
Change in Reservoir Properties
Pressure Well #1
Pressure Well #1 Derivative
Delta P / Delta Q (psi / STB/day)
Equivalent Time (hours)
1
0.1
0.01
0.001
0.0001
1e-005
0.01
0.1
1
10

FIGURE 14

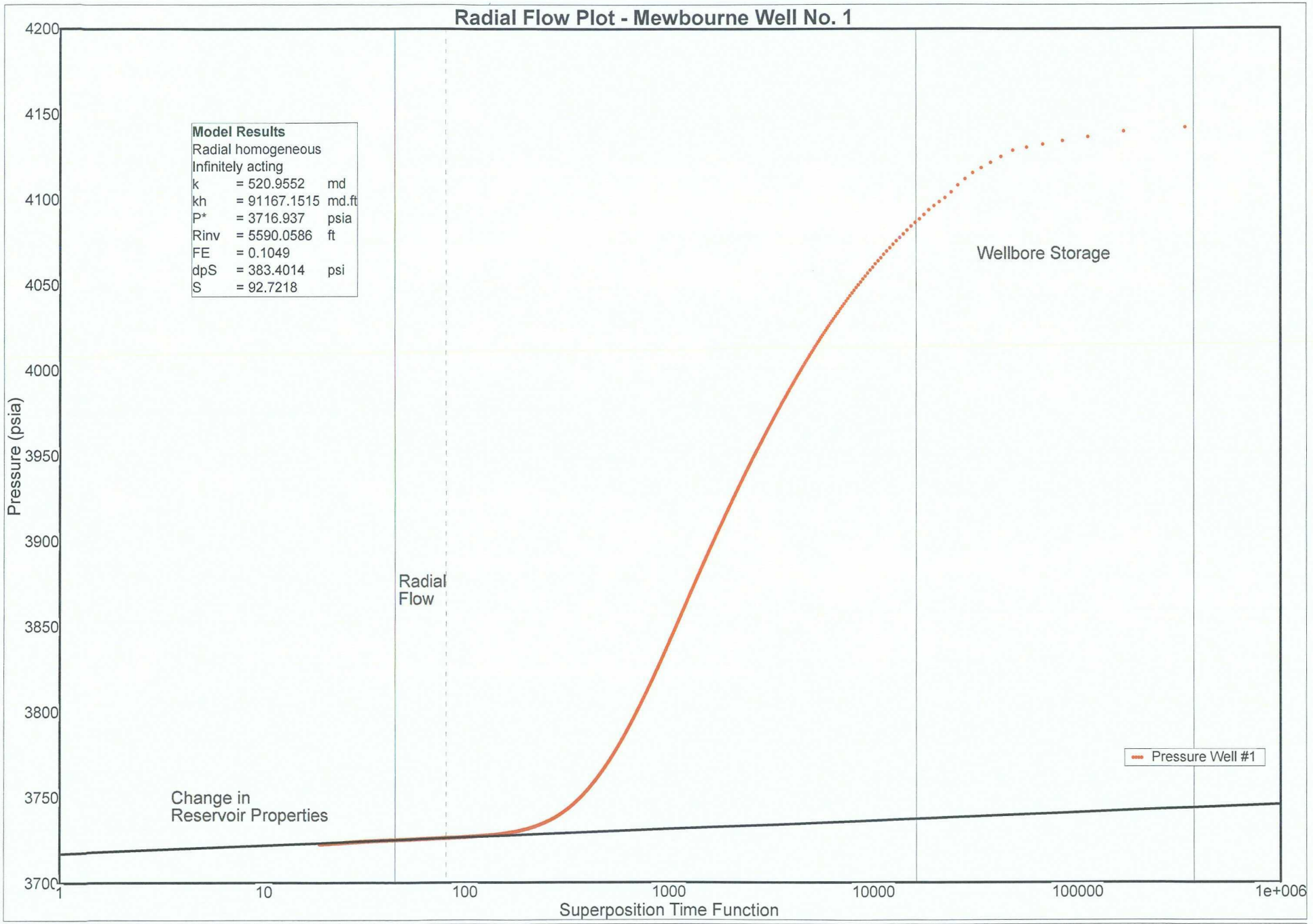

Radial Flow Plot - Mewbourne Well No. 1
Model Results
Radial homogeneous
Infinitely acting
k = 520.9552 md
kh = 91167.1515 md.ft
P* = 3716.937 psia
Rinv = 5590.0586 ft
FE = 0.1049
dpS = 383.4014 psi
S = 92.7218
Wellbore Storage
Radial Flow
Change in Reservoir Properties
Pressure Well #1
Pressure (psia)
Superposition Time Function
4200
4150
4100
4050
4000
3950
3900
3850
3800
3750
3700
1
10
100
1000
10000
100000
1e+006

FIGURE 15

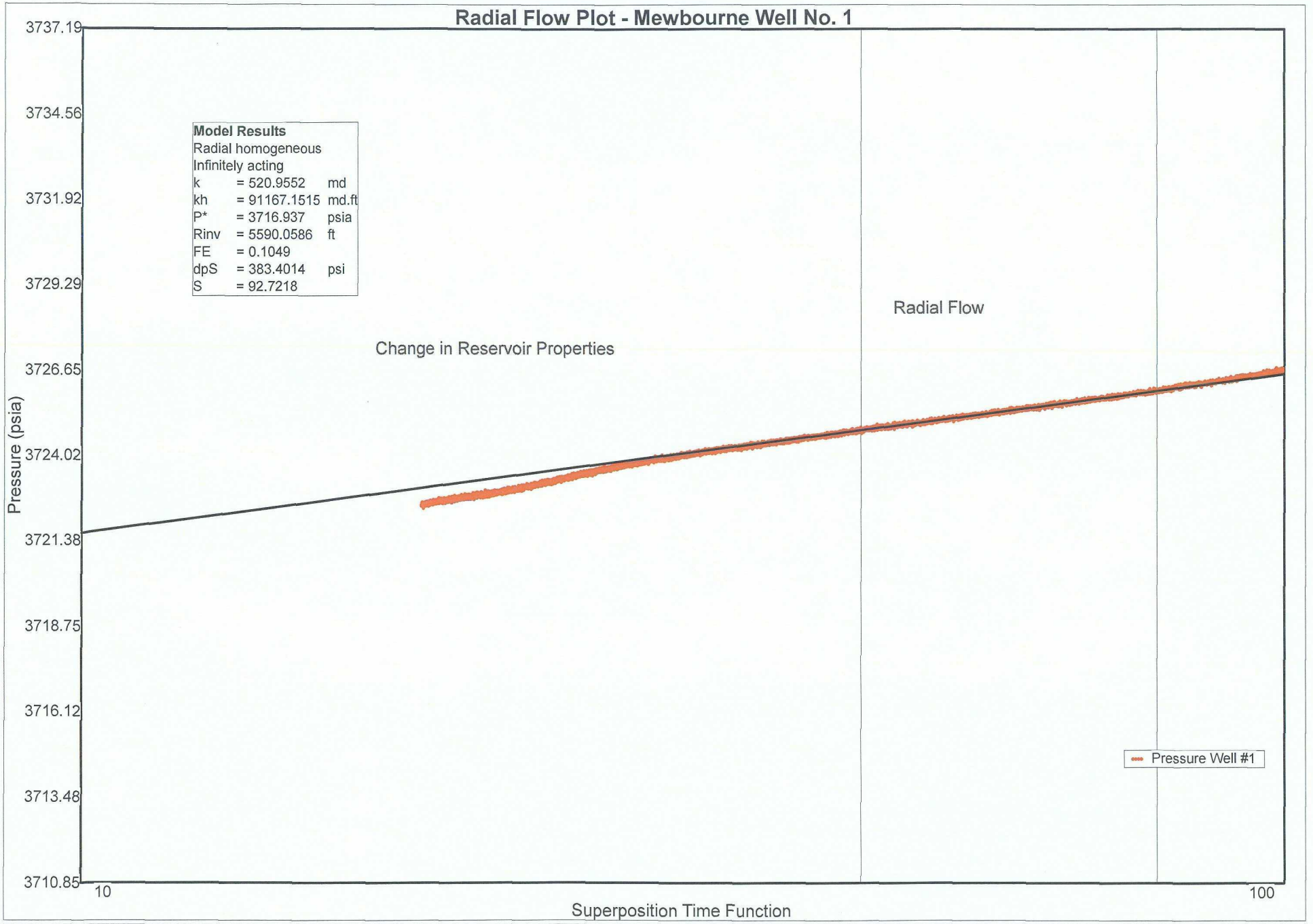

Radial Flow Plot - Mewbourne Well No. 1
3737.19
3734.56
3731.92
3729.29
3726.65
3724.02
3721.38
3718.75
3716.12
3713.48
3710.85
Pressure (psia)
Model Results
Radial homogeneous
Infinitely acting
k = 520.9552 md
kh = 91167.1515 md.ft
P* = 3716.937 psia
Rinv = 5590.0586 ft
FE = 0.1049
dpS = 383.4014 psi
S = 92.7218
Change in Reservoir Properties
Radial Flow
Pressure Well #1
10
100
Superposition Time Function

FIGURE 16

Navajo Refining Company
Mewbourne Well No. 1
Hall Plot

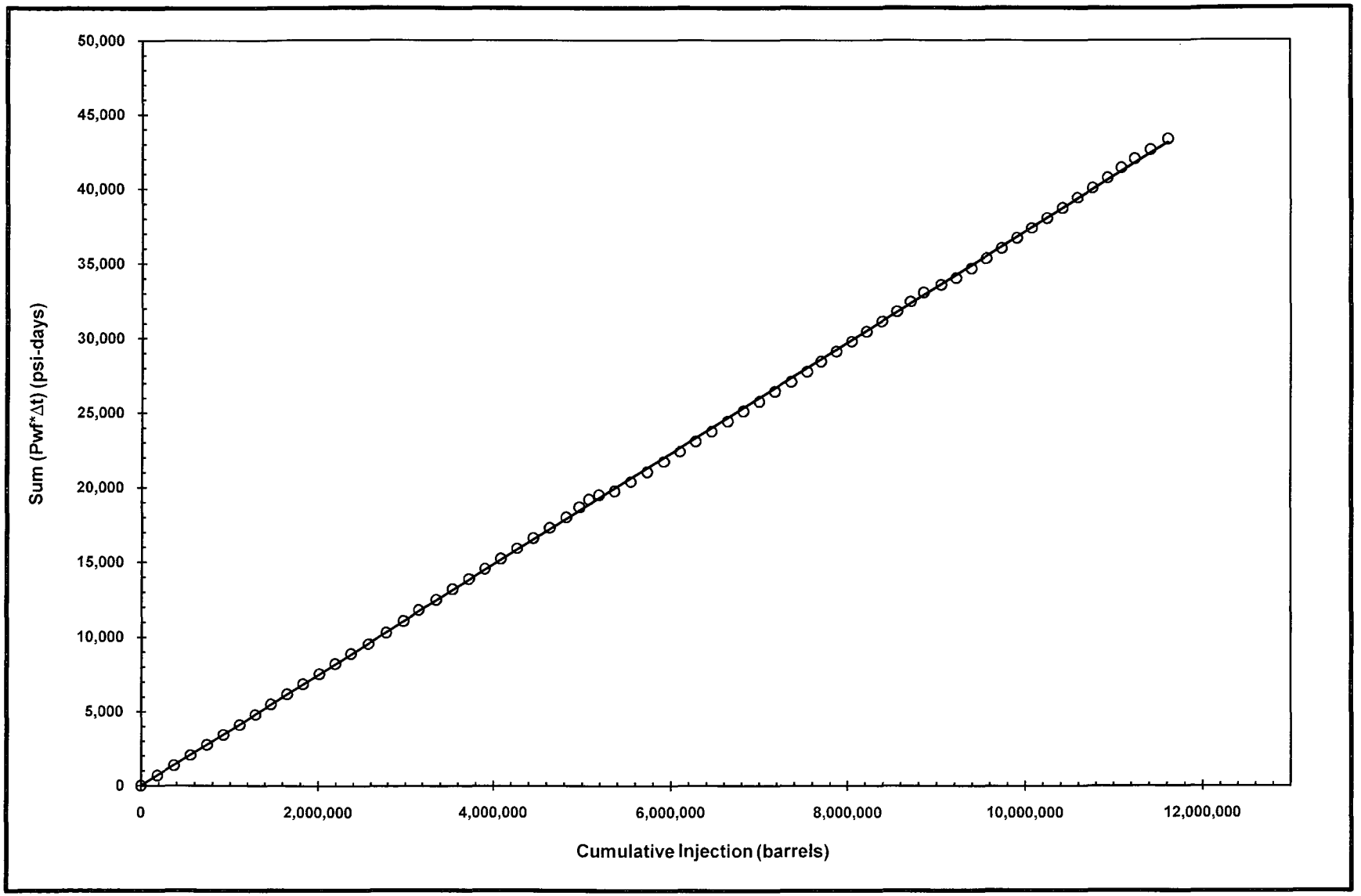



FIGURE 17

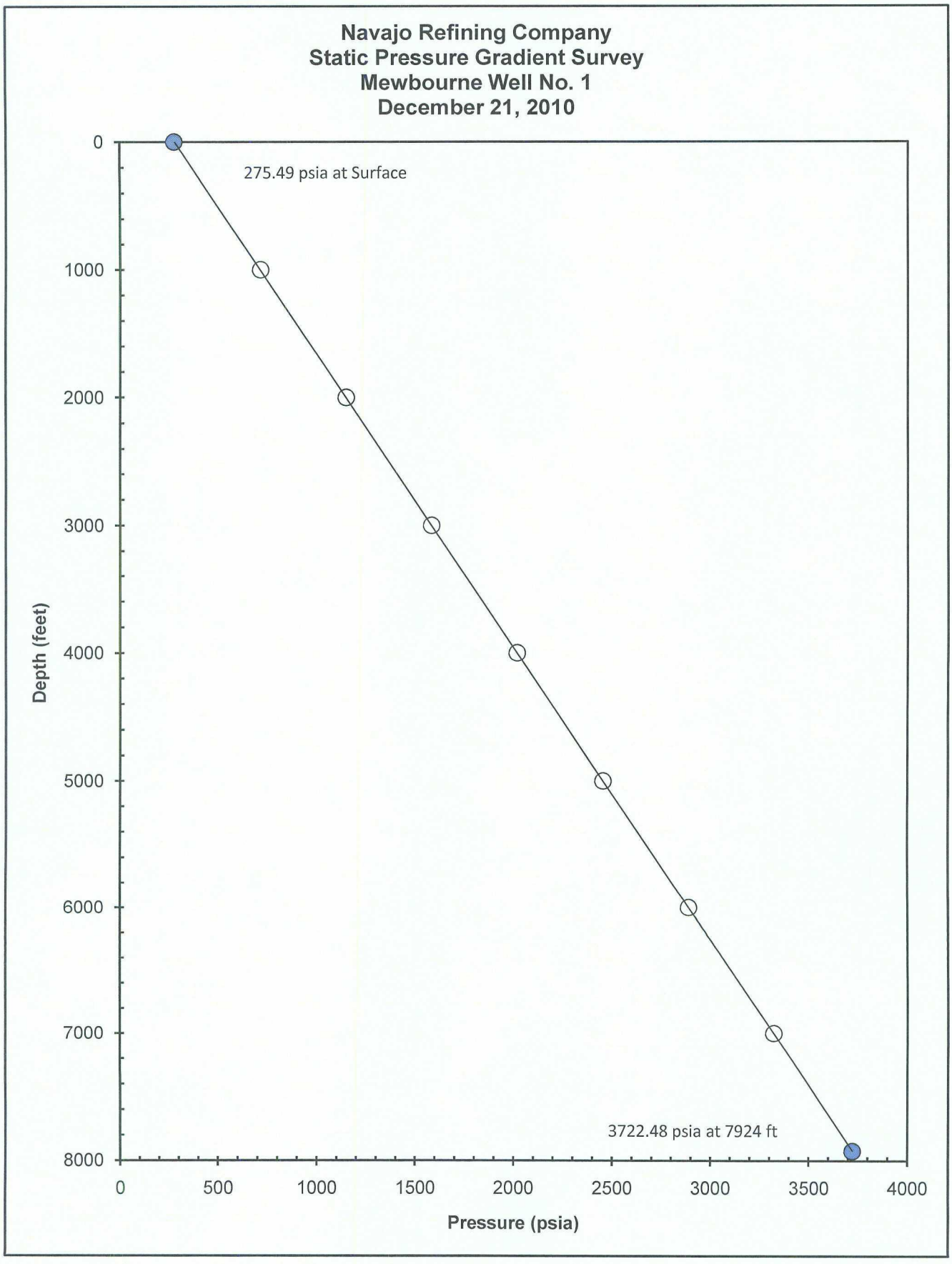

Navajo Refining Company
Static Pressure Gradient Survey
Mewbourne Well No. 1
December 21, 2010
275.49 psia at Surface
3722.48 psia at 7924 ft
Depth (feet)
0
1000
2000
3000
4000
5000
6000
7000
8000
0
500
1000
1500
2000
2500
3000
3500
4000
Pressure (psia)

FIGURE 18

# APPENDICES

# APPENDIX C

# COMPRESSIBILITY OF FLUID

# APPENDIX C

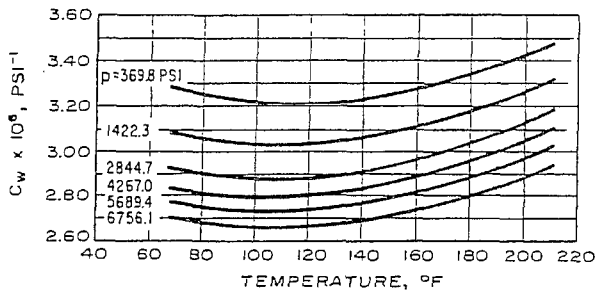



Fig. D.16 Average compressibility of distilled water. After Long and Chierici.[13]

Source: Earlougher, 1977, Advances in Well Test Analysis

COMPRESSIBILITY OF PORE VOLUME AND DISTILLED WATER

# APPENDIX D

# COMPRESSIBILITY OF PORE VOLUME

APPENDIX D

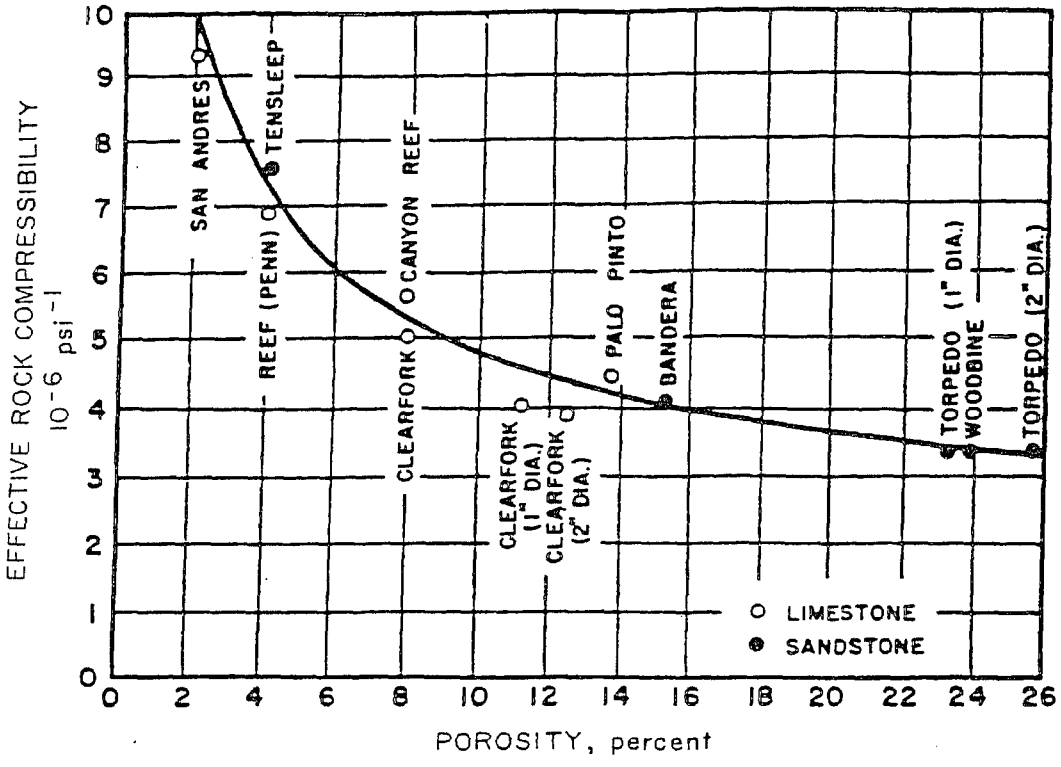



Fig. G.5 Effective formation (rock) compressibility. From Hall, *Trans.*, AIME (1953) 198, 309.

Source: Matthews and Russell, 1967, Pressure Buildup and Flow Tests in Wells

# APPENDIX F

# WATER VISCOSITIES AT VARIOUS SALINITIES AND TEMPERATURES

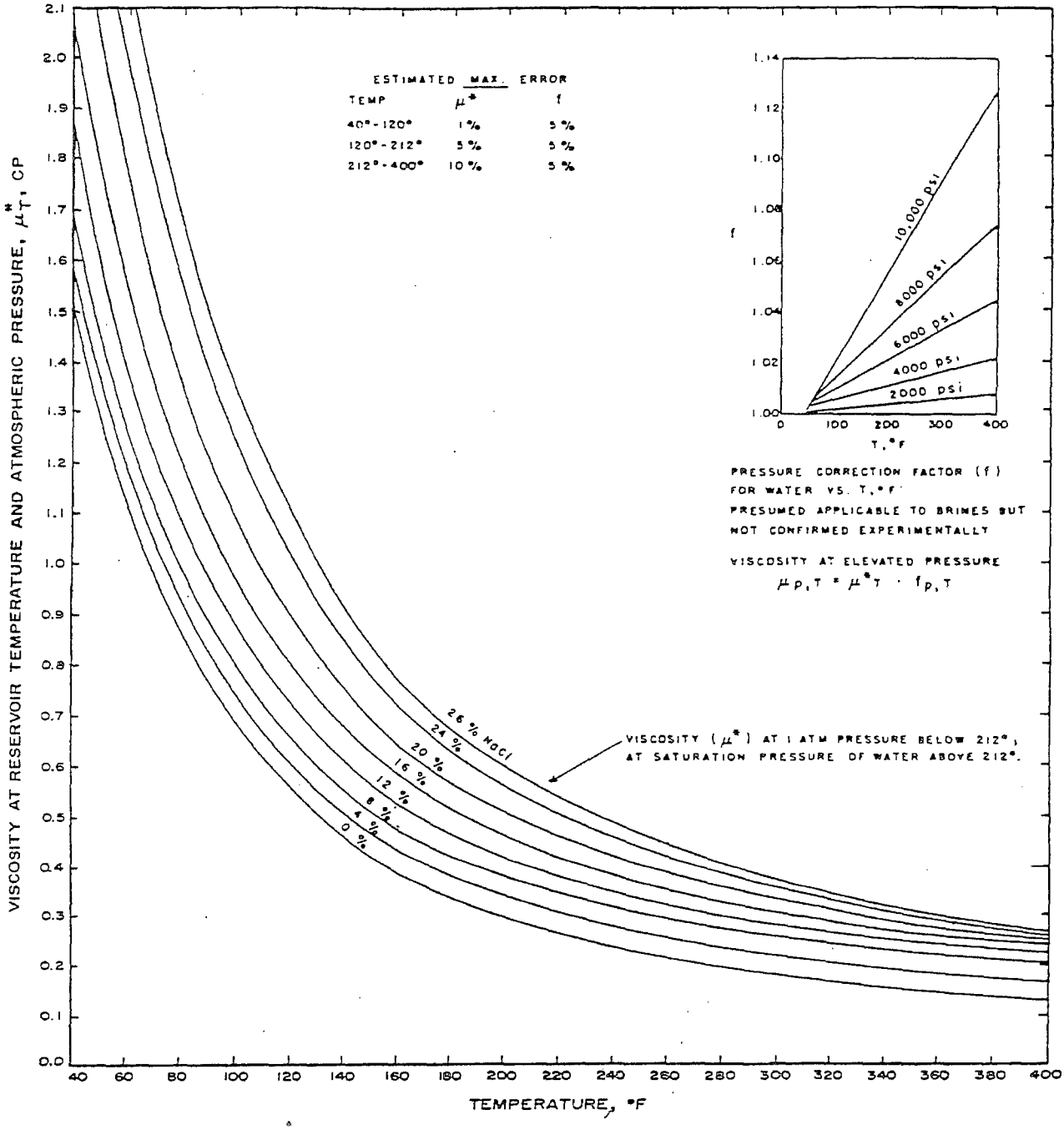



Fig. D-35 Water viscosity at various salinities and temperatures. After Matthews and Russell, data of Chesnut.[18]

FROM: Earlougher, R.C., 1977, "Advances in Well Test Analysis", SPE of AIME, Dallas, Texas

# APPENDIX G

# DAILY RATE HISTORY DATA

## APPENDIX G

## NAVAJO REFINING
## INJECTION RATES USED IN ANALYSIS

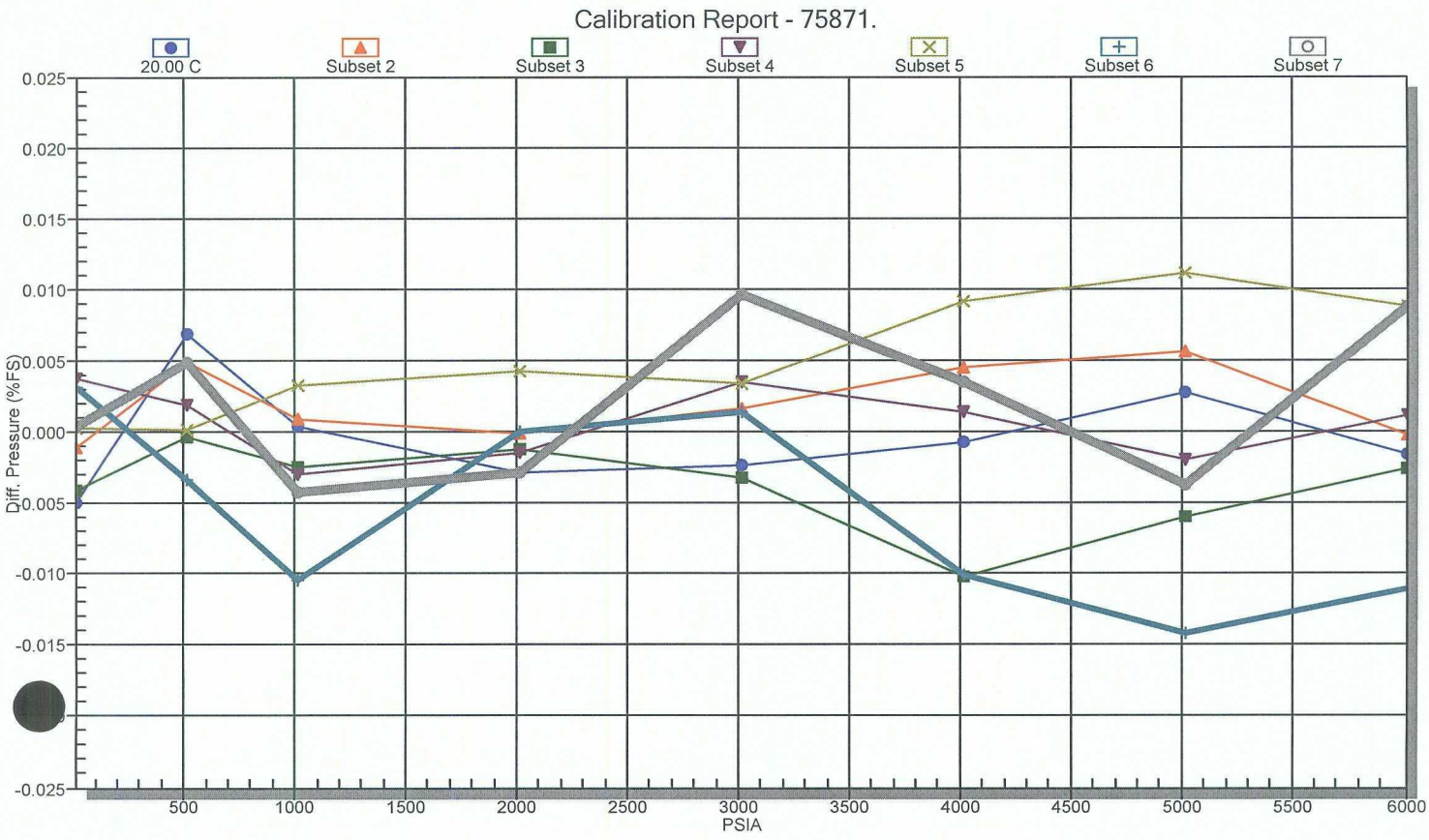
| Date (mm/dd/yy hh:mm) | Elasped Time (hours) | Bottom Hole Pressure (psia) | Bottom Hole Temperature (°F) | Average Injection Rate (bpd) | Average Injection Rate (gpm) | Comments |
|---|---|---|---|---|---|---|
| 12/16/01 11:45 AM | 0.00 | 17.09 | 45.36 | 3687.84 | 107.56 | Start Memory Gage |
| 12/16/10 12:26 PM | 0.70 | 4042.63 | 90.94 | 3687.84 | 107.56 | On Depth At 7924 feet |
| 12/16/10 12:26 PM | 0.70 | 4044.95 | 90.98 | 3633.18 | 105.97 | Start 48 Hour Injection Period |
| 12/17/10 9:46 AM | 21.18 | 4028.77 | 90.24 | 3633.18 | 105.97 | Average Rate Change |
| 12/18/10 1:48 PM | 49.30 | 4045.81 | 91.12 | 4268.20 | 124.49 | End 48 Hour Injection Period |
| 12/18/10 1:48 PM | 49.30 | 4045.89 | 91.13 | 4683.83 | 136.61 | Start Stable Injection |
| 12/19/10 10:43 PM | 82.24 | 4145.26 | 87.32 | 4683.83 | 136.61 | End Stable Injection |
| 12/19/10 10:43 PM | 82.25 | 4141.81 | 87.31 | 0.00 | 0.00 | *Start Falloff Period* |
| 12/21/10 8:51 AM | 116.39 | 3722.48 | 94.66 | 0.00 | 0.00 | Start Gradient Stops |
| 12/21/10 10:23 AM | 117.93 | 18.23 | 67.70 | 0.00 | 0.00 | Out of Wellbore with MRO |
| 12/21/10 10:28 AM | 118.02 | 14.89 | 73.53 | 0.00 | 0.00 | Rig Down Unit |

# APPENDIX H

# GAUGE CALIBRATION SHEETS

**Spartek Systems**
#1 Thevenaz Ind. Tr.
Sylvan Lake, AB, Ca, T4S 1P5
Phone (403) 887-2443
Fax (403) 887-4050

# Pressure Gauge
# Certificate of Calibration




GAUGE NUMBER: 75871

2-D POLYNOMIAL LMS CURVEFIT

| | | | |
|---|---|---|---|
| Source of f: | Pres | Temp | Pressure Equation: |
| Fit Order: | 3 | 4 | Pressure (PSI) = A + xp(B + xp(C + xp(D))) |
| Prescale: | xp = m * (fp - fp0) | xt = m * (ft - ft0) | |
| m: | 0.01 | 0.01 | Temperature Compenstation: |
| | fp0 = 681662 | ft0 = 152045 | A = A0 + xt(A1 + xt(A2 + xt(A3 + xt(A4)))) |
| | | | B = B0 + xt(B1 + xt(B2 + xt(B3 + xt(B4)))) |
| | | | C = C0 + xt(C1 + xt(C2 + xt(C3 + xt(C4)))) |
| | | | D = D0 + xt(D1 + xt(D2 + xt(D3 + xt(D4)))) |

Pressure (psi) STANDARD FIT COEFFICIENTS:

| | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|
| A | 12.10286968 | 0.1470412742 | 0.0002468938414 | -7.497062382E-07 | -3.70888077E-09 |
| B | 1.667309854 | -0.00140454224 | -2.843588797E-07 | -1.401645552E-09 | 2.298300841E-12 |
| C | -4.224954529E-06 | -2.851033337E-08 | -6.041581441E-10 | -3.146294955E-12 | -5.756520944E-15 |
| D | -1.483149629E-11 | 7.399789391E-12 | 1.626124344E-13 | 8.394193027E-16 | 1.426114424E-18 |

Temperature (C) STANDARD FIT COEFFICIENTS

A 19.84409497
B -0.3680945049
C -1.917152205E-05
D -2.247456296E-07

0 points eliminated.
Error File: Gauge # 75871

| Pressure psi | Temperature Deg. C | Count (Pres) | Count (Temp) | DIFF (press) psi |
|---|---|---|---|---|
| 513.28 | 20.00 | 0.41 | -0.27 | -0.27 |
| 1013.55 | 20.00 | 0.02 | -0.33 | -0.33 |
| 2013.87 | 20.00 | -0.17 | -0.33 | -0.33 |
| 3014.16 | 20.00 | -0.14 | -0.20 | -0.20 |
| 4014.44 | 20.00 | -0.05 | 0.07 | 0.07 |
| 5014.69 | 20.00 | 0.16 | 0.48 | 0.48 |
| 6014.92 | 20.00 | -0.10 | 1.03 | 1.03 |
| 12.41 | 50.00 | -0.07 | -0.20 | -0.20 |
| 513.28 | 50.00 | 0.29 | -0.30 | -0.30 |
| 1013.55 | 50.00 | 0.06 | -0.35 | -0.35 |
| 2013.87 | 50.00 | -0.01 | -0.37 | -0.37 |
| 3014.16 | 50.00 | 0.10 | -0.28 | -0.28 |
| 4014.44 | 50.00 | 0.27 | -0.10 | -0.10 |
| 5014.69 | 50.00 | 0.34 | 0.21 | 0.21 |
| 6014.92 | 50.00 | -0.01 | 0.64 | 0.64 |
| 12.41 | 75.00 | -0.25 | -0.03 | -0.03 |
| 513.28 | 75.00 | -0.02 | -0.12 | -0.12 |
| 1013.55 | 75.00 | -0.15 | -0.17 | -0.17 |
| 2013.87 | 75.00 | -0.07 | -0.21 | -0.21 |
| 3014.16 | 75.00 | -0.19 | -0.17 | -0.17 |
| 4014.44 | 75.00 | -0.62 | -0.01 | -0.01 |
| 5014.69 | 75.00 | -0.36 | 0.24 | 0.24 |
| 6014.92 | 75.00 | -0.16 | 0.59 | 0.59 |
| 12.41 | 95.10 | 0.23 | 0.11 | 0.11 |
| 513.28 | 95.10 | 0.11 | 0.04 | 0.04 |
| 1013.55 | 95.10 | -0.18 | -0.03 | -0.03 |
| 2013.87 | 95.10 | -0.09 | -0.07 | -0.07 |
| 3014.16 | 95.10 | 0.21 | -0.03 | -0.03 |
| 4014.44 | 95.10 | 0.08 | 0.10 | 0.10 |
| 5014.69 | 95.10 | -0.12 | 0.30 | 0.30 |
| 6014.92 | 95.10 | 0.07 | 0.56 | 0.56 |
| 12.41 | 115.10 | 0.01 | 0.05 | 0.05 |
| 513.28 | 115.10 | 0.00 | -0.06 | -0.06 |
| 1013.55 | 115.10 | 0.20 | -0.12 | -0.12 |
| 2013.87 | 115.10 | 0.26 | -0.17 | -0.17 |
| 3014.16 | 115.10 | 0.21 | -0.14 | -0.14 |
| 4014.44 | 115.10 | 0.55 | -0.04 | -0.04 |
| 5014.69 | 115.10 | 0.66 | 0.07 | 0.07 |
| 6014.92 | 115.10 | 0.52 | 0.28 | 0.28 |
| 12.41 | 134.90 | 0.18 | -0.01 | -0.01 |
| 513.28 | 134.90 | -0.20 | -0.07 | -0.07 |
| 1013.55 | 134.90 | -0.63 | -0.13 | -0.13 |
| 2013.87 | 134.90 | 0.00 | -0.20 | -0.20 |
| 3014.16 | 134.90 | 0.08 | -0.25 | -0.25 |
| 4014.44 | 134.90 | -0.61 | -0.28 | -0.28 |
| 5014.69 | 134.90 | -0.85 | -0.19 | -0.19 |
| 6014.92 | 134.90 | -0.66 | -0.14 | -0.14 |
| 12.41 | 149.80 | 0.03 | 0.31 | 0.31 |
| 513.28 | 149.80 | 0.29 | 0.26 | 0.26 |
| 1013.55 | 149.80 | -0.26 | 0.18 | 0.18 |
| 2013.87 | 149.80 | -0.17 | 0.08 | 0.08 |
| 3014.16 | 149.80 | 0.58 | 0.02 | 0.02 |
| 4014.44 | 149.80 | 0.21 | -0.01 | -0.01 |
| 5014.69 | 149.80 | -0.23 | -0.02 | -0.02 |
| 6014.92 | 149.80 | 0.52 | -0.10 | -0.10 |

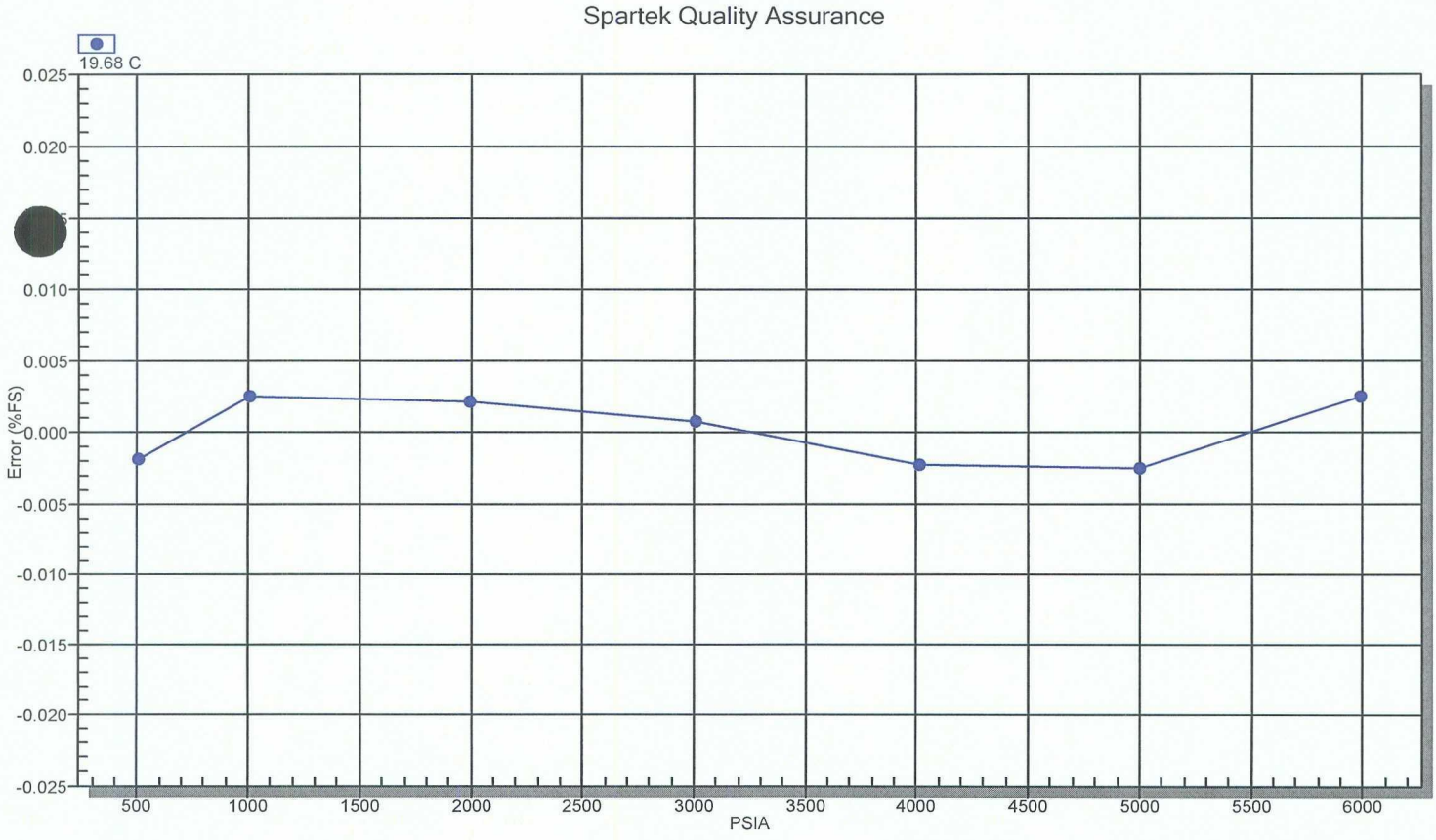
**Spartek Systems**
#1 Thevenaz Ind. Tr.
Sylvan Lake, AB, Ca, T4S 1P5
Phone (403) 887-2443
Fax (403) 887-4050

# Pressure Gauge
# Certificate of Conformance

| | | | |
|---|---|---|---|
| MODEL | 1139 | REVISION | 0 |
| SERIAL NUMBER | 75871 | DEADWEIGHT USED | Piston Cylinder No. 528 |
| CALIBRATED | JUN13/06 | E.U.B. CERT. DATE | May 09 2006 |
| PRESSURE RANGE | 6014.92 psi | TEMPERATURE RANGE | 149.80 Deg. C |

ACCURACY

As shown in the graph below, this Spartek Gauge conformed to within +/- 0.025 %F.S. of the pressure standard used in calibration, which is accurate to within +/- 0.01% of reading. This gives an overall accuracy of +/-(0.025%F.S. + 0.01% of reading)




Accepted By: _____

Date: Wednesday, April 09, 2008

**Spartek Systems**
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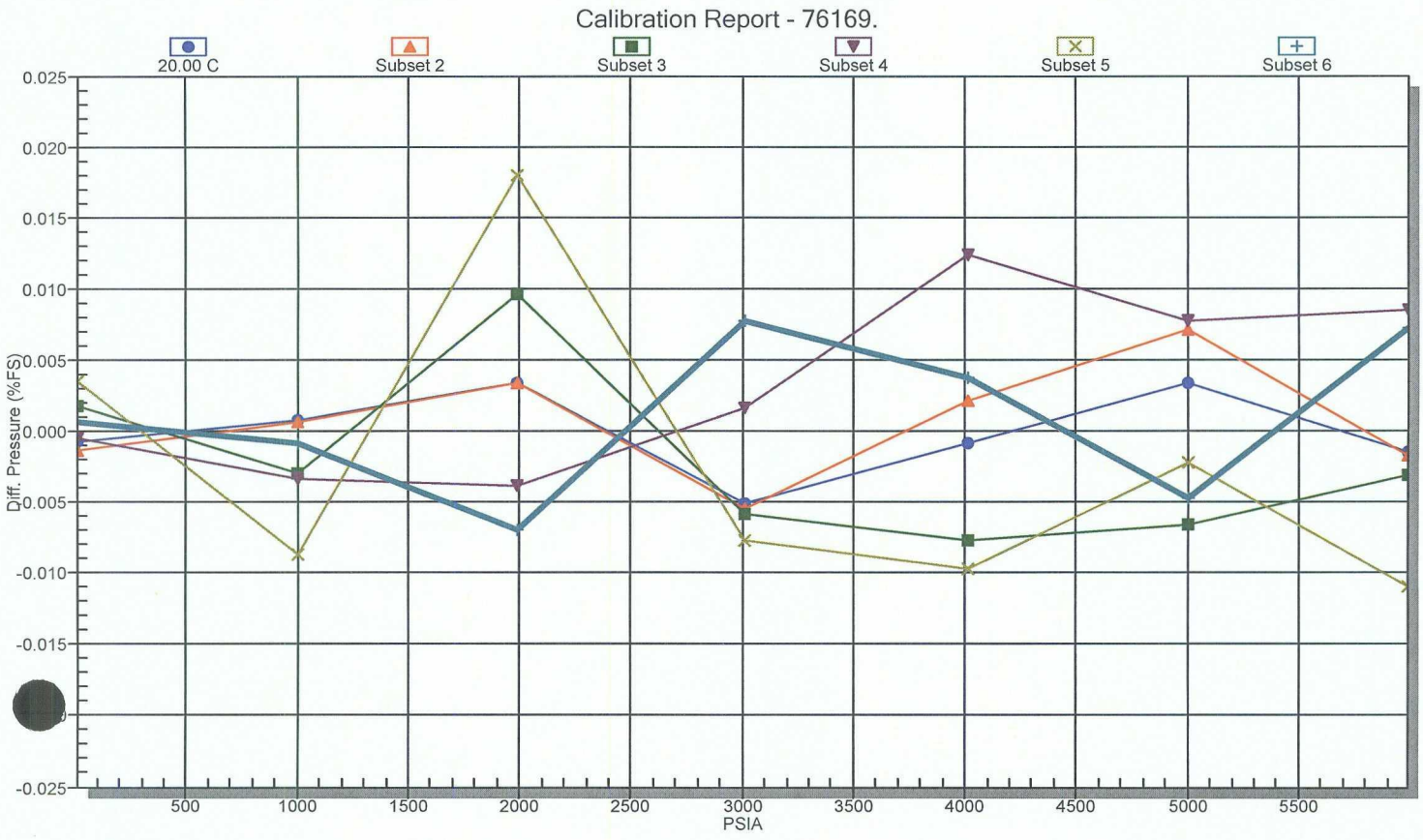
# Pressure Gauge
# Certificate of Calibration




GAUGE NUMBER: 76169

2-D POLYNOMIAL LMS CURVEFIT

| | | | |
|---|---|---|---|
| Source of f: | Pres | Temp | Pressure Equation: |
| Fit Order: | 3 | 4 | Pressure (PSI) = A + xp(B + xp(C + xp(D))) |
| Prescale: | xp = m * (fp - fp0) | xt = m * (ft - ft0) | |
| m: | 0.01 | 0.01 | Temperature Compenstation: |
| | fp0 = 681645 | ft0 = 151106 | A = A0 + xt(A1 + xt(A2 + xt(A3 + xt(A4)))) |
| | | | B = B0 + xt(B1 + xt(B2 + xt(B3 + xt(B4)))) |
| | | | C = C0 + xt(C1 + xt(C2 + xt(C3 + xt(C4)))) |
| | | | D = D0 + xt(D1 + xt(D2 + xt(D3 + xt(D4)))) |

| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Pressure (psi) STANDARD FIT COEFFICIENTS: | | | | |
| A 13.44324838 | 0.1882850161 | 0.00101019162 | 2.870013815E-06 | 3.120425604E-09 |
| B 2.01472189 | -0.001786427729 | -3.408955408E-06 | -1.762779483E-08 | -2.326711214E-11 |
| C -4.883058348E-06 | 1.031978613E-07 | 1.962575439E-09 | 1.037101793E-11 | 1.587160732E-14 |
| D 2.999047813E-10 | -2.003609874E-11 | -3.805828823E-13 | -2.12811198E-15 | -3.419813586E-18 |

Temperature (C) STANDARD FIT COEFFICIENTS

A 19.9770683

B -0.357215731

C 4.219414208E-06

D -2.235439456E-07

0 points eliminated.
Error File: Gauge # 76169

| Pressure psi | Temperature Deg. C | Count (Pres) | Count (Temp) | DIFF (press) psi |
|---|---|---|---|---|
| 1003.75 | 20.00 | 0.05 | -0.14 | -0.14 |
| 1993.33 | 20.00 | 0.20 | -0.19 | -0.19 |
| 3008.16 | 20.00 | -0.31 | -0.16 | -0.16 |
| 4012.02 | 20.00 | -0.05 | 0.00 | 0.00 |
| 5001.33 | 20.00 | 0.20 | 0.20 | 0.20 |
| 5987.27 | 20.00 | -0.09 | 0.47 | 0.47 |
| 13.50 | 50.00 | -0.08 | -0.08 | -0.08 |
| 1003.75 | 50.00 | 0.04 | -0.16 | -0.16 |
| 1993.33 | 50.00 | 0.20 | -0.22 | -0.22 |
| 3008.16 | 50.00 | -0.33 | -0.20 | -0.20 |
| 4012.02 | 50.00 | 0.13 | -0.11 | -0.11 |
| 5001.33 | 50.00 | 0.42 | 0.02 | 0.02 |
| 5987.27 | 50.00 | -0.10 | 0.28 | 0.28 |
| 13.50 | 85.00 | 0.11 | 0.07 | 0.07 |
| 1003.75 | 85.00 | -0.18 | 0.01 | 0.01 |
| 1993.33 | 85.00 | 0.57 | -0.04 | -0.04 |
| 3008.16 | 85.00 | -0.35 | -0.03 | -0.03 |
| 4012.02 | 85.00 | -0.46 | 0.02 | 0.02 |
| 5001.33 | 85.00 | -0.39 | 0.12 | 0.12 |
| 5987.27 | 85.00 | -0.19 | 0.30 | 0.30 |
| 13.50 | 110.00 | -0.03 | 0.13 | 0.13 |
| 1003.75 | 110.00 | -0.20 | 0.01 | 0.01 |
| 1993.33 | 110.00 | -0.23 | -0.06 | -0.06 |
| 3008.16 | 110.00 | 0.10 | -0.06 | -0.06 |
| 4012.02 | 110.00 | 0.74 | -0.01 | -0.01 |
| 5001.33 | 110.00 | 0.46 | 0.09 | 0.09 |
| 5987.27 | 110.00 | 0.51 | 0.23 | 0.23 |
| 13.50 | 135.00 | 0.21 | -0.10 | -0.10 |
| 1003.75 | 135.00 | -0.52 | -0.17 | -0.17 |
| 1993.33 | 135.00 | 1.07 | -0.21 | -0.21 |
| 3008.16 | 135.00 | -0.47 | -0.23 | -0.23 |
| 4012.02 | 135.00 | -0.58 | -0.21 | -0.21 |
| 5001.33 | 135.00 | -0.14 | -0.13 | -0.13 |
| 5987.27 | 135.00 | -0.65 | -0.01 | -0.01 |
| 13.50 | 150.00 | 0.04 | 0.17 | 0.17 |
| 1003.75 | 150.00 | -0.05 | 0.07 | 0.07 |
| 1993.33 | 150.00 | -0.42 | 0.01 | 0.01 |
| 3008.16 | 150.00 | 0.47 | 0.01 | 0.01 |
| 4012.02 | 150.00 | 0.23 | 0.03 | 0.03 |
| 5001.33 | 150.00 | -0.28 | 0.08 | 0.08 |
| 5987.27 | 150.00 | 0.44 | 0.19 | 0.19 |

**Spartek Systems**
#1 Thevenaz Ind. Tr.
Sylvan Lake, AB, Ca, T4S 1P5
Phone (403) 887-2443
Fax (403) 887-4050

# Pressure Gauge
# Certificate of Conformance

| | | | |
|---|---|---|---|
| MODEL | 1139 | REVISION | 0 |
| SERIAL NUMBER | 76169 | DEADWEIGHT USED | Piston Cylinder No. 528 |
| CALIBRATED | DEC15/06 | E.U.B. CERT. DATE | May 09 2006 |
| PRESSURE RANGE | 5987.27 psi | TEMPERATURE RANGE | 150.00 Deg. C |

ACCURACY

As shown in the graph below, this Spartek Gauge conformed to within +/- 0.025 %F.S. of the pressure standard used in calibration, which is accurate to within +/- 0.01% of reading. This gives an overall accuracy of +/-(0.025%F.S. + 0.01% of reading)


Accepted By: _____

Date: Wednesday, April 09, 2008

**Spartek Systems**
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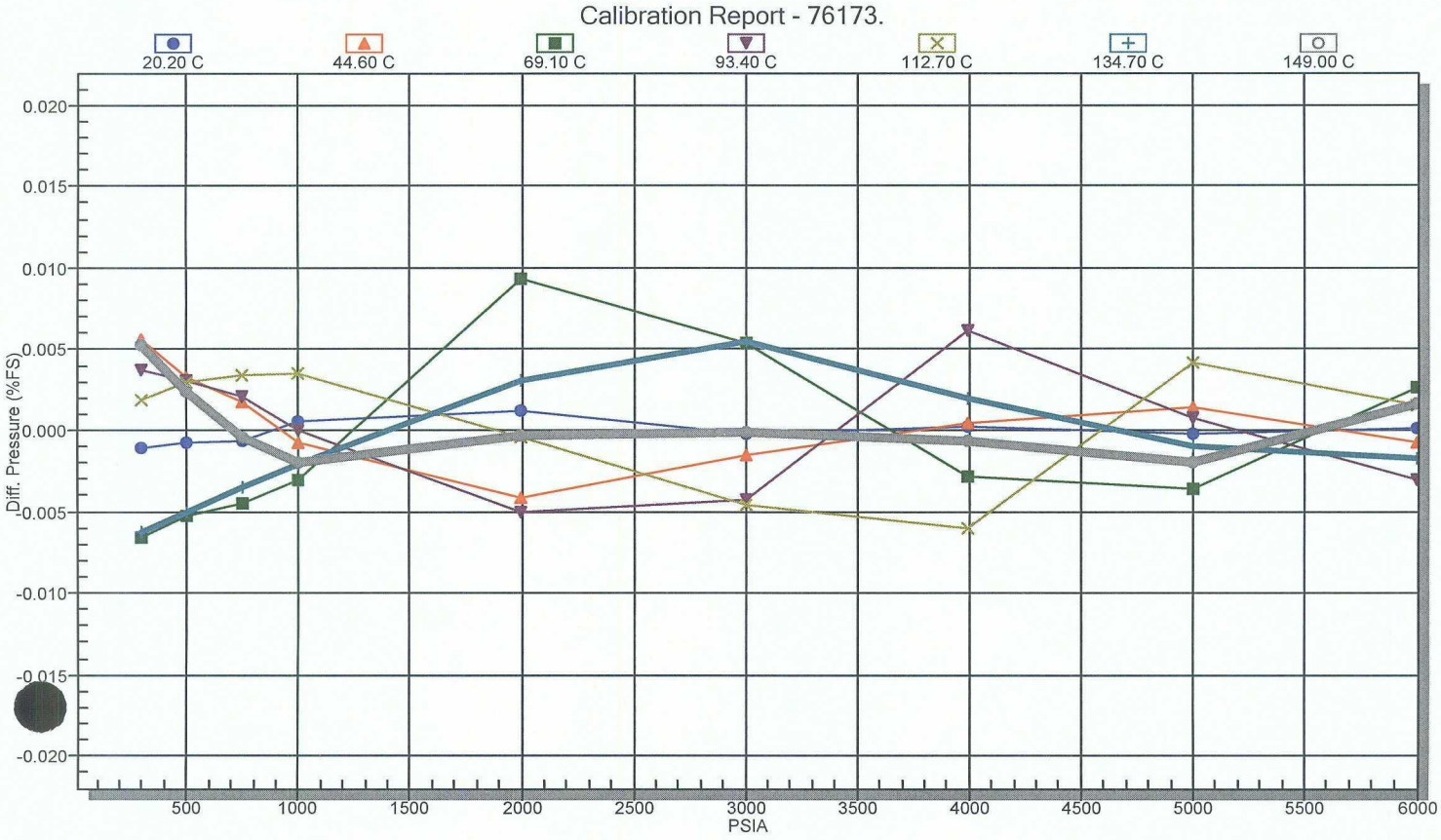
# Pressure Gauge

# Certificate of Calibration




GAUGE NUMBER: 76173

2-D POLYNOMIAL LMS CURVEFIT

| | | | |
|---|---|---|---|
| Source of f: | Pres | Temp | Pressure Equation: |
| Fit Order: | 3 | 4 | Pressure (PSI) = A + xp(B + xp(C + xp(D))) |
| Prescale: | xp = m * (fp - fp0) | xt = m * (ft - ft0) | |
| m: | 0.01 | 0.01 | Temperature Compenstation: |
| | fp0 = 693181 | ft0 = 155171 | A = A0 + xt(A1 + xt(A2 + xt(A3 + xt(A4)))) |
| | | | B = B0 + xt(B1 + xt(B2 + xt(B3 + xt(B4)))) |
| | | | C = C0 + xt(C1 + xt(C2 + xt(C3 + xt(C4)))) |
| | | | D = D0 + xt(D1 + xt(D2 + xt(D3 + xt(D4)))) |

Pressure (psi) STANDARD FIT COEFFICIENTS:

| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| A 296.8243979 | -0.009034878215 | 0.001358751677 | 5.020502212E-06 | 6.509090838E-09 |
| B 1.637207894 | -0.001254275254 | -9.246861864E-08 | -2.503492126E-09 | -2.678433945E-12 |
| C -3.629488314E-06 | -5.782243012E-08 | -7.453253941E-10 | -2.691177945E-12 | -3.159127954E-15 |
| D 1.648318667E-10 | 1.138808285E-11 | 1.882101656E-13 | 8.002614476E-16 | 1.059857244E-18 |

Temperature (C) STANDARD FIT COEFFICIENTS

A 20.10372196

B -0.3563077466

C -4.920886728E-05

D -2.839383097E-07

0 points eliminated.
Error File: Gauge # 76173

| Pressure psi | Temperature Deg. C | Count (Pres) | Count (Temp) | DIFF (press) psi |
|---|---|---|---|---|
| 296.90 | 20.20 | 693181.67 | 155171.50 | -0.07 |
| 500.63 | 20.30 | 705629.67 | 155170.25 | -0.05 |
| 747.13 | 20.20 | 720704.33 | 155191.50 | -0.04 |
| 998.06 | 20.40 | 736060.33 | 155189.50 | 0.03 |
| 1997.30 | 20.20 | 797311.00 | 155210.00 | 0.07 |
| 3002.25 | 20.30 | 858976.33 | 155161.00 | -0.02 |
| 3997.19 | 20.30 | 920089.33 | 155099.00 | 0.01 |
| 5002.07 | 20.30 | 981732.00 | 154980.25 | -0.01 |
| 6003.35 | 20.40 | 1043097.67 | 154845.25 | 0.01 |
| 296.85 | 44.60 | 692878.67 | 148289.75 | 0.33 |
| 500.57 | 44.70 | 704692.67 | 148304.25 | 0.19 |
| 747.08 | 44.70 | 718998.33 | 148311.25 | 0.11 |
| 998.00 | 44.70 | 733560.00 | 148307.75 | -0.04 |
| 1997.25 | 44.80 | 791636.33 | 148313.75 | -0.25 |
| 3002.20 | 44.70 | 850113.00 | 148281.50 | -0.09 |
| 3997.15 | 44.70 | 908011.67 | 148218.00 | 0.02 |
| 5002.04 | 44.70 | 966471.33 | 148133.50 | 0.08 |
| 6003.32 | 44.70 | 1024618.33 | 148012.00 | -0.05 |
| 296.92 | 69.10 | 692267.00 | 141375.00 | -0.40 |
| 500.66 | 69.10 | 703505.67 | 141381.25 | -0.31 |
| 747.18 | 69.10 | 717108.33 | 141385.00 | -0.27 |
| 998.11 | 69.10 | 730965.33 | 141388.00 | -0.18 |
| 1997.36 | 69.20 | 786235.00 | 141392.75 | 0.56 |
| 3002.33 | 69.20 | 841838.67 | 141379.50 | 0.32 |
| 3997.28 | 69.10 | 896877.33 | 141335.00 | -0.17 |
| 5002.18 | 69.20 | 952435.00 | 141260.75 | -0.22 |
| 6003.47 | 69.10 | 1007736.33 | 141173.75 | 0.16 |
| 296.99 | 93.40 | 691780.00 | 134731.50 | 0.23 |
| 500.72 | 93.40 | 702467.33 | 134737.00 | 0.18 |
| 747.24 | 93.40 | 715409.00 | 134744.00 | 0.12 |
| 998.17 | 93.40 | 728588.67 | 134749.75 | 0.00 |
| 1997.42 | 93.40 | 781166.33 | 134761.25 | -0.30 |
| 3002.38 | 93.40 | 834146.00 | 134745.00 | -0.26 |
| 3997.33 | 93.40 | 886664.33 | 134713.75 | 0.37 |
| 5002.23 | 93.50 | 939627.33 | 134659.00 | 0.04 |
| 6003.51 | 93.40 | 992316.00 | 134581.50 | -0.18 |
| 297.01 | 112.70 | 691429.00 | 129608.50 | 0.11 |
| 500.73 | 112.70 | 701713.33 | 129617.00 | 0.18 |
| 747.25 | 112.70 | 714164.33 | 129622.50 | 0.20 |
| 998.17 | 112.80 | 726847.67 | 129629.25 | 0.21 |
| 1997.42 | 112.70 | 777426.67 | 129640.50 | -0.03 |
| 3002.37 | 112.70 | 828395.00 | 129633.75 | -0.28 |
| 3997.32 | 112.70 | 878919.33 | 129611.75 | -0.36 |
| 5002.21 | 112.70 | 929982.67 | 129568.00 | 0.25 |
| 6003.49 | 112.70 | 980766.00 | 129501.25 | 0.09 |
| 297.04 | 134.70 | 691041.00 | 124063.25 | -0.38 |
| 500.77 | 134.80 | 700893.33 | 124056.50 | -0.30 |
| 747.29 | 134.80 | 712825.00 | 124063.75 | -0.21 |
| 998.22 | 134.80 | 724979.33 | 124070.25 | -0.13 |
| 1997.47 | 134.80 | 773458.33 | 124081.00 | 0.19 |
| 3002.43 | 134.80 | 822309.33 | 124079.25 | 0.33 |
| 3997.38 | 134.80 | 870713.67 | 124059.00 | 0.12 |
| 5002.28 | 134.80 | 919633.00 | 124027.75 | -0.06 |
| 6003.56 | 134.70 | 968360.00 | 123978.50 | -0.10 |
| 297.09 | 149.00 | 690806.33 | 120603.00 | 0.32 |
| 500.82 | 149.10 | 700388.00 | 120608.00 | 0.14 |
| 747.34 | 149.10 | 711994.00 | 120620.75 | -0.03 |
| 998.27 | 149.10 | 723819.33 | 120624.25 | -0.12 |
| 1997.53 | 149.20 | 771000.33 | 120622.75 | -0.02 |
| 3002.49 | 149.20 | 818537.33 | 120612.25 | -0.01 |
| 3997.45 | 149.20 | 865657.00 | 120593.75 | -0.04 |
| 5002.35 | 149.20 | 913253.00 | 120557.25 | -0.12 |
| 5996.37 | 149.30 | 960315.67 | 120505.75 | 0.10 |

**Spartek Systems**
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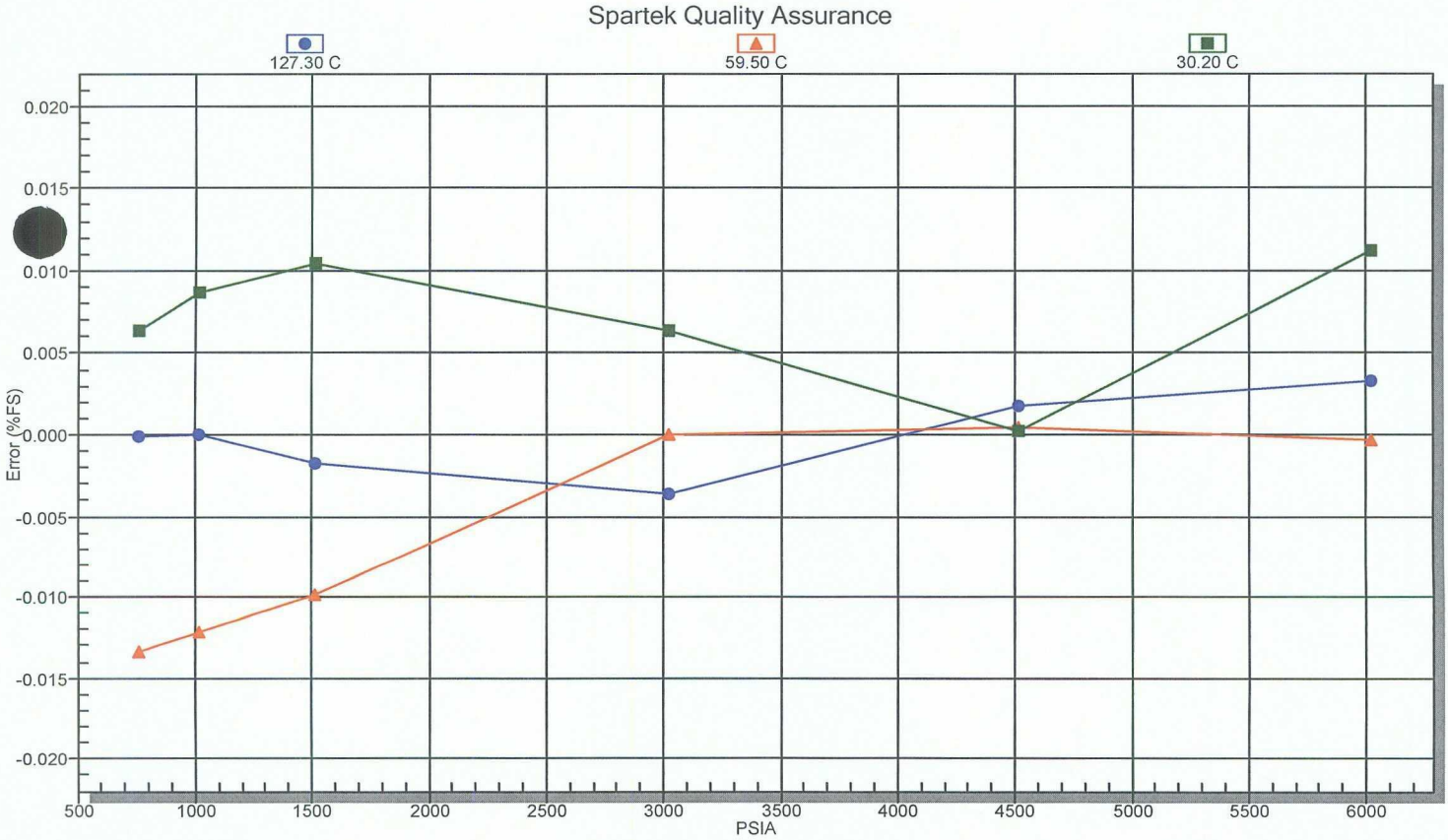
# Pressure Gauge
## Certificate of Conformance

| | | | |
|---|---|---|---|
| MODEL | 1139 | REVISION | 0 |
| SERIAL NUMBER | 76173 | DEADWEIGHT USED | Piston Cylinder No. 528 |
| CALIBRATED | DEC09/08 | E.U.B. CERT. DATE | May 09 2006 |
| PRESSURE RANGE | 6003.56 psi | TEMPERATURE RANGE | 149.30 Deg. C |

ACCURACY

As shown in the graph below, this Spartek Gauge conformed to within +/- 0.022 %F.S. of the pressure standard used in calibration, which is accurate to within +/- 0.01% of reading. This gives an overall accuracy of +/-(0.022%F.S. + 0.01% of reading)

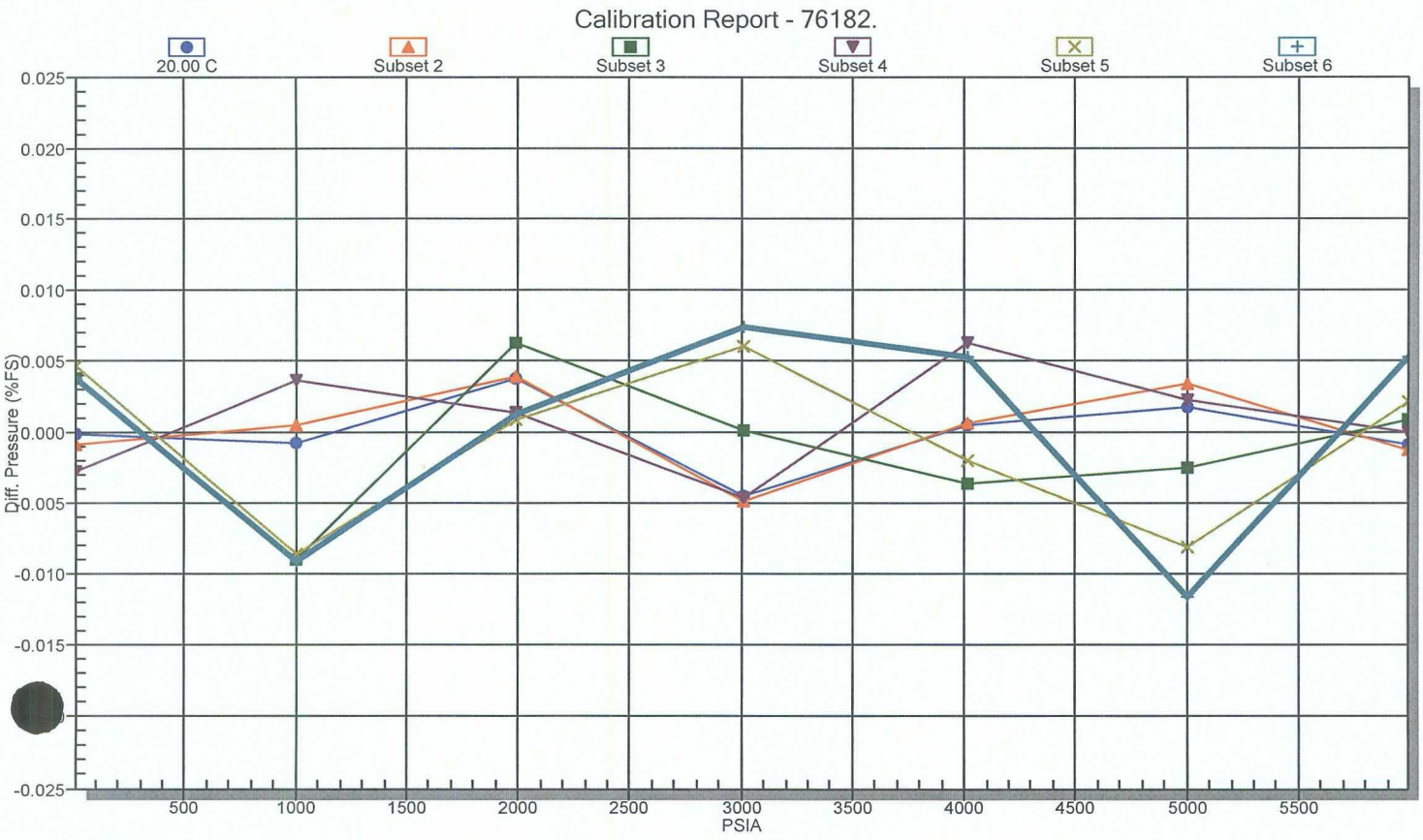



Accepted By: _____

Date: Wednesday, December 17, 2008

**Spartek Systems**
#1 Thevenaz Ind. Tr.
Sylvan Lake, AB, Ca, T4S 1P5
Phone (403) 887-2443
Fax (403) 887-4050

# Pressure Gauge
# Certificate of Calibration




GAUGE NUMBER: 76182

2-D POLYNOMIAL LMS CURVEFIT

| | | | |
|---|---|---|---|
| Source of f: | Pres | Temp | Pressure Equation: |
| Fit Order: | 3 | 4 | Pressure (PSI) = A + xp(B + xp(C + xp(D))) |
| Prescale: | xp = m * (fp - fp0) | xt = m * (ft - ft0) | |
| m: | 0.01 | 0.01 | Temperature Compenstation: |
| | fp0 = 688862 | ft0 = 152426 | A = A0 + xt(A1 + xt(A2 + xt(A3 + xt(A4)))) |
| | | | B = B0 + xt(B1 + xt(B2 + xt(B3 + xt(B4)))) |
| | | | C = C0 + xt(C1 + xt(C2 + xt(C3 + xt(C4)))) |
| | | | D = D0 + xt(D1 + xt(D2 + xt(D3 + xt(D4)))) |

| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Pressure (psi) STANDARD FIT COEFFICIENTS: | | | | |
| A 13.47852494 | 0.2189303292 | 0.0005428346087 | -5.845752466E-07 | -4.705748664E-09 |
| B 1.99173863 | -0.00165322469 | -7.67652636E-07 | -2.220527404E-09 | 4.851584078E-12 |
| C -4.524144325E-06 | 1.026879913E-08 | -4.319609922E-12 | -1.009417117E-12 | -4.518369862E-15 |
| D 1.235198867E-10 | 5.134001041E-13 | 6.499233546E-14 | 4.86295983E-16 | 1.270013257E-18 |

Temperature (C) STANDARD FIT COEFFICIENTS

A 19.94484003

B -0.3611188605

C -4.342615759E-05

D -3.152177425E-07

0 points eliminated.
Error File: Gauge # 76182

| Pressure psi | Temperature Deg. C | Count (Pres) | Count (Temp) | DIFF (press) psi |
|---|---|---|---|---|
| 1003.75 | 20.00 | -0.05 | -0.17 | -0.17 |
| 1993.33 | 20.00 | 0.22 | -0.22 | -0.22 |
| 3008.16 | 20.00 | -0.27 | -0.18 | -0.18 |
| 4012.02 | 20.00 | 0.03 | 0.00 | 0.00 |
| 5001.33 | 20.00 | 0.11 | 0.22 | 0.22 |
| 5987.27 | 20.00 | -0.05 | 0.51 | 0.51 |
| 13.50 | 50.00 | -0.05 | -0.05 | -0.05 |
| 1003.75 | 50.00 | 0.03 | -0.13 | -0.13 |
| 1993.33 | 50.00 | 0.23 | -0.20 | -0.20 |
| 3008.16 | 50.00 | -0.29 | -0.18 | -0.18 |
| 4012.02 | 50.00 | 0.04 | -0.09 | -0.09 |
| 5001.33 | 50.00 | 0.20 | 0.05 | 0.05 |
| 5987.27 | 50.00 | -0.08 | 0.31 | 0.31 |
| 13.50 | 85.00 | 0.22 | 0.08 | 0.08 |
| 1003.75 | 85.00 | -0.54 | 0.00 | 0.00 |
| 1993.33 | 85.00 | 0.38 | -0.08 | -0.08 |
| 3008.16 | 85.00 | 0.01 | -0.08 | -0.08 |
| 4012.02 | 85.00 | -0.21 | 0.00 | 0.00 |
| 5001.33 | 85.00 | -0.15 | 0.11 | 0.11 |
| 5987.27 | 85.00 | 0.05 | 0.29 | 0.29 |
| 13.50 | 110.00 | -0.16 | 0.06 | 0.06 |
| 1003.75 | 110.00 | 0.22 | -0.03 | -0.03 |
| 1993.33 | 110.00 | 0.08 | -0.09 | -0.09 |
| 3008.16 | 110.00 | -0.27 | -0.09 | -0.09 |
| 4012.02 | 110.00 | 0.37 | -0.04 | -0.04 |
| 5001.33 | 110.00 | 0.13 | 0.04 | 0.04 |
| 5987.27 | 110.00 | 0.00 | 0.19 | 0.19 |
| 13.50 | 135.00 | 0.27 | 0.00 | 0.00 |
| 1003.75 | 135.00 | -0.51 | -0.06 | -0.06 |
| 1993.33 | 135.00 | 0.06 | -0.13 | -0.13 |
| 3008.16 | 135.00 | 0.36 | -0.16 | -0.16 |
| 4012.02 | 135.00 | -0.12 | -0.12 | -0.12 |
| 5001.33 | 135.00 | -0.49 | -0.05 | -0.05 |
| 5987.27 | 135.00 | 0.13 | 0.07 | 0.07 |
| 13.50 | 150.00 | 0.22 | 0.14 | 0.14 |
| 1003.75 | 150.00 | -0.55 | 0.06 | 0.06 |
| 1993.33 | 150.00 | 0.07 | -0.03 | -0.03 |
| 3008.16 | 150.00 | 0.44 | -0.05 | -0.05 |
| 4012.02 | 150.00 | 0.31 | -0.03 | -0.03 |
| 5001.33 | 150.00 | -0.69 | 0.03 | 0.03 |
| 5987.27 | 150.00 | 0.31 | 0.14 | 0.14 |

**Spartek Systems**
#1 Thevenaz Ind. Tr.
Sylvan Lake, AB, Ca, T4S 1P5
Phone (403) 887-2443
Fax (403) 887-4050

# Pressure Gauge
# Certificate of Conformance

| | | | |
|---|---|---|---|
| MODEL | 1139 | REVISION | 0 |
| SERIAL NUMBER | 76182 | DEADWEIGHT USED | Piston Cylinder No. 528 |
| CALIBRATED | DEC15/06 | E.U.B. CERT. DATE | May 09 2006 |
| PRESSURE RANGE | 5987.27 psi | TEMPERATURE RANGE | 150.00 Deg. C |

ACCURACY
As shown in the graph below, this Spartek Gauge conformed to within +/- 0.025 %F.S. of the pressure standard used in calibration, which is accurate to within +/- 0.01% of reading. This gives an overall accuracy of +/-(0.025%F.S. + 0.01% of reading)

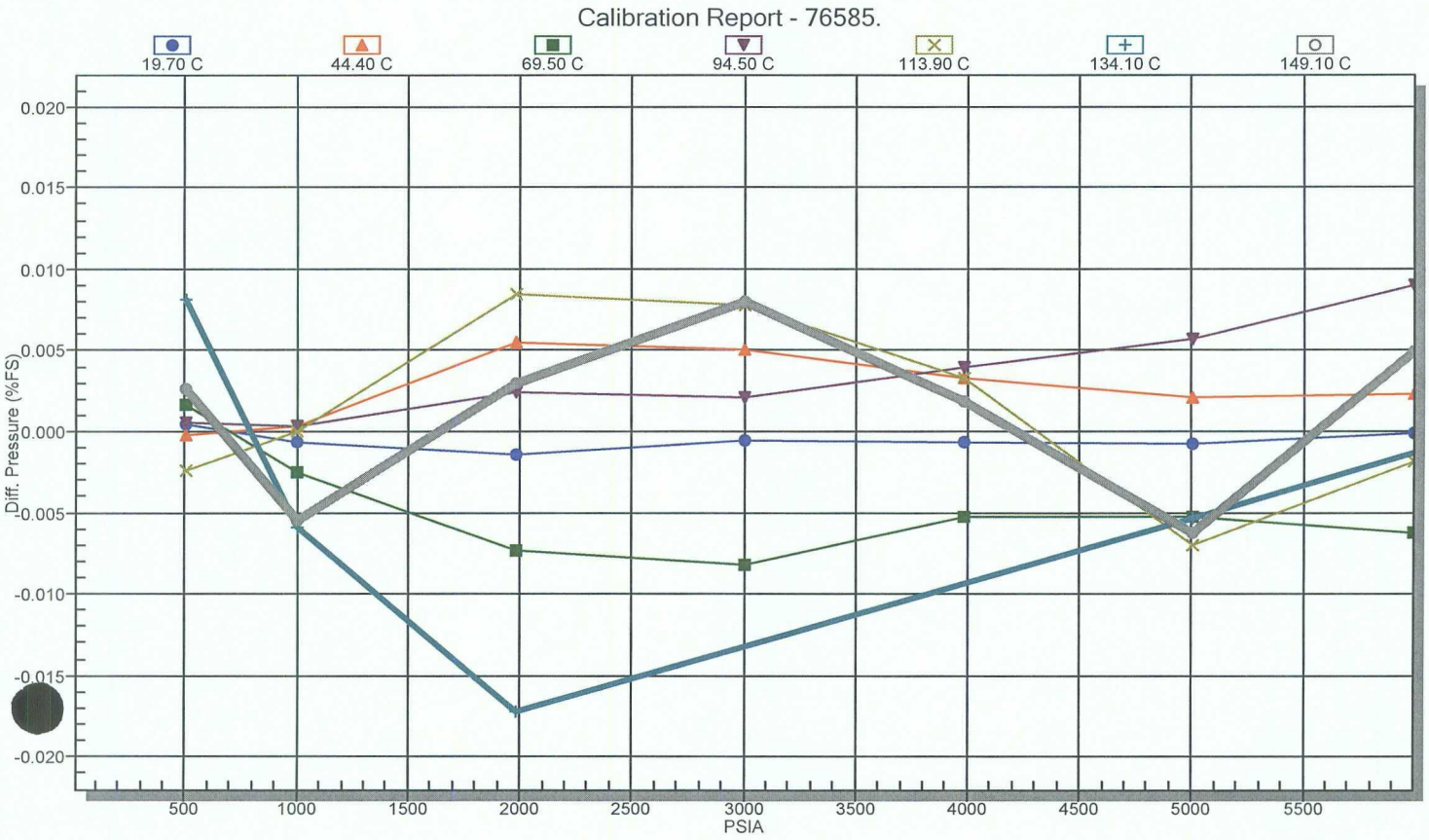

Accepted By: _____

Date: Wednesday, April 09, 2008

**Spartek Systems**
#1 Thevenaz Ind. Tr.
Sylvan Lake, AB, Ca, T4S 1P5
Phone (403) 887-2443
Fax (403) 887-4050

# Pressure Gauge

## Certificate of Calibration




GAUGE NUMBER: 76585

2-D POLYNOMIAL LMS CURVEFIT

| | | |
|---|---|---|
| Source of f: | Pres | Temp |
| Fit Order: | 3 | 4 |
| Prescale: | xp = m * (fp - fp0) | xt = m * (ft - ft0) |
| m: | 0.01 | 0.01 |
| | fp0 = 716247 | ft0 = 154394 |

Pressure Equation:

Pressure (PSI) = A + xp(B + xp(C + xp(D)))

Temperature Compenstation:

A = A0 + xt(A1 + xt(A2 + xt(A3 + xt(A4))))

B = B0 + xt(B1 + xt(B2 + xt(B3 + xt(B4))))

C = C0 + xt(C1 + xt(C2 + xt(C3 + xt(C4))))

D = D0 + xt(D1 + xt(D2 + xt(D3 + xt(D4))))

| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Pressure (psi) STANDARD FIT COEFFICIENTS: | | | | |
| A 506.56816 | -0.3021983464 | -0.0002011536835 | -3.342493636E-06 | -7.392728168E-09 |
| B 2.539145276 | -0.002248915424 | -3.160630871E-06 | -1.532756376E-08 | -1.520790322E-11 |
| C 4.170599769E-06 | 1.507087904E-07 | 2.501358088E-09 | 1.101189316E-11 | 1.099585241E-14 |
| D 2.934358933E-11 | -4.523237952E-11 | -7.325144003E-13 | -3.298214675E-15 | -3.419194911E-18 |

Temperature (C) STANDARD FIT COEFFICIENTS

A 19.80967765

B -0.3540814361

C 4.758682836E-05

D -5.814773214E-08

2 points eliminated.
Error File: Gauge # 76585

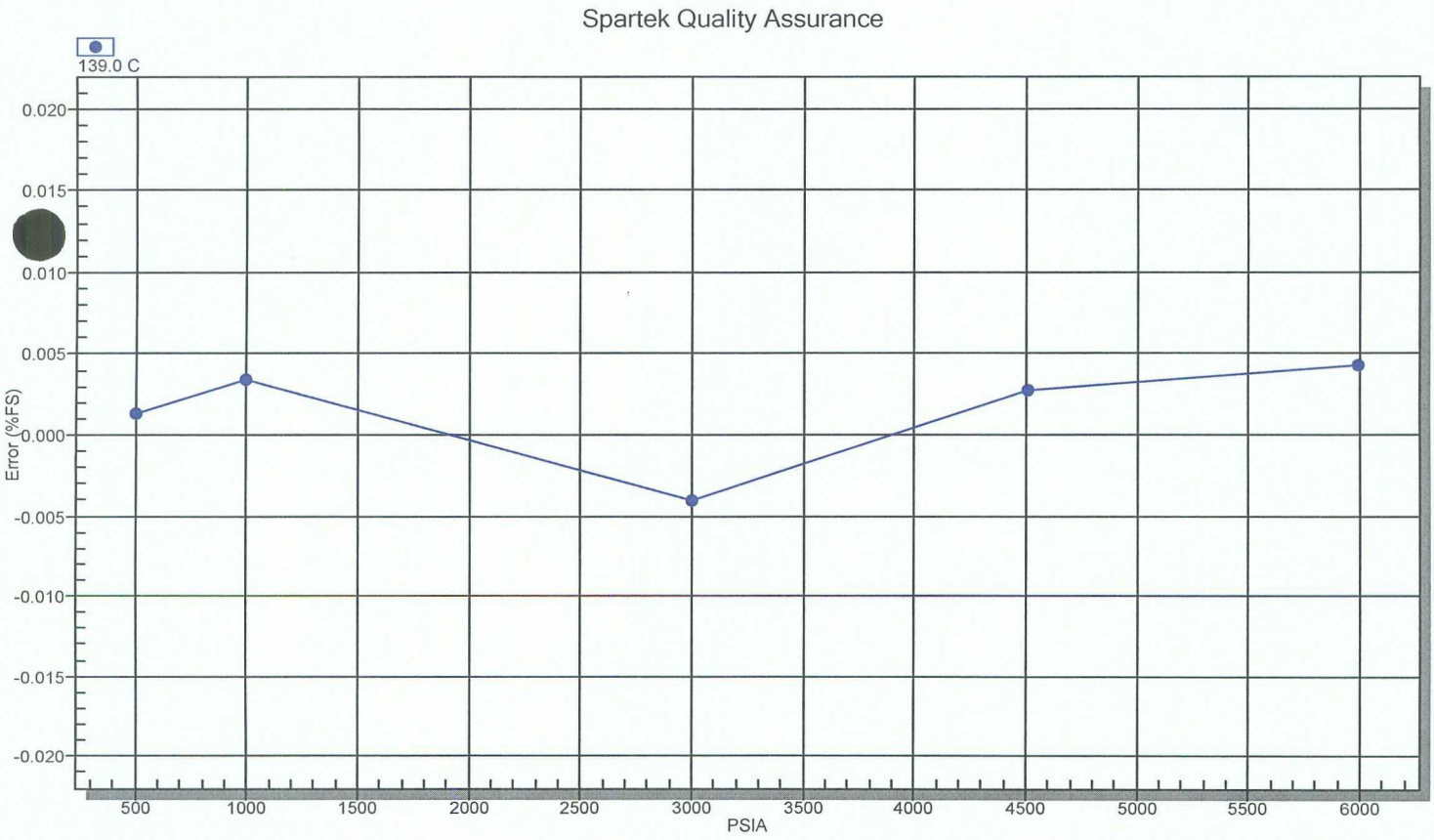
| Pressure psi | Temperature Deg. C | Count (Pres) | Count (Temp) | DIFF (press) psi |
|---|---|---|---|---|
| 506.55 | 19.70 | 716247.31 | 154394.25 | 0.03 |
| 999.76 | 19.70 | 735667.00 | 154408.25 | -0.04 |
| 1986.22 | 19.70 | 774482.69 | 154428.75 | -0.09 |
| 3001.67 | 19.70 | 814392.31 | 154436.75 | -0.03 |
| 3988.09 | 19.70 | 853094.69 | 154430.25 | -0.04 |
| 5003.51 | 19.70 | 892855.31 | 154409.25 | -0.05 |
| 5989.88 | 19.70 | 931392.31 | 154376.50 | -0.01 |
| 506.55 | 44.40 | 715472.31 | 147516.50 | -0.02 |
| 999.76 | 44.40 | 733853.69 | 147530.75 | 0.02 |
| 1986.22 | 44.40 | 770615.69 | 147555.25 | 0.33 |
| 3001.67 | 44.40 | 808413.00 | 147567.25 | 0.30 |
| 3988.09 | 44.40 | 845077.69 | 147566.25 | 0.20 |
| 5003.51 | 44.40 | 882752.31 | 147552.75 | 0.12 |
| 5989.88 | 44.40 | 919267.31 | 147527.25 | 0.14 |
| 506.55 | 69.50 | 714697.00 | 140632.00 | 0.10 |
| 999.76 | 69.50 | 732155.69 | 140646.00 | -0.15 |
| 1986.22 | 69.50 | 767052.69 | 140670.00 | -0.44 |
| 3001.67 | 69.50 | 802935.00 | 140680.00 | -0.49 |
| 3988.09 | 69.50 | 837750.00 | 140682.50 | -0.32 |
| 5003.51 | 69.50 | 873529.00 | 140678.25 | -0.32 |
| 5989.88 | 69.50 | 908215.00 | 140659.25 | -0.38 |
| 506.55 | 94.50 | 713924.31 | 133949.25 | 0.03 |
| 999.76 | 94.50 | 730523.00 | 133956.50 | 0.02 |
| 1986.22 | 94.50 | 763713.00 | 133971.50 | 0.14 |
| 3001.67 | 94.50 | 797844.31 | 133981.50 | 0.13 |
| 3988.09 | 94.50 | 830966.00 | 133987.00 | 0.23 |
| 5003.51 | 94.50 | 865003.31 | 133981.00 | 0.34 |
| 5989.88 | 94.50 | 898005.00 | 133967.75 | 0.54 |
| 506.55 | 113.90 | 713393.00 | 128865.25 | -0.15 |
| 999.76 | 113.90 | 729326.31 | 128878.00 | 0.00 |
| 1986.22 | 113.90 | 761235.00 | 128898.00 | 0.51 |
| 3001.67 | 113.90 | 794082.00 | 128910.75 | 0.47 |
| 3988.09 | 113.90 | 825969.00 | 128916.75 | 0.19 |
| 5003.51 | 113.90 | 858737.00 | 128917.00 | -0.42 |
| 5989.88 | 113.90 | 890514.31 | 128906.00 | -0.11 |
| 506.55 | 134.10 | 713042.00 | 123983.25 | 0.49 |
| 999.76 | 134.10 | 728289.69 | 123994.00 | -0.35 |
| 1986.22 | 134.10 | 758915.31 | 124011.75 | -1.03 |
| 5003.51 | 134.10 | 852963.31 | 124028.00 | -0.32 |
| 5989.88 | 134.10 | 883616.31 | 124024.50 | -0.08 |
| 506.55 | 149.10 | 712889.00 | 120032.00 | 0.16 |
| 999.76 | 149.10 | 727621.00 | 120047.00 | -0.33 |
| 1986.22 | 149.10 | 757288.00 | 120066.00 | 0.18 |
| 3001.67 | 149.10 | 787971.69 | 120075.00 | 0.48 |
| 3988.09 | 149.10 | 817833.31 | 120083.50 | 0.11 |
| 5003.51 | 149.10 | 848556.69 | 120081.25 | -0.38 |
| 5989.88 | 149.10 | 878358.69 | 120081.50 | 0.29 |

**Spartek Systems**
#1 Thevenaz Ind. Tr.
Sylvan Lake, AB, Ca, T4S 1P5
Phone (403) 887-2443
Fax (403) 887-4050

# Pressure Gauge
# Certificate of Conformance

| | | | |
|---|---|---|---|
| MODEL | 1139 | REVISION | 0 |
| SERIAL NUMBER | 76585 | DEADWEIGHT USED | Piston Cylinder No. 528 |
| CALIBRATED | APR23/09 | E.U.B. CERT. DATE | May 09 2007 |
| PRESSURE RANGE | 5989.88 psi | TEMPERATURE RANGE | 149.10 Deg. C |

ACCURACY
As shown in the graph below, this Spartek Gauge conformed to within +/- 0.022 %F.S. of the pressure standard used in calibration, which is accurate to within +/- 0.01% of reading. This gives an overall accuracy of +/-(0.022%F.S. + 0.01% of reading)




Accepted By: _____

Date: Tuesday, April 28, 2009

Sapphire,Apr 24/06
6 8 -13.50
14.50, 20.00, 685942.69, 153089.50
506.26, 20.00, 715338.00, 153115.50
1002.15, 20.00, 744991.31, 153130.25
1990.65, 20.00, 804243.69, 153128.75
3006.81, 20.00, 865357.69, 153117.25
3993.52, 20.00, 924665.00, 153033.00
5011.56, 20.00, 985922.31, 152918.25
5998.12, 20.00, 1045264.69, 152778.00
14.50, 50.00, 686448.69, 144848.75
506.26, 50.00, 713978.69, 144891.75
1002.15, 50.00, 741731.69, 144887.75
1990.65, 50.00, 797204.69, 144920.75
3006.81, 50.00, 854346.00, 144873.00
3993.52, 50.00, 909938.00, 144846.75
5011.56, 50.00, 967245.31, 144742.25
5998.12, 50.00, 1022829.31, 144640.25
14.50, 85.00, 686779.31, 135387.25
506.26, 85.00, 712413.69, 135408.25
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5998.12, 85.00, 999775.69, 135248.50
14.50, 110.00, 686974.31, 128942.00
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1002.15, 110.00, 735918.69, 128976.75
1990.65, 110.00, 785070.31, 128992.50
3006.81, 110.00, 835716.31, 128984.75
3993.52, 110.00, 884917.31, 128961.50
5011.56, 110.00, 935720.31, 128916.75
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506.26, 135.00, 710482.00, 122868.50
1002.15, 135.00, 733852.31, 122883.50
1990.65, 135.00, 780640.31, 122900.75
3006.81, 135.00, 828905.69, 122899.00
3993.52, 135.00, 875852.69, 122879.50
5011.56, 135.00, 924314.00, 122836.50
5998.12, 135.00, 971289.00, 122788.25
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1002.15, 150.00, 732847.00, 119416.50
1990.65, 150.00, 778204.31, 119429.00
3006.81, 150.00, 825113.31, 119427.50
3993.52, 150.00, 870745.00, 119414.50
5011.56, 150.00, 917896.00, 119384.75
5998.12, 150.00, 963608.69, 119336.50

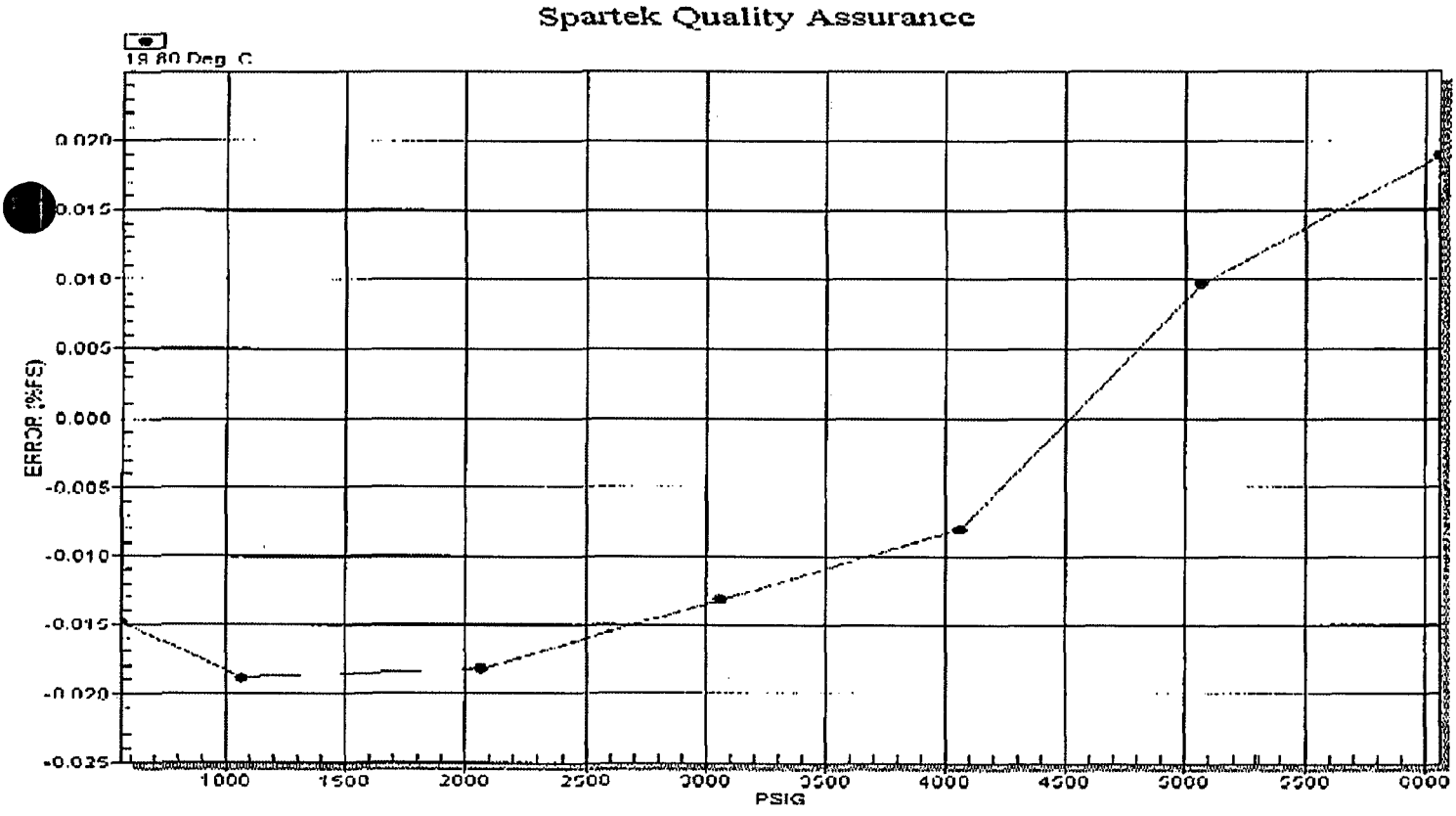
**Spartek Systems**
#1 Thevenaz Ind. Tr.
Sylvan Lake, AB, Ca. T4S 1P5
Phone (403) 887-2443
Fax (403) 887-4050

# Pressure Gauge

# Certificate of Conformance

| | | | |
|---|---|---|---|
| MODEL | 1139 | REVISION | 21 |
| SERIAL NUMBER | 76648 | DEADWEIGHT USED | |
| CALIBRATED | Apr 24/06 | E.U.B. CERT. DATE | |
| PRESSURE RANGE | 5998 psi | | |
| TEMPERATURE RANGE | 150 Deg. C | | |

ACCURACY
As shown in the graph below, this Spartek Gauge conformed to within +/- 0.025%F.S of the pressure standard used in calibration, which is accurate to within +/- 0.01% of reading. This gives an overall accuracy of +/-(0.025%F.S. + 0.01% of reading)

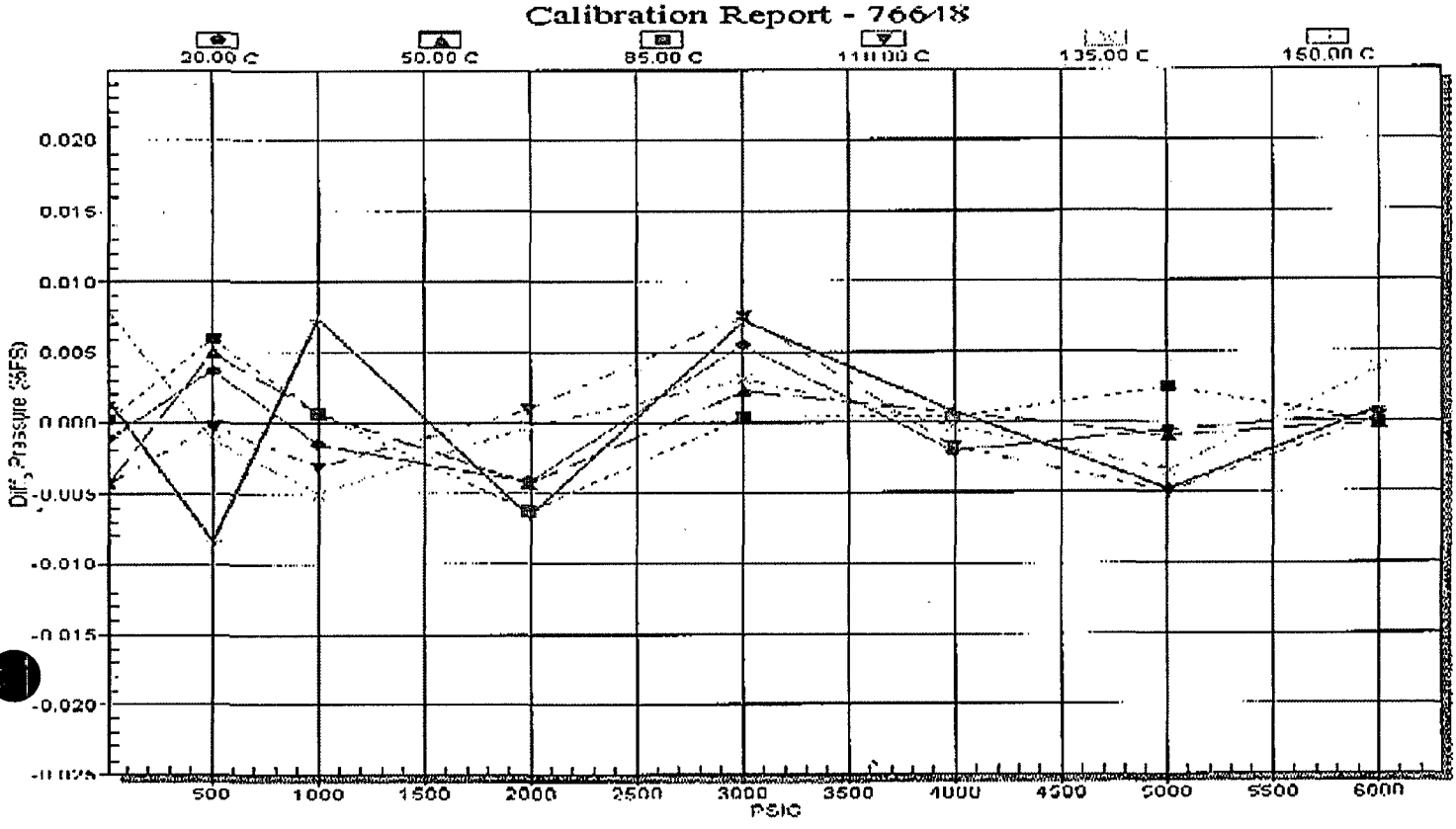



Accepted By: _____ Date: May 02 2006

**Spartek Systems**
#1 Thevenaz Ind. Tr.
Sylvan Lake, AB, Ca, T4S 1P5
Phone (403) 887-2443
Fax (403) 887-4050

# Pressure Gauge

# Certificate of Calibration




GAUGE NUMBER : 76648

2 D POLYNOMIAL LMS CURVEFIT

| | | | |
|---|---|---|---|
| Source of f: | Pres | Temp | Pressure Equation: |
| Fit Order: | 3 | 4 | Pressure (psi) A + xp(B + xp(C + xp(D))) |
| Formula: | xp = m * (fp - fp0) | xt = m * (ft - ft0) | |
| m: | 0.01 | 0.01 | Temperature Compensation: |
| | fp0 = 685942.0000 | ft0 = 153089.0000 | A = A0 + xt(A1 + xt(A2 + xt(A3 + xt(A4)))) |
| | | | B = B0 + xt(B1 + xt(B2 + xt(B3 + xt(B4)))) |
| | | | C = C0 + xt(C1 + xt(C2 + xt(C3 + xt(C4)))) |
| | | | D = D0 + xt(D1 + xt(D2 + xt(D3 + xt(D4)))) |

| 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Pressure (psi) STANDARD FIT COEFFICIENTS: | | | | |
| A 14.419054 | 0.1331522319 | 0.0002036014076 | -9.569877646E-7 | -4.198592143E-9 |
| B 1.675269078 | -0.001500544319 | -2.027192994E-6 | 9.283776385E-9 | -8.696558505E-12 |
| C -3.664425458E-6 | 8.601210007E-8 | 1.446532444E 9 | 7.024480868E-12 | 9.406930557E-15 |
| D -8.733132448E-11 | -1.797000068E-11 | -3.027313115E 13 | -1.520205606E-15 | -2.161140070E-18 |

Temperature (C) STANDARD FIT COEFFICIENTS:

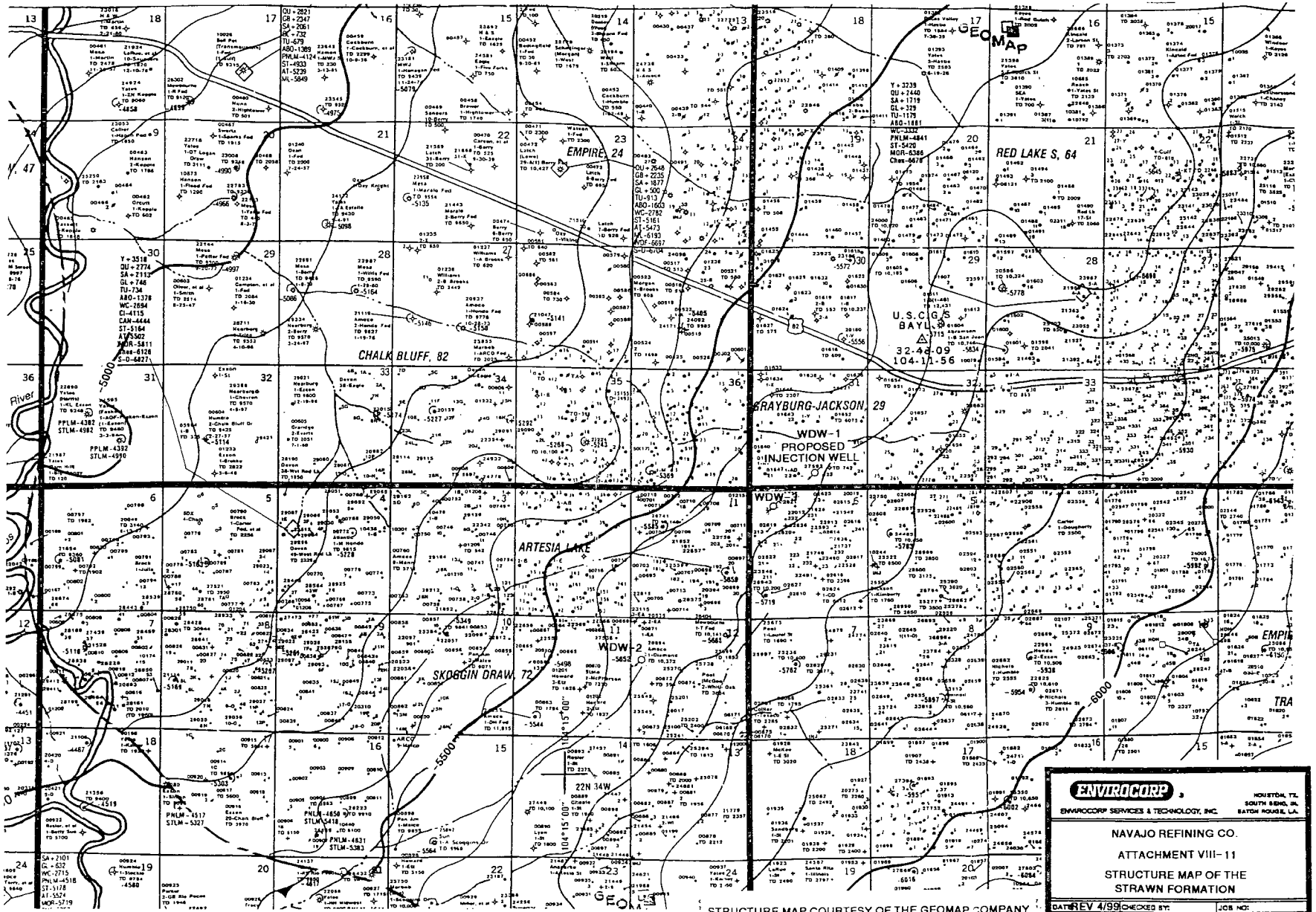
A 19.83009975

B -0.3672080205

C -5.247779942E-5

# APPENDIX I

# STRAWN STUCTURE MAPS




STRUCTURE MAP COURTESY OF THE GEOMAP COMPANY
Poster July 1997

ENVIROCORP
ENVIROCORP SERVICES & TECHNOLOGY, INC.
HOUSTON, TX.
SOUTH BEND, IN.
BATON ROUGE, LA.

NAVAJO REFINING CO.

ATTACHMENT VIII-11

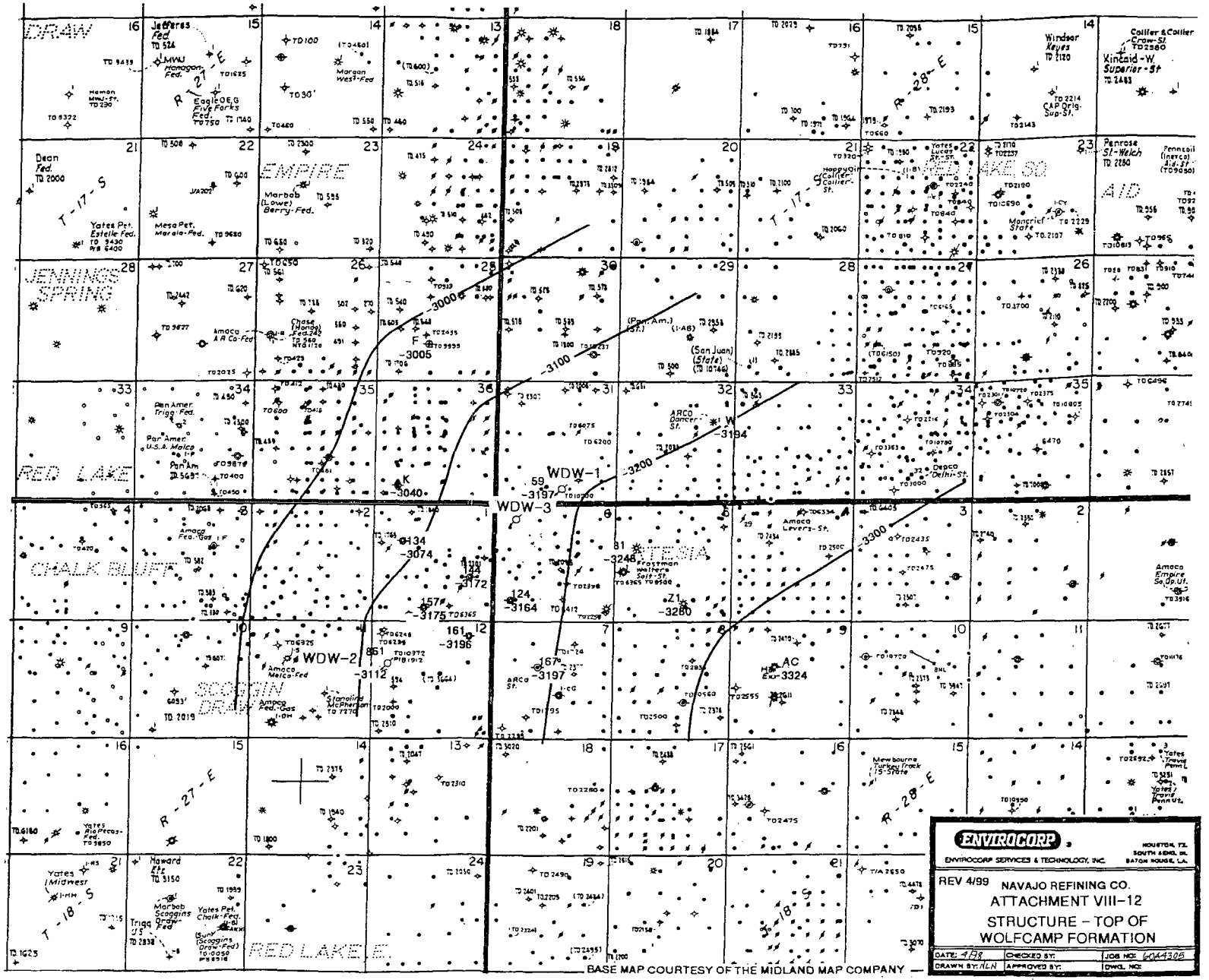
STRUCTURE MAP OF THE STRAWN FORMATION

| DATE REV 4/99 | CHECKED BY: | JOB NO: |
|---|---|---|
| DRAWN BY: | APPROVED BY: | DWG. NO: |

**APPENDIX I**

# APPENDIX J

# WOLFCAMP STRUCTURE MAPS




ENVIROCORP
ENVIROCORP SERVICES & TECHNOLOGY, INC.
HOUSTON, TX. SOUTH BEND, IN. BATON ROUGE, LA.

REV 4/99 NAVAJO REFINING CO.

ATTACHMENT VIII-12

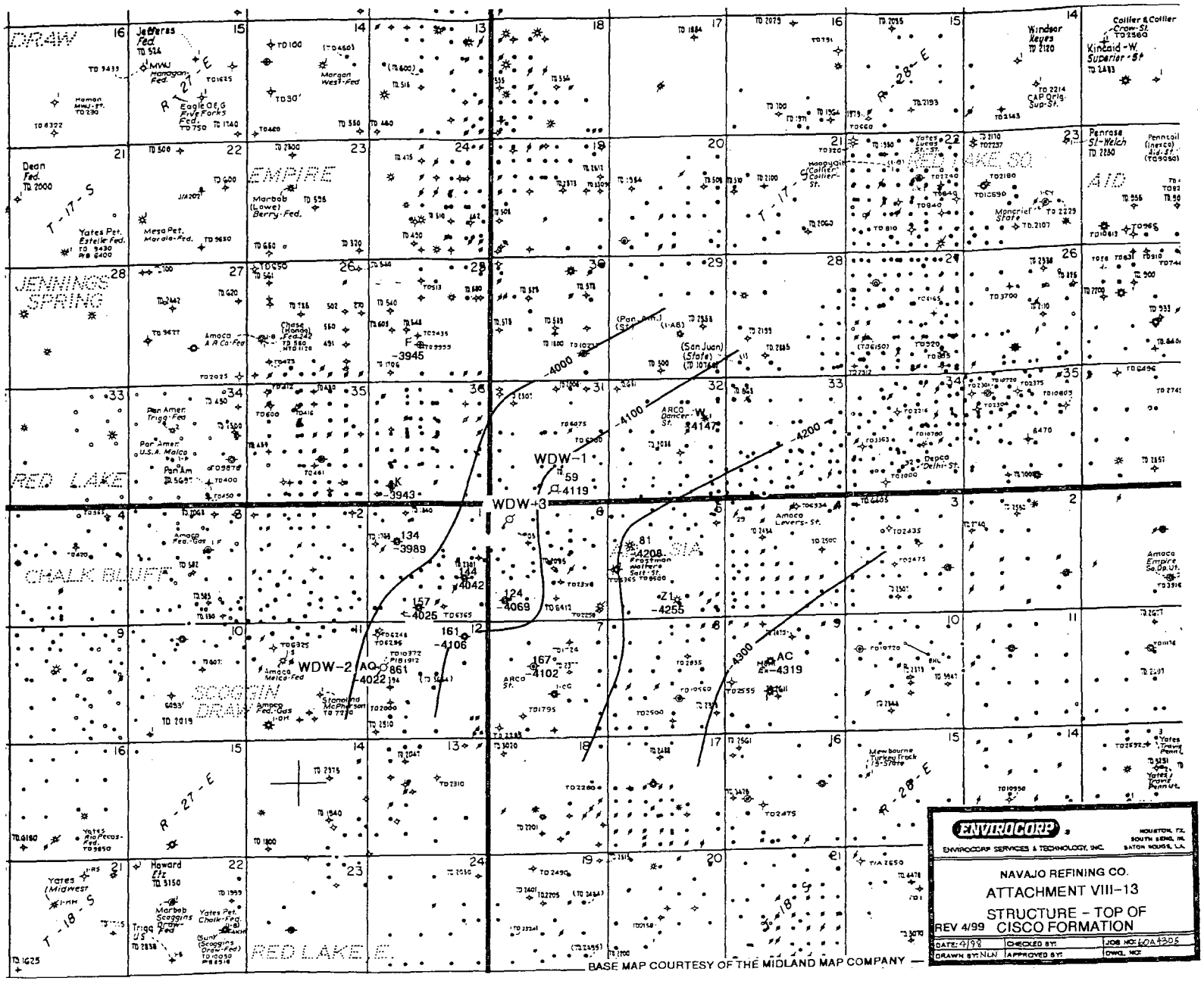
STRUCTURE - TOP OF WOLFCAMP FORMATION

| DATE: 4/98 | CHECKED BY: | JOB NO: 604306 |
|---|---|---|
| DRAWN BY: ALN | APPROVED BY: | DWG. NO: |

APPENDIX J

# APPENDIX K

# CISCO STRUCTURE MAPS




157 -4025 — ID NO. / SUBSEA DEPTH

BASE MAP COURTESY OF THE MIDLAND MAP COMPANY

ENVIROCORP — ENVIROCORP SERVICES & TECHNOLOGY, INC. — HOUSTON, TX. SOUTH BEND, IN. BATON ROUGE, LA.

NAVAJO REFINING CO.

ATTACHMENT VIII-13

STRUCTURE - TOP OF CISCO FORMATION

REV 4/99

| DATE: 4/98 | CHECKED BY: | JOB NO: 60A4305 |
|---|---|---|
| DRAWN BY: NLN | APPROVED BY: | DWG. NO: |

APPENDIX K

# APPENDIX L

# CHRONOLOGY OF FIELD ACTIVITIES

## APPENDIX L (Continued)

## CHRONOLOGY OF FIELD ACTIVITIES

**December 15, 2010**

Russell Smith:
Traveled to Artesia, New Mexico, and contacted contractors.

**December 16, 2010**

Russell Smith:
Subsurface arrived at the Navajo Plant at 8:00 a.m. CST. Memory read-out (MRO) gauges were placed into each well as follows:

WDW-1

Two MROs spotted at 7,924 feet 12:48 a.m. CST (Serial Nos. 76173 and 76871). Wire was 092 carbon steel. Wellhead pressure was 700 psig. Surface gauge (Serial No. 10579) was installed on December 17, 2010.

WDW-2

Two MROs spotted at 7,570 feet 09:33 a.m. CST (Serial Nos. 76169 and 76182). Wire was 092 stainless steel. Wellhead pressure was 550 psig.

WDW-3

Two MROs spotted at 7,660 feet 11:12 a.m. CST, wire was 092 carbon steel, Serial Nos. 76169 and 76182, and wellhead pressure was 700 psig.

**General Schedule**

1. Gauges in all wells and continue normal operations – Thursday – 12/16/2010 – 11:45 a.m.
2. Shut in well Nos. 2 and 3 and start injection period in well No. 1 – Saturday – 12/18/2010 1:45 p.m. – 49 hours

## APPENDIX L (Continued)

## CHRONOLOGY OF FIELD ACTIVITIES

3. Shut in well No. 1. Start falloff period – Sunday – 12/19/2010 – 10:45 p.m. – 33 hours
4. Pull gauges from all wells and return wells to normal operations – Tuesday – 12/21/2010 – 08:50 a.m. – 34 hours.
5. After 1:00 p.m. on Tuesday, 12/21/2010, the plant can restart injection into the wells.

All personnel left the well site at 1:00 p.m. Subsurface personnel traveled back to Houston, Texas.

**December 20, 2010**

Russell Smith:
Traveled to Artesia, New Mexico, and contacted contractors. Note, all times are in Mountain Standard Time (MST).

**December 21, 2010**

Russell Smith:
Subsurface personnel and wireline crew arrived at the well location at 7:00 a.m. MST. At 8:50 a.m., wireline crew started out of the wellbore with memory read-out (MRO) pressure gauges making five-minute gradient stops every 1,000 feet (7,924 feet, 7,000 feet, 6,000 feet, 5,000 feet, 4,000 feet, 3,000 feet, 2,000 feet, 1,000 feet, surface). At 10:23 a.m. MST wireline crew was out of the WDW-1 wellbore and moved over to the WDW-3 well. At 11:30 MST a.m. wireline crew started out of WDW-3 wellbore with MRO gauges. At 12:40 p.m. MST wireline crew moved over the WDW-2 and started out of the wellbore with MRO gauges. At 1:40 p.m. MST wireline crew had pulled all gauges and left the well site.

Subsurface personnel traveled back to Houston, Texas from Artesia, New Mexico.

# APPENDIX M

# PANSYSTEM© ANALYSIS OUTPUT

SUBSURFACE

| | |
|---|---|
| Company | Navajo Refining Company |
| Location | Artesia, New Mexico |
| Well | Mewbourne Well No. 1 |
| Date | December 16 - 21, 2011 |
| Test | Falloff |
| | |
| Gauge Depth | 7924 feet |
| | |
| Injection Interval | 7924 feet - 8476 feet |
| Completion Type | Perforated |
| Top of Fill | 9001 feet |
| Last Stabilization | January 2009 |
| | |
| Analyst | RLS |
| Subsurface Project No. | 70A6516 |

**Reservoir Description**

Fluid type : Water
Well orientation : Vertical
Number of wells : 1
Number of layers : 1

**Layer Parameters Data**

| | Layer 1 |
|---|---|
| Formation thickness | 175.0000 ft |
| Average formation porosity | 0.1000 |
| Water saturation | 0.0000 |
| Gas saturation | 0.0000 |
| Formation compressibility | 0.000000 psi-1 |
| Total system compressibility | 8.4000e-6 psi-1 |
| Layer pressure | 3716.931804 psia |
| Temperature | 0.000000 deg F |

**Well Parameters Data**

| | WDW-1 |
|---|---|
| Well radius | 0.3646 ft |
| Distance from observation to active well | 0.000000 ft |
| Wellbore storage coefficient | 0.0900 bbl/psi |
| Storage Amplitude | 0.000000 psi |
| Storage Time Constant | 0.000000 hr |
| Second Wellbore Storage | 0.170000 bbl/psi |
| Time Change for Second Storage | 0.050000 hr |
| Well offset - x direction | 0.0000 ft |
| Well offset - y direction | 0.0000 ft |

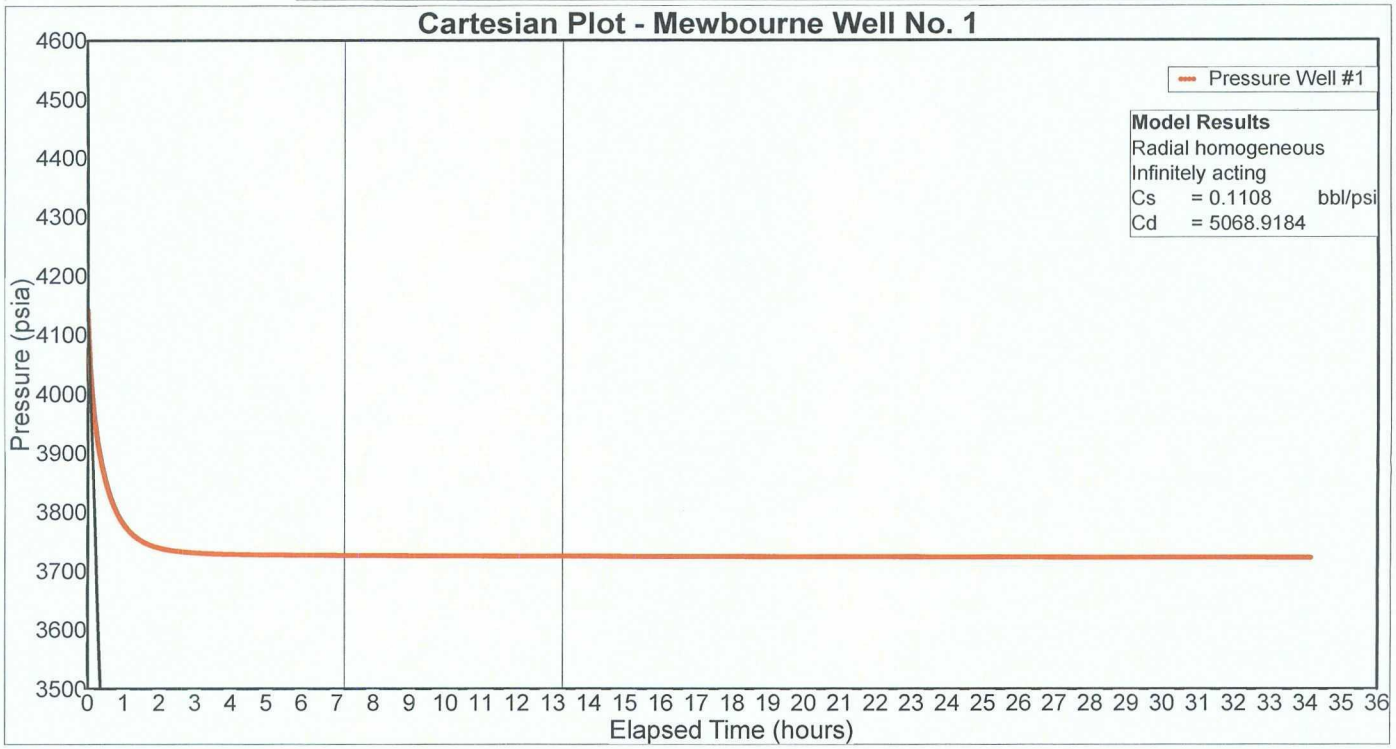
**Fluid Parameters Data**

| | Layer 1 |
|---|---|
| Oil gravity | 0.000000 API |
| Gas gravity | 0.000000 sp grav |
| Gas-oil ratio (produced) | 0.000000 scf/STB |
| Water cut | 0.000000 |
| Water salinity | 0.000000 ppm |
| Check Pressure | 0.000000 psia |
| Check Temperature | 0.000000 deg F |
| Gas-oil ratio (solution) | 0.000000 scf/STB |
| Bubble-point pressure | 0.000000 psia |
| Oil density | 0.000 lb/ft3 |
| Oil viscosity | 0.000 cp |
| Oil formation volume factor | 0.000 RB/STB |
| Gas density | 0.000 lb/ft3 |
| Gas viscosity | 0.0 cp |
| Gas formation volume factor | 0.000 ft3/scf |
| Water density | 0.000 lb/ft3 |
| Water viscosity | 0.570 cp |
| Water formation volume factor | 1.000 RB/STB |
| Oil compressibility | 0.000000 psi-1 |
| Initial Gas compressibility | 0.000000 psi-1 |
| Water compressibility | 0.000000 psi-1 |

**Layer 1 Correlations**
Not Used

**Rate Change Data**

| Time Hours | Pressure psia | Rate STB/day |
|---|---|---|
| -792.000000 | 0.000000 | -4228.888582 |
| -768.000000 | 0.000000 | -4391.549806 |
| -744.000000 | 0.000000 | -4384.479672 |
| -720.000000 | 0.000000 | -4384.376378 |
| -696.000000 | 0.000000 | -4374.848597 |
| -672.000000 | 0.000000 | -4176.157065 |
| -648.000000 | 0.000000 | -4325.868803 |
| -624.000000 | 0.000000 | -4308.064641 |
| -600.000000 | 0.000000 | -4302.856847 |
| -576.000000 | 0.000000 | -4268.163357 |
| -552.000000 | 0.000000 | -4211.405051 |
| -528.000000 | 0.000000 | -4314.799121 |
| -504.000000 | 0.000000 | -4274.892719 |
| -480.000000 | 0.000000 | -3790.877466 |
| -456.000000 | 0.000000 | -4078.245257 |
| -432.000000 | 0.000000 | -4080.230053 |
| -408.000000 | 0.000000 | -4067.616136 |
| -384.000000 | 0.000000 | -4044.605134 |
| -360.000000 | 0.000000 | -4027.491560 |
| -336.000000 | 0.000000 | -3777.450665 |
| -312.000000 | 0.000000 | -3466.263264 |
| -288.000000 | 0.000000 | -4606.468701 |
| -264.000000 | 0.000000 | -4060.063248 |
| -240.000000 | 0.000000 | -4051.826741 |
| -216.000000 | 0.000000 | -4064.050333 |
| -192.000000 | 0.000000 | -4064.043834 |
| -168.000000 | 0.000000 | -4082.369662 |
| -144.000000 | 0.000000 | -4090.841307 |
| -120.000000 | 4031.250000 | -4091.821452 |
| -96.000000 | 4031.250000 | -4087.686695 |
| -72.000000 | 4031.250000 | -4091.460208 |
| -47.449664 | 4031.250000 | -4113.064348 |
| -23.489933 | 4040.625000 | -4063.756218 |
| 0.696213 | 4045.107422 | -3687.836512 |
| 21.181005 | 4039.775391 | -3633.179677 |
| 49.300562 | 4046.689453 | -4268.197524 |
| 82.243625 | 4145.268121 | -4683.825820 |
| 116.393616 | 3722.481995 | 0.000000 |

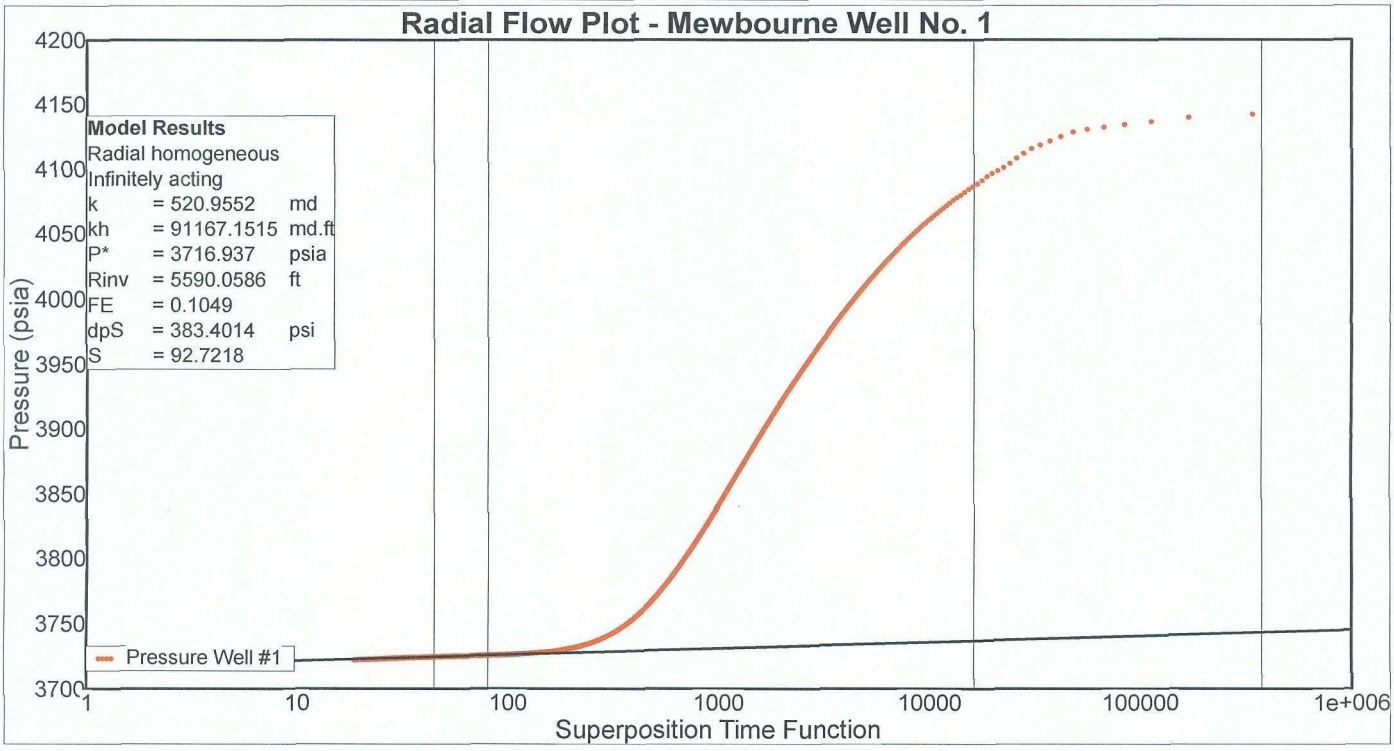



**Cartesian Plot - Mewbourne Well No. 1 Model Results**
Radial homogeneous - Infinitely acting

Time Stepped Wellbore Storage

| | Value |
|---|---|
| Wellbore storage coefficient | 0.110797 bbl/psi |
| Dimensionless wellbore storage | 5068.918371 |

**Cartesian Plot - Mewbourne Well No. 1 Line Details**
Line type : Wellbore storage
Slope : -1761.41
Intercept : 4146.57
Coefficient of Determination : 0.99476
Number of Intersections = 0




**Radial Flow Plot - Mewbourne Well No. 1 Model Results**
Radial homogeneous - Infinitely acting

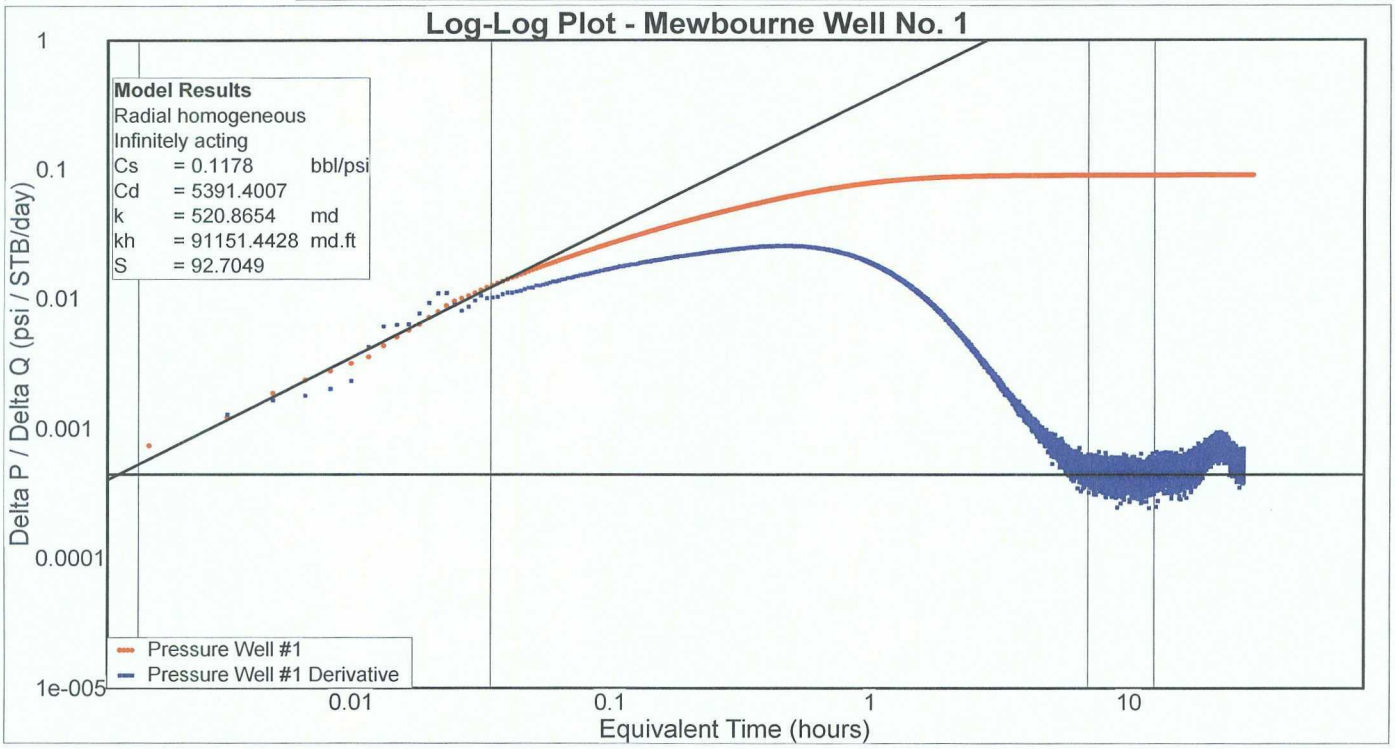
Time Stepped Wellbore Storage

| | Value |
|---|---|
| Permeability | 520.955151 md |
| Permeability-thickness | 9.1167e4 md.ft |
| Extrapolated pressure | 3716.937002 psia |
| Radius of investigation | 5590.058560 ft |
| Flow efficiency | 0.104895 |
| dP skin (constant rate) | 383.401416 psi |
| Skin factor | 92.721791 |

**Radial Flow Plot - Mewbourne Well No. 1 Line Details**
Line type : Radial flow
Slope : 4.76056
Intercept : 3716.94
Coefficient of Determination : 0.991613

| | Radial flow |
|---|---|
| Extrapolated pressure | 3716.937002 psia |
| Pressure at dt = 1 hour | 3730.043896 psia |

Number of Intersections = 0




**Log-Log Plot - Mewbourne Well No. 1 Model Results**
Radial homogeneous - Infinitely acting

Time Stepped Wellbore Storage

| | Value |
|---|---|
| Wellbore storage coefficient | 0.117846 bbl/psi |
| Dimensionless wellbore storage | 5391.400700 |
| Permeability | 520.865387 md |
| Permeability-thickness | 9.1151e4 md.ft |
| Skin factor | 92.704903 |

**Log-Log Plot - Mewbourne Well No. 1 Line Details**
Line type : Radial flow
Slope : 0
Intercept : 0.000441485
Coefficient of Determination : Not Used

Line type : Wellbore storage
Slope : 1
Intercept : 0.353569
Coefficient of Determination : Not Used

Number of Intersections = 0