

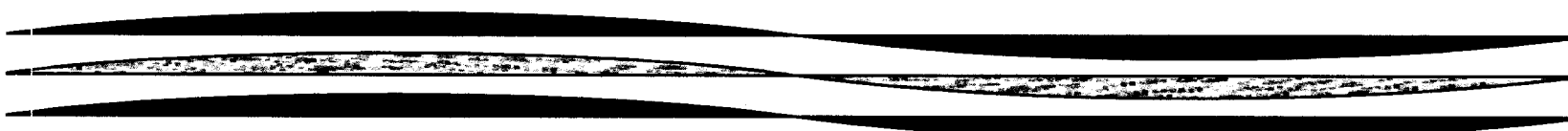
**2012 PRESSURE FALLOFF TEST AND BOTTOM-HOLE
PRESSURE SURVEY ON CHUKKA WELL NO. 2**

**NAVAJO REFINING COMPANY
ARTESIA, NEW MEXICO**

SUBSURFACE PROJECT NO. 70D6835

**SUBMITTED:
FEBRUARY 2013**

**SUBSURFACE TECHNOLOGY, INC.
HOUSTON, TEXAS 77024**





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PREPARED BY:

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I Thaine W Cook, Jr, PE certify that the following is accurate:

1. I or my agent have visited and examined the facility;
2. This report was prepared in accordance with good engineering practice and accepted and sound industry practices and standards;
3. I either have prepared engineering portions of this report or they were prepared under my supervision and I certify that they are correct.

Signature


Name Thane W Cook, Jr, PE

Title: Principal Consultant

Date: 1/14/2013

New Mexico PE # 20219



1/14/2013

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 Chukka Well No. 2. The test was performed in accordance with The 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 assess 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 to 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 36.07-hour injection period and a 33.15-hour falloff period. Bottom-hole gauges were also placed in the offset wells: Mewbourne Well No. 1 and Gaines Federal Well No. 3. These wells are owned by Navajo and are also used to inject plant waste into the same injection interval as Chukka Well No. 2.

As prescribed by the guidelines, this report discusses supporting and background information for Chukka Well No. 2, the one-mile area of review (updated since the 2011 falloff testing), and geology. In addition, information on the offset wells is provided. Daily testing activities and the point of shut-in are also provided. The pressure falloff testing and analysis results are discussed in Section 15.

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 OGRD Number: Section 1, Township 18 South, Range 27 East

2. WELL INFORMATION

- a. OCD UIC Permit Number: WDW-2 UIC I-8-1
- b. Well Classification: Class I Non-Hazardous
- c. Well Name and Number: Chukka Well No. 2
- d. API Number: 30-015-20894
- e. Well Legal Location: 1980 FNL, 660 FWL

3. CURRENT WELLBORE SCHEMATIC

The Chukka Well No. 2 wellbore schematic is presented in Figure 1. The schematic contains data, as requested by the guidelines and includes the following:

- a. Tubing: 3-1/2-inch, 9.2 pound per foot, steel construction, API grade J-55, smls, NUE 10 rd; (Item 3)
- b. Packer: Arrow X-1, 5-1/2-inch by 2-7/8-inch set in tension at 7,528 feet; (Item 7)
- c. Tubing Length: 7,528 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 two casing strings in the well and one below the injection interval. The information for these casing strings was obtained from OCD records on file with the state and geophysical logs. The casing strings are:

- i. 8-5/8-inch, 32.5 pound per foot, steel construction, API grade J-55, with short thread connections (STC), set at a depth of 1,995 feet. The casing was cemented to the surface with 800 sacks of cement. The casing was set in open hole with a diameter of 11 inches; (Item 2)
 - ii. 5-1/2-inch, 17 pound per foot, steel construction, API grade L-80, LT&C, set at a depth of 8,869 feet. The casing was cemented to the surface in two stages with 575 sacks of cement in the first stage and 995 sacks of cement in the second stage. The casing was set in open hole with a diameter of 7-7/8-inches. (Item 6)
- e. The top of cement: Determined from a CBL run in the 5-1/2-inch casing string on May 28, 1999. The top of cement in the 5-1/2-inch casing was found at the surface. From the CBL run in the 8-5/8-inch on May 9, 1999, the top of cement in the 9-5/8-inch was determined to be at 116 feet.
- f. The 5-1/2-inch casing: Perforated on June 1, 1999. The casing was perforated with a 0.5-inch diameter hole, at 2 shots per foot, on a 120° phasing. The perforations are located between 7,570 feet and 7,736 feet and from 7,826 feet to 8,399 feet.
- g. The total depth of the well: 10,372 feet, with the plug back depth at 8,770 feet. On November 3, 2012, fill was tagged at 8,773 feet (GL).
- h. The bottom-hole pressure gauges consisted of two memory readout (MRO) pressure gauges. The MRO pressure gauges were placed at 7,569 feet and 7,570 feet (top of the perforations).

4. ELECTRIC LOG ENCOMPASSING THE COMPLETED INTERVAL

The dual induction log is presented as Appendix A and encompasses the completed interval between 7,570 feet and 8,399 feet. The dual induction log was submitted to the OCD with the original permit. The original dual induction log was

completed August 27, 1973 by Amoco Production Company. The log was resubmitted to the OCD when the well was re-permitted as a Class I injection well.

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

The neutron density log is presented as Appendix B and encompasses the completed interval between 7,570 feet and 8,399 feet. The neutron density log was submitted to the OCD with the original permit after the well was drilled by Amoco Production Company. The compensated neutron formation density log was completed on August 27, 1973. The log was resubmitted to the OCD when the well was re-permitted as a Class I injection well. The average 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 Chukka Well No. 2 was recompleted in June 1999, prior to the issuance of the current well testing guidelines (December 3, 2007). At that time, no directives were in place to test formation fluids or derive formation characteristics from cores. However, reservoir fluid samples were obtained and the average specific gravity 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 $2.9 \times 10^{-6} \text{ psi}^{-1}$. The formation pore volume compressibility was estimated using Appendix D (Figure G.5 SPE Monograph 1). This value was $5.5 \times 10^{-6} \text{ psi}^{-1}$. The total system compressibility is the sum of the fluid compressibility and the pore volume compressibility, $8.4 \times 10^{-6} \text{ psi}^{-1}$. The temperature used with the correlations was recorded during the temperature survey conducted in the Chukka Well No. 2 on May 28, 1999 and June 5, 1999, and included in this report as Appendix E.

b. Formation Fluid Viscosity with Reference Temperature:

The formation fluid had an average 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 specific gravity 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 of the refinery waste water was measured during the injection portion of the reservoir testing. The specific gravity was 1.0013 (8.34 pounds per gallon). Using the same methodology described above, the viscosity of the injected fluid was 0.50 cp at 127°F. The compressibility of the injected plant waste was $2.9 \times 10^{-6} \text{ psi}^{-1}$ at 127°F.

7. DAILY RATE HISTORY DATA (MINIMUM OF ONE MONTH PRECEDING 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 wells as of November 2, 2012, was 2,778,083,466 gallons. The volume of fluid injected into the Mewbourne Well No. 1 was 1,472,729,197 gallons. The volume of fluid injected into the Chukka Well No. 2 was 900,783,125 gallons. The volume of fluid injected into the Gaines Well No. 3 was 404,571,144 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 memory readout pressure gauges were used for the Chukka Well No. 2 buildup and falloff testing. The downhole MRO gauges were set at 7,569 feet and 7,570 feet. Bottom-hole MRO pressure gauges were also placed in each of the offset wells (Mewbourne Well No. 1 and Gaines Well No. 3). The pressure gauges were set at 7,924 feet in the Mewbourne Well No. 1 and at 7,660 feet in the Gaines Well No. 3.

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

In the Chukka Well No. 2, 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 MRO pressure gauges (Serial Nos. 76222 and 76077) were used. Both gauges were sapphire crystal gauges and were manufactured by Spartek Systems.

In the Mewbourne Well No. 1, two MRO pressure gauges were used to monitor the bottom-hole pressure and temperature during the testing of the Chukka Well No. 2. Both gauges were sapphire crystal gauges with Serial Nos. 77120 and 76404. Both gauges were 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 Chukka Well No. 2. Both gauges were sapphire crystal gauges with Serial Nos. 76171 and 75900. Both gauges were manufactured by Spartek Systems.

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

In Chukka Well No. 2, the MRO pressure gauges, Serial Nos. 76222 and 76077, has a full range of 0 psi to 10,000 psi, an accuracy of 0.022% of full scale, and a resolution of 0.0003% of full scale.

In Mewbourne Well No. 1, the MRO pressure gauges, Serial Nos. 77120 and 76404, have a full range of 0 psi to 10,000 psi, an accuracy of 0.022% of full scale, and a resolution of 0.0003% of full scale.

In Gaines Well No. 3, the MRO pressure gauges, Serial Nos. 76171 and 75900, have a full range of 0 psi to 10,000 psi, an accuracy of 0.022% of full scale, and a resolution of 0.0003% of full scale.

c. Provide the manufacture'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 manufacturers 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 2012, 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 2011 update.

No new fresh water wells were reported within the search area since the submittal of the 2011 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 VIII 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 2011 annual report submittal.

Twenty-eight (28) wells were found in which the owner had changed. One (1) new plugged and abandoned oil and gas well was found. Two (2) wells were placed in temporarily abandoned status. Four (4) wells were found that were returned to production status. Six (6) wells were found that had been recompleted.

There were twenty-nine (29) new drills and permits to drill, of which none 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 other injection wells in the same interval. Mewbourne Well No. 1 is listed at ID No. 59 in Table II and no changes have occurred to this well. Gaines #3 is listed at ID No. 157 in Table II and no changes have occurred to this well. The wellbore schematics for Mewbourne Well No. 1 and Gaines Well No. 3 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 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, but 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 and the structure map for the Cisco Formation 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 Mewbourne Well No. 1 and the Gaines Well No. 3. 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 10,860 feet from Chukka Well No. 2, the test well. The Gaines Well No. 3 is approximately 3,130 feet from the Chukka Well No. 2.

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

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

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

The offset wells were shut in prior to beginning the 36.07-hour injection period and remained shut-in during the 33.15 hour falloff portion of the testing. No impact was observed.

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 bottom hole gauges were placed into the wells on October 29, 2012 and the 48 hour injection monitoring period portion of the testing started on October 29, 2012, at 3:25 p.m., and continued until October 31, 2012, at 6:30 p.m. On October 31, 2012 at 6:30 pm the Mewbourne Well No. 1 and Gaines Well No. 3 were shut-in and the 36.07 hour buildup portion for Chukka Well No. 2 was

started. The buildup portion of the testing ended at 6:34 am on November 2, 2012 and Chukka Well No. 2 was shut-in with both of the offset wells remaining shut in for the duration of the 33.15 hour falloff portion of the testing. The Chukka Well No. 2 falloff test ended on November 3, 2012, at 3:40 p.m. On November 3, 2012, at 3:40 p.m., seven-minute gradient stops were made while pulling out of the wellbore with the pressure gauges. After the bottom hole gauges were removed from the well, the well was turned over to Navajo plant operations personnel.

b. Time of the injection period:

The buildup portion of the testing began on October 31, 2012, when the injection rate was set at an average injection rate of 158 gallons per minute (gpm). The injection rate was held constant for 36.07 hours. The injection period used in the pressure falloff analysis was 36.07 hours.

c. Type of injection fluid:

The injected fluid was non-hazardous waste water from the plant. The density averaged 8.3 pounds per gallon during the 36.07-hour injection period (OCD Guideline Section VII.6).

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

The final flowing pressure (P_{wf}) and temperature (T_{wf}) were 3,952.68 psia and 95.43°F, respectively.

e. Total shut-in time:

The Chukka Well No. 2 was shut-in for a total of 33.15 hours.

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

The final static pressure at 7,570 feet was 3,900.59 psia. The final temperature was 104.36 °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 Chukka Well No. 2, there is one, 4-inch control valve (CV) installed on the incoming pipeline before the POD filters. Two 4-inch valves are installed between the POD filters and the wellhead and one 4-inch filter bypass valve is installed at the POD filters. One motorized valve (MV) is installed between the POD filters and the well. 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.

At shut-in, the procedure would be to close the motorized valves, isolation valves, control valve, filter bypass valve, and drain the POD filters in that order.

15. PRESSURE FALLOFF ANALYSIS

The following discussion of the analysis of the pressure data recorded during the falloff testing of the Chukka Well No. 2 satisfies Sections 15 through 19 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 gauge from the time the tool was in place. Figure 10 shows the pressure and temperature data recorded by the bottom-hole gauge from the time the tool was in place until it was pulled. Figure 11 is a Cartesian

plot of the injection rates versus time for the injection period from the time the bottom hole pressure gauges were placed into the wellbore. The superposition time function was used to account for all rate changes since the last stable shut in period. Figure 12 is a plot of the surface pressures and injection rates versus time for the stabilized injection period (36.07 hours) of the testing. Figure 13 is a plot of the historical injection rates and surface pressures versus calendar time since injection began in 1999.

Figure 14 is a log-log diagnostic plot of the falloff data, showing change in pressure and pressure derivative versus elapsed shut in time. The wellbore storage, radial flow and change in reservoir characteristics flow regimes 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 0.0019 hours and continues to an elapsed shut in time of 0.038 hours. Radial flow begins at an elapsed shut in time of 2.97 hours and continues until 5.95 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 logarithmic Horner time of 1104.15 and continues until a Horner time of 2203.73, 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 1.606032 psi/cycle (OCD Guideline Section IX.15.c). The measured injection rate prior to shut in was 5413.38 bbl/day (157.89 gpm).

An estimate of mobility-thickness (transmissibility, OCD Guideline Section IX.15.d), kh/μ , for the reservoir was determined to be 548,069 md-ft/cp from the following equation:

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

where,

- kh/μ = 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

$$\begin{aligned}\frac{kh}{\mu} &= 162.6 \frac{(5413.38)(1.0)}{(1.606032)} \\ &= 548,069\end{aligned}$$

The permeability-thickness (flow capacity, OCD Guideline Section IX.15.i), kh , was determined to be 338,245 md-ft by multiplying the mobility-thickness, kh/μ , by the viscosity of the formation fluid (see Section 6), μ , of 0.59 centipoise:

$$\begin{aligned}kh &= \left(\frac{kh}{\mu} \right) \mu \\ &= 573,296 \times 0.59 \\ &= 323,360 \text{ md-ft}\end{aligned}$$

The reservoir permeability (OCD Guideline Section IX.15.e) using the total thickness (see Section 5 and Section 11) of 175 feet was 1848 md:

$$\begin{aligned}k &= \frac{(kh)}{h} \\ &= \frac{323,360}{175} \\ &= 1848 \text{ md}\end{aligned}$$

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:

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

where,

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

A cumulative volume of approximately 900,783,125 gallons of waste has been injected into Chukka Well No. 2 (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 1480 feet:

$$r_{\text{waste}} = \left(\frac{(0.13368)(900,783,125)}{(\pi)(175)(0.10)} \right)^{1/2}$$

= 1480 feet

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

$$t_{\text{waste}} = 948 \frac{\phi \mu_{\text{waste}} c_t r_{\text{waste}}^2}{k}$$

where,

- t_{waste} = time for pressure transient to reach waste front, hours
- ϕ = formation porosity, fraction
- μ_{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 $8.4 \times 10^{-6} \text{ psi}^{-1}$ (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 0.56 hours:

$$t_{\text{waste}} = 948 \frac{(0.10)(0.59)(8.4 \times 10^{-6})(1480)^2}{1848}$$

$$= 0.56 \text{ hours}$$

Since the time required to pass through the waste is less than the 2.97 hours required to reach the beginning of the radial flow period, the assumption that the pressure transient was traveling through formation 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 Δt of one hour, psi
- m_1 = slope of the first radial flow semi-log line, psi/cycle
- k = permeability of the formation, md
- ϕ = porosity of the injection interval, fraction
- μ = 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 3952.68 psia. The pressure determined by extrapolating the radial flow semi-log line to a Δt of one hour, p_{1hr} , was 3904.68 psia (calculated from the analysis software). The wellbore radius, r_w , is 0.3281 feet (completion records). Using these values in addition to the previously discussed parameters results in a skin of 25.99:

$$s = 1.151 \left[\left[\frac{3952.68 - 3904.68}{1.606032} \right] - \log \left(\frac{1848}{(0.10)(0.59)(8.4 \times 10^{-6})(0.3281)^2} \right) + 3.23 \right]$$

= 25.99

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

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

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, Δp_{skin} , using the previously calculated and defined values was determined to be 36.27 psi:

$$\begin{aligned}\Delta p_{\text{skin}} &= 0.869(m)(s) \\ &= 0.869(1.606032)(25.99) \\ &= 36.27 \text{ psi}\end{aligned}$$

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

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

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
- Δp_{skin} = pressure change due to skin damage

Using the previously determined parameters, the flow efficiency was calculated to be 0.29

$$E = \frac{3952.68 - 36.27 - 3900.59}{3952.68 - 3900.59} = 0.30$$

The radius of investigation (OCD Guideline Section IX.15.a) was calculated using the analysis software and was determined to be 10,195 feet at an elapsed shut in time of 33.15 hours.

$$R_{inv} = 0.029 \sqrt{\frac{k \Delta t_s}{\theta \mu C_i}}$$

where,

- k = formation permeability, millidarcies
- Δt_s = elapsed shut-in time, hours
- θ = formation porosity, fraction
- μ = viscosity of the fluid the pressure transient is traveling through, cp
- C_i = total compressibility of the formation plus fluid, psi^{-1}
- 0.029 = constant

$$0.029 \sqrt{\frac{1848(33.15)}{0.10(0.59)(8.4 \times 10^{-6})}}$$

$$R_{inv} = 10,195 \text{ ft}$$

As indicated on Figure 14, the pressure data departs the radial flow region at an elapsed time from shut in of 5.94 hours. Another change in slope is seen at an elapsed time from shut in of 6.60 hours. No pressure or temperature anomalies were noted that would cause this type of pressure response observed on the derivative log-log plot (OCD Section VIII.9). A review of the geology of the injection zones (Section 11) indicates that all three of the formations in which the Chukka Well No. 2 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.

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 November 3, 2012, a static pressure gradient survey was conducted while pulling the pressure gauges out of the well. Static gradient stops were conducted at 7,570 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, at 7,570 feet, was measured after the well had been shut-in for 2 days and was 3900.59 psia and 104.36 °F, respectively. The gradient survey is summarized in Table XI. The data are depicted graphically 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".

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Tabulation of Wells Within One Mile Area of Review

ID	NO	API	Unit	TOWNS		HIP		NO		NS FTG		EW FTG		WELL NAME		OPERATOR		WELL		STATUS		PLUG DATE		DATE - Comp or Plug	
1	30-015-00693	A	36	175	27E	330N	330E	DELHI #001	GEORGE A CHASE & C SERVICE	O					T/A	8/30/1941									
2	30-015-00694	A	36	175	27E	990N	990E	STATE #013	DELHI OIL CORP.	O	6/24/1948	P&A	6/24/1948												
3	30-015-00646	A	36	175	27E	990N	330E	DELHI #007	GEORGE A CHASE & C SERVICE	O					T/A	4/21/1950									
4	30-015-00668	G	36	175	27E	1650N	2310E	SOUTH RED LAKE GRAYBURG UNIT #010	LEGACY RESERVES OPERATING, LP	O					SHUT IN	12/6/1947									
5	30-015-00690	G	36	175	27E	1830N	2205E	CONKLIN #002	GEORGE A CHASE & C SERVICE	O					ACTIVE	3/6/1949									
6	30-015-00667	G	36	175	27E	2310N	2310E	SOUTH RED LAKE GRAYBURG UNIT #011	FAIRWAY RESOURCES OPERATING INC	I					ACTIVE	3/23/1949									
7	30-015-00666	G	36	175	27E	2310N	2310E	CONKLIN #001	GEORGE A CHASE & C SERVICE	O	N/A	P&A	1/10/1942												
8	30-015-00689	H	36	175	27E	1650N	330E	GATES STATE #001	GEORGE A CHASE JR & C SERVICE	O					ACTIVE	8/4/1950									
9	30-015-00647	H	36	175	27E	1650N	990E	GATES STATE #002	ASPEN OIL INC	O	10/21/2003	ACTIVE	10/21/2003												
10	30-015-00669	H	36	175	27E	2310N	330E	HOMAN #001	GEORGE A CHASE JR & C SERVICE	O	5/6/2008	P&A	5/6/2008												
11	30-015-00688	I	36	175	27E	2310S	330E	RAMAPO #001	KERSEY & CO	O	10/28/1941	P&A	10/28/1941												
12	30-015-00670	I	36	175	27E	2970N	330E	RAMAPO #003	KERSEY & CO	O	1/3/1950	P&A	1/3/1950												
13	30-015-00687	I	36	175	27E	2310S	990E	RAMAPO #002	KERSEY & CO	G	5/7/1948	P&A	5/7/1948												
14	30-015-00685	I	36	175	27E	1650S	330E	EMPIRE ABO UNIT G #020	ARCO OIL & GAS	O	7/10/1989	P&A	7/10/1989												
15	30-015-00671	J	36	175	27E	2310S	2310E	RAMAPO #003	ROJO GRANDE COMPANY LLC	O	1/24/2000	ZONE ABAN	2/13/1942												
16	30-015-01221	J	36	175	27E	2300S	2300E	SOUTH RED LAKE GRAYBURG UNIT #023	MCQUADRANGLE, LC	O	8/13/2002	ZONE ABAN	2/27/1948												
17		J	36	175	27E			DOOLEY STATE #3	MARTIN YATES III	O				4/22/1961											
18	30-015-05934	J	36	175	27E	1650S	1650E	EMPIRE ABO UNIT #019A	BP AMERICA PRODUCTION COMPANY	O		ACTIVE	2/26/1961												
19	30-015-01220	K	36	175	27E	2310S	2330W	SOUTH RED LAKE GRAYBURG UNIT #022	MCQUADRANGLE, LC	O	7/17/2002	ZONE ABAN	2/3/1949												
20	30-015-00674	K	36	175	27E	2310S	2310W	RAMAPO #002	ROJO GRANDE COMPANY LLC	O		ACTIVE	5/15/1947												
21	30-015-01219	K	36	175	27E	2310S	1650W	SOUTH RED LAKE GRAYBURG UNIT #021	MCQUADRANGLE, LC	I		ACTIVE	1/20/1948												
22	30-015-23913	K	36	175	27E	1650S	1650W	SOUTH RED LAKE GRAYBURG UNIT #043	MCQUADRANGLE, LC	O		ACTIVE	12/11/1981												
23		K	36	175	27E			DOOLEY STATE ABO #3	MARTIN YATES III	O		ACTIVE	4/19/1961												
24	30-015-00673	K	36	175	27E	1650S	2310W	RAMAPO #001	ROJO GRANDE COMPANY LLC	O	1/24/2000	ZONE ABAN	1/24/2000												
25	30-015-00682	N	36	175	27E	990S	1650W	RAMAPO #004	ROJO GRANDE COMPANY LLC	O	1/24/2000	ZONE ABAN	1/24/2000												
26	30-015-00683	N	36	175	27E	965S	1650W	SOUTH RED LAKE GRAYBURG UNIT #028	FAIRWAY RESOURCES OPERATING INC	I		ACTIVE	4/16/1948												
27	30-015-01218	N	36	175	27E	330S	2310W	EMPIRE ABO UNIT #018	BP AMERICA PRODUCTION COMPANY	O	3/11/2009	P&A	3/11/2009												
28	30-015-00684	O	36	175	27E	990S	2310E	STATE B-6961 NO. 1-A	BURNHAM OIL COMPANY	O	5/13/1947	P&A	5/13/1947												
29	30-015-01251	O	36	175	27E	660S	1980E	EMPIRE ABO UNIT #019	BP AMERICA PRODUCTION COMPANY	O	4/27/2009	P&A	9/8/1959												
30		I	36	175	27E									MISLOT OF 14											
31	30-015-00677	P	36	175	27E	330S	990E	EMPIRE ABO UNIT #020	BP AMERICA PRODUCTION COMPANY	O	4/10/2009	P&A	4/13/2009												
32	30-015-01616	P	30	175	28E	330S	990E	BLAKE STATE #001	APACHE CORPORATION	O		ACTIVE	3/7/1953												
33	30-015-01638	A	31	175	28E	330N	990E	STATE NO. 1	BEDDINGFIELD, MALCO, RESLER	O	7/15/1952	P&A	7/15/1952												
34	30-015-21594	B	31	175	28E	330N	1650E	POWCO STATE #001	FINNEY OIL COMPANY	O		ACTIVE	11/15/1975												
35	30-015-01636	C	31	175	28E	330N	2310E	DELHI-STATE NO. 1	BEDDINGFIELD, J E	O	12/23/1952	P&A	12/23/1952												
36	30-015-25621	B	31	175	28E	980N	1620E	POWCO STATE #002	FINNEY OIL COMPANY	O		ACTIVE	7/15/1986												
37	30-015-01633	1	31	175	28E	330N	330W	ASTON & FAIR A #001	GEORGE A CHASE JR DBA G AND C SERVICE	O		ACTIVE	6/23/1942												
38	30-015-01634	D	31	175	28E	350N	345W	STATE 31 NO. 1X	ASTON & FAIR	O	2/16/1950	P&A	1/5/1946												
39	30-015-01645	F	31	175	28E	990N	990W	BEDDINGFIELD STATE 1 NO. 1	MCLAUGHLIN, C T	O		NO COMPL	2/16/1950												
40	30-015-02666	2	31	175	28E	2310N	330W	HUDSON SAKIN STATE #001	APACHE CORPORATION	O		ACTIVE	5/29/1948												
41	30-015-24887	2	31	175	28E	2310N	990W	HUDSON SAKIN STATE #002	APACHE CORPORATION	O		ACTIVE	7/7/1984												
42	30-015-01643	F	31	175	28E	2310N	2260W	EMPIRE ABO UNIT #022	BP AMERICA PRODUCTION COMPANY	O	7/10/2009	P&A	6/7/1960												
43	30-015-01635	F	31	175	28E	2310N	2310W	ASTON & FAIR #001Y	GEORGE A CHASE JR DBA G AND C SERVICE	O		ACTIVE	5/8/1948												
44	30-015-01637	G	31	175	28E	2310N	2310E	MALCO STATE #001	GEORGE A CHASE JR DBA G AND C SERVICE	O		ACTIVE	10/12/1953												
45	30-015-01652	G	31	175	28E	2288N	1625E	BOLING #001	KERSEY & CO	O		ACTIVE	8/10/1960												
46	30-015-10537	H	31	175	28E	2277N	330E	NORTHWEST ARTESIA UNIT #004	LIME ROCK RESOURCES A, L.P.	O		ACTIVE	9/23/1965												
47	30-015-10833	I	31	175	28E	1980S	660E	NORTHWEST ARTESIA UNIT #010	LIME ROCK RESOURCES A, LP	O		ACTIVE	6/17/1966												
48	30-015-01644	I	31	175	28E	1650S	330E	EMPIRE ABO UNIT #024A	BP AMERICA PRODUCTION COMPANY	O	6/12/2009	P&A	4/29/1960												
49	30-015-01642	J	31	175	28E	1650S	2310E	STATE FW #001	APACHE CORPORATION	O		ACTIVE	12/23/1962												

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Tabulation of Wells Within One Mile Area of Review

ID	NO	API	Unit	No.	Sect	HIP	TOWNS	RNG	N5 FTG	EW FTG	WELL NAME	WELL TYPE	DATE - Comp or Plug	STATUS	PLUG DATE	STATUS	DATE - Comp or Plug
50	30-015-01650	J	31	17S	28E	1650S	1958E	EMPIRE ABO UNIT #023A	BP AMERICA PRODUCTION COMPANY	O	9/17/2003	P&A	9/17/2003	P&A	9/17/2003	P&A	9/17/2003
51	30-015-01651	K	31	17S	28E	1650S	2387W	EMPIRE ABO UNIT #022B	BP AMERICA PRODUCTION COMPANY	O	10/22/2009	P&A	10/22/2009	P&A	10/22/2009	P&A	4/10/1960
52	30-015-01640	3	31	17S	28E	2310S	330W	RAMPO #002	APACHE CORPORATION	O	7/16/1955	ACTIVE	7/16/1955	ACTIVE	7/16/1955	ACTIVE	7/16/1955
53	30-015-01648	3	31	17S	28E	1651S	1089E	EMPIRE ABO UNIT #021A	BP AMERICA PRODUCTION COMPANY	O	8/24/2002	ZONE ABAN	8/24/2002	ZONE ABAN	8/24/2002	ZONE ABAN	8/24/2002
54	30-015-01639	4	31	17S	28E	990S	330W	RAMPO #001	APACHE CORPORATION	O	5/1/1948	ACTIVE	5/1/1948	ACTIVE	5/1/1948	ACTIVE	5/1/1948
55	30-015-01647	4	31	17S	28E	660S	660W	EMPIRE ABO UNIT #021	BP AMERICA PRODUCTION COMPANY	O	7/23/2005	P&A	7/23/2005	P&A	7/23/2005	P&A	1/31/1960
56	30-015-01646	N	31	17S	28E	660S	2082W	EMPIRE ABO UNIT #022A	BP AMERICA PRODUCTION COMPANY	O	1/22/1960	P&A	1/22/1960	P&A	1/22/1960	P&A	1/22/1960
57	30-015-10118	N	31	17S	28E	766S	2188W	STATE FV #001	APACHE CORPORATION	O	3/1/1963	ACTIVE	3/1/1963	ACTIVE	3/1/1963	ACTIVE	3/1/1963
58	30-015-01653	O	31	17S	28E	990S	1650E	PARKER-STATE NO. 1	OTIS A ROBERTS	O	1/18/1942	P&A	1/18/1942	P&A	1/18/1942	P&A	1/18/1942
59	30-015-27592	O	31	17S	28E	660S	2310E	WDW #001	NAVAJO REFINING CO. PIPELINE DIVISION	I	8/4/1998	ACTIVE	8/4/1998	ACTIVE	8/4/1998	ACTIVE	8/4/1998
60	30-015-01649	O	31	17S	28E	660S	1939E	EMPIRE ABO UNIT #023	BP AMERICA PRODUCTION COMPANY	O	2/24/1960	P&A	2/24/1960	P&A	2/24/1960	P&A	2/24/1960
61	30-015-20042	P	31	17S	28E	990S	660E	NORTHWEST ARTESIA UNIT #011	LIME ROCK RESOURCES A, LP	O	5/8/1967	ACTIVE	5/8/1967	ACTIVE	5/8/1967	ACTIVE	5/8/1967
62	30-015-01641	P	31	17S	28E	660S	660E	EMPIRE ABO UNIT #024	APACHE CORPORATION	O	3/12/1960	ACTIVE	3/12/1960	ACTIVE	3/12/1960	ACTIVE	3/12/1960
63	30-015-01654	D	32	17S	28E	330N	330W	ASTON-STATE NO. 1	BEDINGFIELD, J E	O	5/12/1953	P&A	5/12/1953	P&A	5/12/1953	P&A	5/12/1953
64	30-015-01671	E	32	17S	28E	2280N	978W	EMPIRE ABO UNIT #025B	BP AMERICA PRODUCTION COMPANY	O	9/13/1960	P&A	9/13/1960	P&A	9/13/1960	P&A	9/13/1960
65	30-015-01657	F	32	17S	28E	2280N	1980W	AA STATE NO. 1	APACHE CORPORATION	O	8/24/1960	ACTIVE	8/24/1960	ACTIVE	8/24/1960	ACTIVE	8/24/1960
66	30-015-10818	K	32	17S	28E	2310S	2105W	NORTHWEST ARTESIA UNIT #008	SDX RESOURCES INC	O	11/6/2006	P&A	11/6/2006	P&A	11/6/2006	P&A	11/6/2006
67	30-015-01661	K	32	17S	28E	1650S	2310W	EMPIRE ABO UNIT #026B	APACHE CORPORATION	O	3/27/1960	ACTIVE	3/27/1960	ACTIVE	3/27/1960	ACTIVE	3/27/1960
68	30-015-10795	L	32	17S	28E	2310S	660W	NORTHWEST ARTESIA UNIT #009	LIME ROCK RESOURCES A, LP	O	5/15/1966	P&A	5/15/1966	P&A	5/15/1966	P&A	5/15/1966
69	30-015-01662	L	32	17S	28E	1650S	990W	EMPIRE ABO UNIT #025A	APACHE CORPORATION	O	4/13/1960	ACTIVE	4/13/1960	ACTIVE	4/13/1960	ACTIVE	4/13/1960
70	30-015-20043	M	32	17S	28E	990S	760W	NORTHWEST ARTESIA UNIT #012	APACHE CORPORATION	O	5/9/1967	T/A	5/9/1967	T/A	5/9/1967	T/A	5/9/1967
71	30-015-01660	M	32	17S	28E	660S	660W	EMPIRE ABO UNIT #025	BP AMERICA PRODUCTION COMPANY	O	1/14/2009	P&A	1/14/2009	P&A	1/14/2009	P&A	3/5/1960
72	30-015-10834	N	32	17S	28E	990S	2030W	NORTHWEST ARTESIA UNIT #013	SDX RESOURCES INC	O	9/15/2006	P&A	9/15/2006	P&A	9/15/2006	P&A	9/15/2006
73	30-015-01659	N	32	17S	28E	660S	1980W	EMPIRE ABO UNIT #026A	APACHE CORPORATION	O	2/14/1960	ACTIVE	2/14/1960	ACTIVE	2/14/1960	ACTIVE	2/14/1960
74	30-015-21539	N	32	17S	28E	150S	1400W	EMPIRE ABO UNIT #261	APACHE CORPORATION	O	7/25/1975	ACTIVE	7/25/1975	ACTIVE	7/25/1975	ACTIVE	7/25/1975
75	30-015-22009	O	32	17S	28E	330S	2481E	EMPIRE ABO UNIT #272	APACHE CORPORATION	O	7/18/1977	ACTIVE	7/18/1977	ACTIVE	7/18/1977	ACTIVE	7/18/1977
76	30-015-02606	3	5	18S	28E	330N	1941W	EMPIRE ABO UNIT #026E	APACHE CORPORATION	O	7/18/1960	ACTIVE	7/18/1960	ACTIVE	7/18/1960	ACTIVE	7/18/1960
77	30-015-22697	3	5	18S	28E	1080N	1914W	EMPIRE ABO UNIT #261A	BP AMERICA PRODUCTION COMPANY	O	1/4/1979	P&A	1/4/1979	P&A	1/4/1979	P&A	1/4/1979
78	30-015-02607	4	5	18S	28E	660N	660W	EMPIRE ABO UNIT #025C	APACHE CORPORATION	O	3/27/1960	ACTIVE	3/27/1960	ACTIVE	3/27/1960	ACTIVE	3/27/1960
79	30-015-22750	4	5	18S	28E	660N	150W	EMPIRE ABO UNIT #251	APACHE CORPORATION	O	1/12/1979	SHUT IN	1/12/1979	SHUT IN	1/12/1979	SHUT IN	1/12/1979
80	30-015-02608	E	5	18S	28E	1660N	330W	STATE E AI #001	CONOCOPHILLIPS COMPANY	O	1/13/2006	P&A	1/13/2006	P&A	1/13/2006	P&A	1/13/2006
81	30-015-24485	E	5	18S	28E	1980N	990W	ILLINOIS CAMP A COM #001	CONOCOPHILLIPS COMPANY	G	8/10/1983	ACTIVE	8/10/1983	ACTIVE	8/10/1983	ACTIVE	8/10/1983
82	30-015-02602	F	5	18S	28E	1650N	1650W	EMPIRE ABO UNIT #026D	APACHE CORPORATION	O	12/30/1959	ACTIVE	12/30/1959	ACTIVE	12/30/1959	ACTIVE	12/30/1959
83	30-015-25522	L	5	18S	28E	2240S	400W	WALTER SOLT STATE #001	APACHE CORPORATION	S	8/12/1983	ACTIVE	8/12/1983	ACTIVE	8/12/1983	ACTIVE	8/12/1983
84	30-015-10244	L	5	18S	28E	2310S	330W	STATE AG #001	MAC K ENERGY CORP	O	3/27/2001	ZONE ABAN	3/27/2001	ZONE ABAN	3/27/2001	ZONE ABAN	3/27/2001
87	30-015-20019	1	6	18S	28E	330N	330E	NORTHWEST ARTESIA UNIT #016	LIME ROCK RESOURCES A, LP	O	3/14/1967	ACTIVE	3/14/1967	ACTIVE	3/14/1967	ACTIVE	3/14/1967
88	30-015-02615	1	6	18S	28E	660N	660E	EMPIRE ABO UNIT #024B	APACHE CORPORATION	O	2/29/1960	ACTIVE	2/29/1960	ACTIVE	2/29/1960	ACTIVE	2/29/1960
89	30-015-02625	2	6	18S	28E	470N	2170E	EMPIRE ABO UNIT #023C	APACHE CORPORATION	O	12/21/1959	T/A	12/21/1959	T/A	12/21/1959	T/A	12/21/1959
90	30-015-21542	2	6	18S	28E	1260N	1580E	EMPIRE ABO UNIT #231	APACHE CORPORATION	O	11/1/1975	ACTIVE	11/1/1975	ACTIVE	11/1/1975	ACTIVE	11/1/1975
91	30-015-02621	3	6	18S	28E	660N	1980W	EMPIRE ABO UNIT #022E	APACHE CORPORATION	O	12/29/1959	ACTIVE	12/29/1959	ACTIVE	12/29/1959	ACTIVE	12/29/1959
92	30-015-21626	G	6	18S	28E	1361N	2531E	EMPIRE ABO UNIT #231A	APACHE CORPORATION	O	10/22/1975	SHUT IN	10/22/1975	SHUT IN	10/22/1975	SHUT IN	10/22/1975
93	30-015-02613	4	6	18S	28E	990N	660W	EMPIRE ABO UNIT #021B	APACHE CORPORATION	O	12/30/1959	ACTIVE	12/30/1959	ACTIVE	12/30/1959	ACTIVE	12/30/1959
94	30-015-23116	5	6	18S	28E	2050N	100W	EMPIRE ABO UNIT #213	APACHE CORPORATION	O	6/2/1980	ACTIVE	6/2/1980	ACTIVE	6/2/1980	ACTIVE	6/2/1980
95	30-015-02619	5	6	18S	28E	1990N	660W	EMPIRE ABO UNIT #021C	APACHE CORPORATION	O	10/30/1959	ACTIVE	10/30/1959	ACTIVE	10/30/1959	ACTIVE	10/30/1959
96	30-015-22637	5	6	18S	28E	2450N	400W	EMPIRE ABO UNIT #212	APACHE CORPORATION	O	12/28/1978	ACTIVE	12/28/1978	ACTIVE	12/28/1978	ACTIVE	12/28/1978
97	30-015-21395	5	6	18S	28E	2630N	1300W	EMPIRE ABO UNIT #211	APACHE CORPORATION	O	2/11/1975	ACTIVE	2/11/1975	ACTIVE	2/11/1975	ACTIVE	2/11/1975
98	30-015-22012	F	6	18S	28E	1350N	1572W	EMPIRE ABO UNIT #222	APACHE CORPORATION	O	3/13/1977	ACTIVE	3/13/1977	ACTIVE	3/13/1977	ACTIVE	3/13/1977
99	30-015-02626	F	6	18S	28E	1650N	1650W	STATE NO. 1	SARKIN, DAVID C & OLIVER, HENRY F	O	2/21/1942	P&A	2/21/1942	P&A	2/21/1942	P&A	2/21/1942
100	30-015-10107	F	6	18S	28E	1874N	1874W	STATE FX #001	DORAL ENERGY CORP	O	8/8/1963	ACTIVE	8/8/1963	ACTIVE	8/8/1963	ACTIVE	8/8/1963

**Table II
Tabulation of Wells Within One Mile Area of Review**

ID	API	Unit No.	TOWNS	SECT	HIP	RNG	NS FTG	EW FTG	WELL NAME	OPERATOR	WELL TYPE	PLUG DATE	STATUS	DATE - Comp or Plug
101	30-015-02620	F	6	18S	28E	1990N	2082W		EMPIRE ABO UNIT #022D	APACHE CORPORATION	O		ACTIVE	11/26/1959
102	30-015-22527	F	6	18S	28E	2630N	1930W		EMPIRE ABO UNIT #223	APACHE CORPORATION	O		ACTIVE	5/19/1978
103	30-015-21746	F	6	18S	28E	2610N	2713W		EMPIRE ABO UNIT #221	APACHE CORPORATION	O		ACTIVE	4/23/1976
104	30-015-22913	G	6	18S	28E	1750N	1600E		EMPIRE ABO UNIT #235	APACHE CORPORATION	O		ACTIVE	7/8/1979
105	30-015-22593	G	6	18S	28E	1900N	2441E		EMPIRE ABO UNIT #234	BP AMERICA PRODUCTION COMPANY	O	12/3/2008	P&A	8/27/1978
106	30-015-02614	G	6	18S	28E	1980N	1980E		EMPIRE ABO UNIT #023B	APACHE CORPORATION	O		ACTIVE	1/26/1960
107	30-015-21737	G	6	18S	28E	2253N	1576E		EMPIRE ABO UNIT #232	BP AMERICA PRODUCTION COMPANY	O	5/7/2009	P&A	4/13/1976
108		H	6	18S	28E								MISPLUG OF 107	
109	30-015-22490	G	6	18S	28E	2550N	2050E		EMPIRE ABO UNIT #233	BP AMERICA PRODUCTION COMPANY	O	4/3/2009	P&A	6/5/1978
110	30-015-02616	H	6	18S	28E	1650N	990E		EMPIRE ABO UNIT #024C	APACHE CORPORATION	O		ACTIVE	3/24/1960
111	30-015-23547	H	6	18S	28E	1950N	660E		EMPIRE ABO UNIT #241	BP AMERICA PRODUCTION COMPANY	O	9/19/2008	P&A	4/12/1981
112	30-015-02617	I	6	18S	28E	2310S	990E		EMPIRE ABO UNIT #024K	BP AMERICA PRODUCTION COMPANY	O	12/12/2002	P&A	12/12/2002
113	30-015-22528	J	6	18S	28E	2300S	1570E		EMPIRE ABO UNIT #232A	BP AMERICA PRODUCTION COMPANY	O	4/7/2009	P&A	2/5/1979
114	30-015-02611	J	6	18S	28E	2310S	2310E		STATE NO. 1	BARNEY COCKBURN	O	8/15/1949	P&A	8/15/1949
115	30-015-02628	J	6	18S	28E	2260S	2270E		EMPIRE ABO UNIT #023D	BP AMERICA PRODUCTION COMPANY	O		ACTIVE	5/23/1979
116	30-015-22491	J	6	18S	28E	1700S	2350E		EMPIRE ABO UNIT #231B	BP AMERICA PRODUCTION COMPANY	O	9/2/2009	P&A	8/13/1978
117	30-015-02618	J	6	18S	28E	1647S	2076E		CAPITOL STATE NO. 1	MILLER BROS OIL CO	G	3/21/1955	P&A	3/21/1955
118	30-015-02623	K	6	18S	28E	2248S	2075W		EMPIRE ABO UNIT #022F	APACHE CORPORATION	O		ACTIVE	2/22/1960
119		K	6	18S	28E								MISPLUG	
120		L	6	18S	28E				WDW-2 (ORIGINAL LOCATION)	NAVAJO REFINING COMPANY				
121	30-015-02622	6	6	18S	28E	2219S	660W		EMPIRE ABO UNIT #021D	APACHE CORPORATION	O		ACTIVE	1/23/1960
122	30-015-23548	6	6	18S	28E	1950S	1000W		EMPIRE ABO UNIT #211A	APACHE CORPORATION	O		ACTIVE	7/17/1980
123	30-015-02627	7	6	18S	28E	949S	990W		STATE M-AI #002	RUTH OIL CO, LLC	O		ACTIVE	10/21/1960
124	30-015-26943	7	6	18S	28E	990S	730W		CHALK BLUFF 6 STATE #001	MEWBOURNE OIL CO	G		ACTIVE	4/16/1992
125	30-015-02610	N	6	18S	28E	955S	1750W		EMPIRE ABO UNIT #022C	APACHE CORPORATION	O		ACTIVE	8/5/1960
126	30-015-02624	O	6	18S	28E	968S	2270E		STATE CD NO. 1	PAN AMERICAN PETROLEUM CO	O	5/1/1961	P&A	5/1/1961
127	30-015-25503	P	6	18S	28E	660S	330E		KIMBERLY STATE NO. 1	DICKSON PETROLEUM CO	O	12/30/1985	P&A	12/30/1985
128	30-015-02612	P	6	18S	28E	330S	330E		STATE NO. 1	D & H OIL CO	O	5/13/1952	P&A	5/13/1952
129	30-015-01215	1	1	18S	27E	667N	666E		EMPIRE ABO UNIT #020D	APACHE CORPORATION	O		ACTIVE	11/5/1959
130	30-015-00708	2	1	18S	27E	660N	1980E		EMPIRE ABO UNIT #019B	LIME ROCK RESOURCES II-A, L.P.	O		ACTIVE	7/7/1959
131		C	1	18S	27E				HILL #4	MALCO REFINERIES		5/10/1948	P&A	5/10/1948
132		C	1	18S	27E								MISPLUG	
133	30-015-00710	3	1	18S	27E	660N	1980W		AAO FEDERAL No. 013	ALAMO PERMIAN RESOURCES, LLC	O		ACTIVE	7/21/2004
134	30-015-26741	F	1	18S	27E	1650N	1350W		CHALK BLUFF FEDERAL COM #002	MEWBOURNE OIL CO	G		ACTIVE	8/24/1991
135	30-015-00706	F	1	18S	27E	2310N	1980W		EMPIRE ABO UNIT #018A	ALAMO PERMIAN RESOURCES, LLC	O		ACTIVE	5/31/1959
136	30-015-00709	G	1	18S	27E	1980N	1980E		EMPIRE ABO UNIT #019C	ALAMO PERMIAN RESOURCES, LLC	O		ACTIVE	8/2/1959
137		G	1	18S	27E								MISPLUG	
138	30-015-21552	G	1	18S	27E	2500N	2500E		EMPIRE ABO UNIT #191	CFM OIL, LLC	O		ACTIVE	9/7/1975
139	30-015-00711	H	1	18S	27E	1980N	660E		EMPIRE ABO UNIT #020C	ALAMO PERMIAN RESOURCES, LLC	O		ACTIVE	10/13/1959
140	30-015-21783	H	1	18S	27E	2490N	1299E		EMPIRE ABO UNIT #202	ALAMO PERMIAN RESOURCES, LLC	O		ACTIVE	5/13/1976
141	30-015-22656	H	1	18S	27E	2400N	700E		EMPIRE ABO UNIT #203	APACHE CORPORATION	O		ACTIVE	10/10/1978
142		H	1	18S	27E				CRONIN #1	MANHATTAN OIL		7/1/2027	P&A	7/1/1927
143	30-015-21553	H	1	18S	27E	2501N	20E		EMPIRE ABO UNIT #201	ALAMO PERMIAN RESOURCES, LLC	O		ACTIVE	7/19/1975
144	30-015-27163	I	1	18S	27E	1980S	990E		CHALK BLUFF FEDERAL COM #003	MEWBOURNE OIL CO	G		ACTIVE	1/16/1993
145	30-015-00697	I	1	18S	27E	1980S	660E		EMPIRE ABO UNIT #020K	BP AMERICA PRODUCTION COMPANY	O	1/5/2003	P&A	1/5/2003
146	30-015-22657	J	1	18S	27E	2490S	2200E		EMPIRE ABO UNIT #193	ALAMO PERMIAN RESOURCES, LLC	O		ACTIVE	10/26/1978
147	30-015-00696	J	1	18S	27E	1980S	1980E		EMPIRE ABO UNIT #019Q	ALAMO PERMIAN RESOURCES, LLC	O		ACTIVE	8/20/1959
148	30-015-22560	J	1	18S	27E	220S	1390E		EMPIRE ABO UNIT #192	BP AMERICA PRODUCTION COMPANY	O		ACTIVE	6/25/1978
149	30-015-21873	J	1	18S	27E	1526S	1470E		EMPIRE ABO UNIT #191A	ALAMO PERMIAN RESOURCES, LLC	O		ACTIVE	9/23/1976

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Tabulation of Wells Within One Mile Area of Review

ID	NO	API	Unit	No.	Sect	HIP	TOWNS	RNG	NS	FTG	EW	FTG	WELL NAME	OPERATOR	WELL TYPE	PLUG DATE	STATUS	DATE - Comp or Plug
150	30-015-22658	J	1	18S	27E	1500S	2130E	EMPIRE ABO UNIT #194	APACHE CORPORATION	O	ACTIVE		11/14/1978					
151	30-015-22559	K	1	18S	27E	2290S	2445W	EMPIRE ABO UNIT #184	APACHE CORPORATION	O	SHUT IN		7/25/1978					
152	30-015-22096	K	1	18S	27E	2370S	1510W	EMPIRE ABO UNIT #183	APACHE CORPORATION	O	ACTIVE		7/24/1977					
153	30-015-21554	K	1	18S	27E	1367S	1440W	EMPIRE ABO UNIT #181	BP AMERICA PRODUCTION COMPANY	O	P&A	4/17/2003	4/17/2003					
154	30-015-00707	K	1	18S	27E	1980S	1980W	EMPIRE ABO UNIT #018B	APACHE CORPORATION	O	ACTIVE		5/22/1959					
155	30-015-21792	K	1	18S	27E	1533S	2370W	EMPIRE ABO UNIT #182	LIME ROCK RESOURCES A, L.P.	O	ACTIVE		6/1/1976					
156	30-015-00713	N	1	18S	27E	995S	1644W	EMPIRE ABO UNIT #018D	BP AMERICA PRODUCTION COMPANY	O	P&A	9/27/2003	9/27/2003					
157	30-015-26575	N	1	18S	27E	790S	2250W	WDW-3	NAVAJO REFINING COMPANY	I	ACTIVE		3/7/1991					
158	30-015-20394	O	1	18S	27E	953S	2197E	EMPIRE ABO FEDERAL NO. 5	HUMBLE OIL & REFINING CO	O	P&A	4/9/1971	4/9/1971					
159	30-015-00698	O	1	18S	27E	660S	1980E	EMPIRE ABO UNIT #191	BP AMERICA PRODUCTION COMPANY	S	ACTIVE		11/8/1959					
160	30-015-00699	P	1	18S	27E	940S	330E	EMPIRE ABO UNIT #020B	APACHE CORPORATION	O	ACTIVE		12/2/1961					
161	30-015-26404	A	12	18S	27E	660N	990E	FEDERAL T #001	APACHE CORPORATION	I	ACTIVE		9/13/1990					
162	30-015-25099	H	12	18S	27E	1809N	990E	COMSTOCK FEDERAL #006	HARLOW ENTERPRISES LLC	O	ACTIVE		9/11/1985					
165	30-015-25997	C	7	18S	28E	940N	1757W	LAUREL STATE #001	EASTLAND OIL CO	O	ACTIVE		2/23/1987					
166	30-015-25675	2	7	18S	28E	940N	1757W	LAUREL STATE #002	EASTLAND OIL CO	O	ACTIVE		11/10/1988					
167	30-015-25236	F	7	18S	28E	1980N	1980W	STATE BY #001	MOREXCO INC	O	ACTIVE		6/10/1985					
168	30-015-22636	J	7	18S	28E	1950N	1300W	PRE-ONGUARD WELL #213	DYAD PE	O	ABAN LOCATION							
169	30-015-22635	J	8	18S	28E	1900N	100W	PRE-ONGUARD WELL #212	DYAD PE	O	ABAN LOCATION							
170	30-015-24372	J	8	18S	28E	1980S	990E	PRE-ONGUARD WELL #001	DYAD PE	O	ABAN LOCATION							
171	30-015-27636	H	7	18S	28E	2310N	810E	CHALK BLUFF 6 STATE #002	PHILLIPS PETROLEUM	O	ABAN LOCATION							
353	30-015-27286	M	36	17S	27E	660S	990W	CHALK BLUFF 36 STATE #001	MEWBOURNE OIL CO	O	ACTIVE		3/30/1993					
354	30-015-24612	M	36	17S	27E	790S	990W	STATE M #001	PRONGHORN MANAGEMENT CORP	O	P&A	4/21/2009	10/11/1983					
355	30-015-00676	M	36	17S	27E	330N	990W	EMPIRE ABO UNIT #017	LIME ROCK RESOURCES A, L.P.	O	ACTIVE							
356	30-015-10184	M	36	17S	27E	330S	920W	STATE #006	ASPEN OIL INC	O	ACTIVE							
358	30-015-21623	M	36	17S	27E	360S	455W	STATE #007	GEORGE A CHASE JR & C SERVICE	O	ACTIVE							
359	30-015-00662	M	36	17S	27E	330S	330W	STATE NO. 2	ACREY, B L & F D	O	P&A	10/15/1942	10/15/1942					
595	30-015-02605	B	5	18S	28E	930N	2271E	EMPIRE ABO UNIT NO. 27 E	BP AMERICA PRODUCTION UNIT	O	P&A	6/12/2009	3/30/1960					
748	30-015-00715	4	1	18S	27E	330N	330W	SOUTH RED LAKE GRAYBURG UNIT #037	LEGACY RESERVES OPERATING LP	I	ACTIVE							
748	30-015-00701	D	1	18S	27E	330N	330W	SOUTH RED LAKE GRAYBURG UNIT 37 WIW	FAIRWAY RESOURCES OPERATING LLC	O	ACTIVE							
749	30-015-00712	D	1	18S	27E	647N	667W	EMPIRE ABO UNIT I NO. 17	ARCO OIL & GAS	O	P&A	1/24/1987	1/24/1987					
750	30-015-00712	E	1	18S	27E	1650N	330W	BRAINARD	JONES	O	P&A	5/10/1939	5/10/1939					
751	30-015-00704	E	1	18S	27E	1980N	660W	EMPIRE ABO UNIT J NO. 17	ARCO OIL & GAS	O	P&A	3/26/1959	3/26/1959					
752	30-015-00703	L	1	18S	27E	1980S	660W	EMPIRE ABO UNIT #017A	BP AMERICA PRODUCTION COMPANY	O	P&A	5/22/1995	5/22/1995					
753	30-015-22815	M	1	18S	27E	670S	330W	EMPIRE ABO UNIT #171	LIME ROCK RESOURCES A, L.P.	O	ACTIVE		5/22/1979					
754	30-015-00714	M	1	18S	27E			HILL #1	VALLEY REFINING CO		MISPLUG OF 756							
755	30-015-00714	N	1	18S	27E			EMPIRE ABO UNIT #017B	BP AMERICA PRODUCTION COMPANY	O	P&A	12/20/1943	12/20/1943					
756	30-015-00705	M	1	18S	27E	990S	660W	STATE 2	BP AMERICA PRODUCTION COMPANY	O	P&A	6/25/1959	6/25/1959					
757	30-015-00721	A	2	18S	27E	330N	610E	STATE 2	BRAINARD & GUY	O	NO COMPL	1/31/1942	1/31/1942					
758	30-015-00721	1	2	18S	27E	330N	990E	SOUTH RED LAKE GRAYBURG UNIT #036	FAIRWAY RESOURCES OPERATING LLC	O	PROD	11/6/1947	11/6/1947					
765	30-015-00724	1	2	18S	27E	990N	330E	EMPIRE ABO UNIT #016B	FAIRWAY RESOURCES OPERATING LLC	O	ACTIVE							
766	30-015-00737	B	2	18S	27E	905N	1601E	SOUTH RED LAKE GRAYBURG UNIT #038	FAIRWAY RESOURCES OPERATING LLC	O	ACTIVE							
772	30-015-00745	H	2	18S	27E	1980N	660E	STATE H #001	MAC ENERGY CORPORATION	O	P&A	3/7/2008	3/7/2008					
773	30-015-00742	H	2	18S	27E	1650N	990E	SOUTH RED LAKE GRAYBURG UNIT 39 WIW	S&J OPERATING COMPANY	O	P&A	2/8/1991	2/8/1991					
774	30-015-00740	G	2	18S	27E	1650N	2197E	SOUTH RED LAKE GRAYBURG UNIT #040	MCQUADRANGLE, LC	I	P&A	7/10/2002	7/10/2002					
778	30-015-00746	G	2	18S	27E	2310N	1650E	HUDSON #2	RUTTER & WILBANKS	O		1/1/1957	1/1/1957					
779	30-015-00741	G	2	18S	27E	2310N	1980E	EMPIRE ABO UNIT #015B	APACHE CORPORATION	O	ACTIVE	6/6/1959	6/6/1959					
781	30-015-00717	J	2	18S	27E	2310S	2310E	STATE B-2	MALCO REFINING CO	O	P&A	1/1/1947	1/1/1947					
785	30-015-00717	I	2	18S	27E	1980S	660E	EMPIRE ABO UNIT #016	APACHE CORPORATION	O	ACTIVE	2/6/1995	2/6/1995					
786	30-015-00716	J	2	18S	27E	1980S	1830E	EMPIRE ABO UNIT #015	APACHE CORPORATION	O	ACTIVE	3/23/1959	3/23/1959					

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Tabulation of Wells Within One Mile Area of Review

ID	API	Unit No.	Sect	HIP	TOWNS	RNG	NS FTG	EW FTG	WELL NAME	OPERATOR	WELL TYPE	PLUG DATE	STATUS	DATE - Comp or Plug
789	30-015-22896	K	2	18S		27E	1820S	2550W	EMPIRE ABO UNIT #143A	WALTER SOLT, LLC	O		ACTIVE	5/13/1979
791	30-015-22914	I	2	18S		27E	1310S	590E	EMPIRE ABO UNIT #161	COG OPERATING, LLC	O		ACTIVE	9/13/1979
792		O	2	18S		27E							MISPLLOT OF 814	
793	30-015-22609	N	2	18S		27E	1200S	1900W	EMPIRE ABO UNIT #143	APACHE CORPORATION	O		ACTIVE	12/20/1978
795		P	2	18S		27E							MISPLLOT OF 765	
796	30-015-21544	O	2	18S		27E	1110S	1322E	EMPIRE ABO UNIT #151	APACHE CORPORATION	O		T/A	11/4/1975
797	30-015-22885	O	2	18S		27E	1040S	2025E	EMPIRE ABO UNIT #155	APACHE CORPORATION	O		T/A	5/1/1979
799	30-015-00722	P	2	18S		27E	660S	660E	EMPIRE ABO UNIT #016A	APACHE CORPORATION	O	2/24/2009	P&A	1/20/1959
800	30-015-22808	O	2	18S		27E	600S	1330E	EMPIRE ABO UNIT #0156	BP AMERICA PRODUCTION COMPANY	O	2/5/2009	P&A	4/12/1979
801	30-015-00731	O	2	18S		27E	660S	1980E	EMPIRE ABO UNIT #015A	BP AMERICA PRODUCTION COMPANY	O	2/11/2009	P&A	11/19/1958
802	30-015-22669	O	2	18S		27E	800S	2500E	EMPIRE ABO UNIT #154	BP AMERICA PRODUCTION COMPANY	O	1/27/2009	P&A	12/4/1978
805	30-015-22013	O	2	18S		27E	90S	1456E	EMPIRE ABO UNIT #153	BP AMERICA PRODUCTION COMPANY	O	10/30/2008	P&A	4/20/1977
806	30-015-21825	O	2	18S		27E	320S	2602E	EMPIRE ABO UNIT #152	APACHE CORPORATION	O		T/A	6/17/1976
807	30-015-22608	N	2	18S		27E	100S	1950W	EMPIRE ABO UNIT #142	BP AMERICA PRODUCTION COMPANY	O		(No info on dates)	
808	30-015-21807	M	2	18S		27E	275S	1243W	EMPIRE ABO UNIT #132	BP AMERICA PRODUCTION COMPANY	O		ACTIVE	7/1/1976
812	30-015-00730	N	2	18S		27E	660S	1980W	EMPIRE ABO UNIT #014	APACHE CORPORATION	O		ACTIVE	10/21/1958
813	30-015-00720	A	2	18S		27E	990N	1650E	RIVERWOLF UNIT #004	BP AMERICA PRODUCTION COMPANY	O	12/12/2008	P&A	10/21/1959
814	30-015-22051	K	2	18S		27E	1370S	2445W	EMPIRE ABO UNIT #141A	APACHE CORPORATION	O		ACTIVE	5/17/1977
836	30-015-00869	A	11	18S		27E	330N	653E	EMPIRE ABO UNIT #016C	BP AMERICA PRODUCTION COMPANY	O	10/25/2004	P&A	10/25/2004
837	30-015-22568	B	11	18S		27E	400N	1450E	EMPIRE ABO UNIT #151B	BP AMERICA PRODUCTION COMPANY	O	8/16/2006	P&A	8/16/2006
838	30-015-22838	B	11	18S		27E	200N	1925E	EMPIRE ABO UNIT #153B	BP AMERICA PRODUCTION COMPANY	O	1/4/2009	P&A	5/6/1979
839	30-015-00868	B	11	18S		27E	660N	1980E	EMPIRE ABO UNIT #015C	BP AMERICA PRODUCTION COMPANY	O	7/16/2004	P&A	7/16/2004
840	30-015-22569	B	11	18S		27E	560N	2588E	EMPIRE ABO UNIT #152B	BP AMERICA PRODUCTION COMPANY	O	9/24/2008	P&A	8/23/1978
841	30-015-22834	C	11	18S		27E	225N	2280W	EMPIRE ABO UNIT #141B	APACHE CORPORATION	O		ACTIVE	5/21/1979
842	30-015-00864	C	11	18S		27E	660N	1980W	EMPIRE ABO UNIT M NO. 14	ARCO OIL & GAS	O	9/5/1957	P&A	9/5/1957
843	30-015-22833	D	11	18S		27E	450N	1175W	EMPIRE ABO UNIT #133B	APACHE CORPORATION	O		ACTIVE	5/23/1979
844	30-015-00867	D	11	18S		27E	660N	660W	EMPIRE ABO UNIT M NO. 13	ARCO OIL & GAS	O	4/26/1958	P&A	4/26/1958
846	30-015-22556	D	11	18S		27E	1100N	1200W	EMPIRE ABO UNIT M NO. 131	ARCO OIL & GAS	O	7/10/1978	P&A	7/10/1978
848	30-015-20510	F	11	18S		27E	1650N	1653W	MALCO S NO. 1	AMOCO PRODUCTION CO	O	10/16/1971	P&A	10/16/1971
849	30-015-00865	F	11	18S		27E	1650N	1980W	EMPIRE ABO UNIT N NO. 14	ARCO OIL & GAS	O	2/3/1961	P&A	2/3/1961
850	30-015-00866	E	11	18S		27E	1980N	660W	EMPIRE ABO UNIT N NO. 131	ARCO OIL & GAS	O	3/27/1958	P&A	3/27/1958
851	30-015-00870	J	11	18S		27E	1980S	1980E	SMITH-MCPHERSON NO. 1	AMOCO PRODUCTION CO	O	9/1/1956	P&A	9/1/1956
852	30-015-01201	N	11	18S		27E			AN ETZ #3	OSCAR HOWARD		4/15/2027	P&A	
853	30-015-01202	O	11	18S		27E			AN ETZ #2	OSCAR HOWARD		2/4/2027	P&A	
854	30-015-00863	N	11	18S		27E			VICKERS #1	B.R. POLK, JR.		10/14/1949	P&A	10/14/1949
855	30-015-24857	M	11	18S		27E	700S	990W	FEDERAL DH GAS COM #001	CHESAPEAKE OPERATING INC	G		ACTIVE	5/18/1984
856	30-015-20535	D	12	18S		27E	330N	455W	FEDERAL EA 2	ROBERT G COX	O	8/7/1973	P&A	8/7/1973
857	30-015-00871	D	12	18S		27E	330N	330W	FEDERAL EA #001	RHONDA OPERATING CO	O	4/12/1994	P&A	4/12/1994
858	30-015-23115	D	12	18S		27E	330N	380W	FEDERAL EA NO. 3	RHONDA OPERATING CO	O	3/16/1980	D&A	3/16/1980
859	30-015-25738	G	12	18S		27E	2310E	2310E	COMSTOCK FEDERAL #009	HARLOW ENTERPRISES LLC	O		ACTIVE	4/25/1987
860	30-015-25270	F	12	18S		27E	2310N	2310W	CHUKKA FEDERAL #001	BILL MILLER	O		ACTIVE	4/23/1985
861	30-015-20894	E	12	18S		27E	1980N	660W	WDW #002	NAVAJO REFINING COMPANY	I		ACTIVE	7/18/1973
862	30-015-00874	J	12	18S		27E	2310S	2355E	COMSTOCK FEDERAL #007	HARLOW ENTERPRISES LLC	O		ACTIVE	6/29/1948
863	30-015-00872	L	12	18S		27E	310S	990W	COMSTOCK FEDERAL NO. 1	MCKEE-JONES	O	2/18/1943	D&A	2/18/1943
864	30-015-25201	K	12	18S		27E	1650S	1770W	COMSTOCK FEDERAL #002	HARLOW ENTERPRISES LLC	O		ACTIVE	3/16/1985
865	30-015-25649	L	12	18S		27E	1650S	990W	COMSTOCK FEDERAL NO. 8	FRED POOL DRILLING CO	O	10/10/1986	D&A	10/10/1986
866	30-015-25545	M	12	18S		27E	990S	990W	COMSTOCK FEDERAL #003	HARLOW ENTERPRISES LLC	O		ACTIVE	5/19/1986
867	30-015-00873	M	12	18S		27E			MAGRUDER #2	R.E. MCKEE ET AL		2/27/1945	P&A	2/27/1945

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Tabulation of Wells Within One Mile Area of Review

ID	API	Unit No.	TOWNS		RNG	NS FTG	EW FTG	WELL NAME	OPERATOR	WELL TYPE	PLUG DATE	STATUS	DATE - Comp or Plug
			Sect	HIP									
868	30-015-26017	N	12	18S	27E	990S	1650W	COMSTOCK FEDERAL #010	EASTLAND OIL CO	O	1/23/2003	P&A	1/23/2003
869	30-015-25100	N	12	18S	27E	330S	1650W	COMSTOCK FEDERAL #001	HARLOW ENTERPRISES LLC	O		ACTIVE	12/10/1984
870	30-015-25202	O	12	18S	27E	330S	2310E	COMSTOCK FEDERAL #005	HARLOW ENTERPRISES LLC	O		ACTIVE	4/19/1985
871	30-015-06171	I	12	18S	27E	1069S	251E	MICHAEL CRONIN NO. 3	PILCHER OIL & GAS	O	5/20/2026	P&A	2/15/1932
872		P	12	18S	27E			MICHAEL CRONIN #1	PILCHER OIL & GAS	O	7/30/1952	P&A	7/30/1952
873	30-015-00875	P	12	18S	27E	330S	330E	MAGRUDER NO. B-4	CITIES SERVICE OIL CO	O	2/8/1954	P&A	2/8/1954
874	30-015-00876	P	12	18S	27E	100S	500E	MAGRUDER NO. 5	ROBERT E MCKEE	O	2/22/2026	P&A	
875	30-015-06170	P	12	18S	27E	200S	200E	MICHAEL CRONIN NO. 2	PILCHER OIL & GAS	O	1/1/2026	P&A	
876	30-015-01200	A	13	18S	27E	O		STATE NO. 1	HASSENFUSH-DONNELLY	O	1/1/2026	D&A	
877	30-015-06137	A	13	18S	27E	250N	990E	STATE NO. 2	EASTLAND OIL CO	O		ACTIVE	9/28/1985
878	30-015-25394	C	13	18S	27E	330N	2310W	ARTESIA STATE #002	BILL MILLER	O		ACTIVE	4/13/1985
879	30-015-25241	C	13	18S	27E	330N	1650W	ARTESIA STATE #001	BILL MILLER	O	1/29/1945	P&A	1/29/1945
880	30-015-00884	C	13	18S	27E	990N	1650W	STATE NO. 3	DALE RESLER	O		ACTIVE	8/27/1985
881	30-015-25370	D	13	18S	27E	480N	940W	ARTESIA STATE UNIT #002A	APACHE CORPORATION	O		ACTIVE	12/11/1944
882	30-015-00883	D	13	18S	27E	990W	990W	ARTESIA STATE UNIT #001	APACHE CORPORATION	O	1/26/1945	P&A	1/26/1945
883	30-015-00880	E	13	18S	27E	1650N	990W	STATE NO. 1	DALE RESLER - JONES	O	7/17/2011	P&A	6/18/1984
884	30-015-24881	F	13	18S	27E	1880N	1830W	ANADARKO 13 FEDERAL #001	DAVID G HAMMOND	O	11/28/1954	P&A	11/28/1954
885	30-015-00888	F	13	18S	27E	1980N	1650W	PAGE NO. 1	RALPH NIX & JERRY CURTIS	O	3/14/1945	D&A	3/14/1945
886	30-015-00879	F	13	18S	27E	2310N	1650W	JONES-GOVT NO. 1	DALE RESLER	O	12/30/1984	D&A	12/30/1984
888	30-015-25078	G	13	18S	27E	1724N	2279E	ANADARKO 13 FEDERAL NO. 1	DICKSON PETROLEUM, INC	O	6/30/1944	P&A	6/30/1944
895	30-015-00891	A	14	18S	27E	990N	330E	ARTESIA STATE UNIT TRACT 4 NO. 1	ANADARKO PETROLEUM CORP	O	1/1/1900	D&A	1/1/1900
896	30-015-00893	G	14	18S	27E	1650N	1650E	STATE NO. 1	RESLER	O		ACTIVE	2/8/1945
897	30-015-00895	H	14	18S	27E	1650N	330E	ARTESIA STATE UNIT #001B	APACHE CORPORATION	O	6/18/1948	D&A	6/18/1948
901	30-015-00695	L	1	18S	27E	1650S	330W	HILL NO. 1	WILLIAM & EDWARD HUDSON	O		P&A	
910	30-015-00744	J	2	18S	27E	2310S	1640E	STATE 1	COMPTON-SMITH	O		ACTIVE	
911	30-015-31123	H	36	17S	27E	1980N	760E	NO BLUFF 36 STATE COM #002	LIME ROCK RESOURCES A, LP	G		ACTIVE	
912	30-015-31036	H	36	17S	27E	2310N	990E	GATES STATE #003	GEORGE A CHASE JR & C SERVICE	O	12/21/2001	P&A	12/21/2001
916	30-015-31592	N	36	17S	27E	330S	2310E	RAMAPO #007	ROJO GRANDE COMPANY LLC	O		ACTIVE	
917	30-015-30784	A	31	17S	28E	330N	480E	NW STATE #012	LIME ROCK RESOURCES A, LP	O		ACTIVE	4/3/2003
918	30-015-30893	A	31	17S	28E	973N	959E	NW STATE #028	LIME ROCK RESOURCES A, LP	O		ACTIVE	
919	30-015-32162	1	31	17S	28E	460N	990W	ENRON STATE #004	LIME ROCK RESOURCES A, LP	O		ACTIVE	
920	30-015-30783	H	31	17S	28E	1650N	330E	NW STATE #011	LIME ROCK RESOURCES A, LP	O		ACTIVE	
921	30-015-30849	I	31	17S	28E	2310S	270E	NW STATE #009	LIME ROCK RESOURCES A, LP	O		ACTIVE	
922	30-015-30760	P	31	17S	28E	735S	330E	NW STATE #010	LIME ROCK RESOURCES A, LP	O		ACTIVE	
923	30-015-31920	D	32	17S	28E	990N	990W	ENRON STATE #002	APACHE CORPORATION	O		ACTIVE	
924	30-015-30781	K	32	17S	28E	1900S	2146W	NW STATE #005	LIME ROCK RESOURCES A, LP	I		ACTIVE	
925	30-015-30777	L	32	17S	28E	2310S	990W	NW STATE #006	APACHE CORPORATION	O		ACTIVE	
926	30-015-30685	M	32	17S	28E	990S	990W	NW STATE #007	APACHE CORPORATION	O		ACTIVE	
927	30-015-30815	N	32	17S	28E	1090S	2126W	NW STATE #008	LIME ROCK RESOURCES A, LP	I		ACTIVE	5/4/2004
928	30-015-32310	1	1	18S	27E	990N	990E	AAO FEDERAL #004	APACHE CORPORATION	O		ACTIVE	4/10/2003
929	30-015-32309	2	1	18S	27E	330N	1690E	AAO FEDERAL #003	APACHE CORPORATION	O		ACTIVE	9/19/2002
930	30-015-32308	3	1	18S	27E	430N	2310W	AAO FEDERAL #002	APACHE CORPORATION	O		ACTIVE	12/10/2002
931	30-015-32307	4	1	18S	27E	330N	990W	AAO FEDERAL #001	APACHE CORPORATION	O		ACTIVE	6/28/1980
932	30-015-22816	O	1	18S	27E	1120S	1440E	EMPIRE ABO UNIT L #192	ARCO OIL & GAS	O	6/23/1980	ABAN LOCATION	
933	30-015-20388	N	1	18S	27E	990S	2297E	EMPIRE ABO #5	ARCO OIL & GAS	O	12/31/9999	SAME AS 158	
934	30-015-27719	I	12	18S	27E	1650S	990E	CHALK BLUFF 12 FED #001	MEWBOURNE OIL CO	G		ABAN LOCATION	
935	30-015-27437	B	14	18S	27E	660N	1980E	BEAUREGARD ANP STATE COM #001	YATES PETROLEUM CORPORATION	G		ABAN LOCATION	
936	30-015-31086	E	5	18S	28E	1650N	990W	LP STATE #001	MARBOB ENERGY CORP	O	3/11/2008	P&A	3/11/2008
937	30-015-31109	E	5	18S	28E	2301N	230W	LP STATE #002	APACHE CORPORATION	O		PROPOSED	

Tabulation of Wells Within One Mile Area of Review

ID	API	Unit No.	TOWNS	NS	FTG	EW	FTG	WELL NAME	OPERATOR	WELL TYPE	PLUG DATE	STATUS	DATE - Comp or Plug
938	30-015-30785	1	6 18S	28E	430N	330E	NW STATE #015	APACHE CORPORATION		O		ACTIVE	
939	30-015-00264	J	6 18S	28E	2310S	2310E	CAPITAL STATE NO. 1	BARNEY COCKBURN		O		SAME AS 114	5/23/1979
940	30-015-31087	7	6 18S	28E	990S	330W	LP STATE #003	MARBOB ENERGY CORP		O	3/17/2008	P&A	7/15/2000
941	30-015-31088	7	6 18S	28E	330S	990W	LP STATE #004	MARBOB ENERGY CORP		O		PROPOSED	
942	30-015-06250	O	6 18S	28E	470S	2170E		BP AMERICA PRODUCTION COMPANY		O		SAME AS 89	
943	30-015-31319	3	7 18S	28E	2310N	330W	LAUREL STATE #003	EASTLAND OIL CO		O		ACTIVE	1/31/2001
944	30-015-26575	D	6 18S	28E	778N	995W	WDW-3 (ORIGINAL LOC.)	NAVAJO REFINING COMPANY		I		ACTIVE	
945	30-015-32959	E	1 18S	27E	1650N	875W	AAO FEDERAL #005	APACHE CORPORATION		O		ACTIVE	10/12/2004
946	30-015-33473	G	1 18S	27E	1750N	1650S	AAO FEDERAL #007	MARBOB ENERGY CORP		O		ACTIVE	4/4/2005
947	30-015-33784	H	1 18S	27E	1650N	330W	AAO FEDERAL #008	MARBOB ENERGY CORP		O		ACTIVE	2/25/2005
948	30-015-34071	F	1 18S	27E	2169N	1963W	AAO FEDERAL #006	MARBOB ENERGY CORP		O		ACTIVE	8/5/2005
949	30-015-34387	L	1 18S	27E	1980S	630W	AAO FEDERAL #009	MARBOB ENERGY CORP		O		ACTIVE	1/17/2006
950	30-015-34555	M	1 18S	27E	890S	660W	AAO FEDERAL #011	MARBOB ENERGY CORP		O		ACTIVE	3/9/2006
951	30-015-34576	K	1 18S	27E	2060S	2160W	AAO FEDERAL #010	MARBOB ENERGY CORP		O		ACTIVE	10/26/2006
952	30-015-34998	N	1 18S	27E	890S	1650W	AAO FEDERAL #012	MARBOB ENERGY CORP		O		ACTIVE	9/21/2006
953	30-015-34028	G	6 18S	28E	2285N	1366E	SLIDER 6 STATE NO. 001	BP AMERICA PRODUCTION COMPANY		O	12/17/2006	P&A	12/17/2006
954	30-015-35050	D	32 17S	28E	330N	500W	ENRON STATE NO 012	LIME ROCK RESOURCES A, LP		O		ACTIVE	12/21/2006
955	30-015-40187	A	14 18S	27E	660N	990E	VIOLET BIV STATE COM #1	YATES PETROLEUM CORP		O		EXT PERMIT TO DRILL	2/20/2009
956	30-015-33994	A	36 17S	27E	915N	420E	RED LAKE 36 A STATE #2	EDGE PETROLEUM OPERATING COMPANY, INC		O		ACTIVE	4/20/2005
957	30-015-36116	G	36 17S	27E	2305N	1650E	SOUTH RED LAKE UNIT II #57	LEGACY RESERVES OPERATING LP		O		ACTIVE	6/6/2008
958	30-015-32946	J	2 18S	27E	2210S	1650E	SCBP STATE #1	APACHE CORPORATION		O		ACTIVE	4/26/2005
959	30-015-35814	H	2 18S	27E	2063N	441E	STATE H NO 2	MACK ENERGY CORPORATION		O		ACTIVE	1/11/2008
960	30-015-36343	G	31 17S	28E	1650N	2310E	MALCO STATE NO. 002	GEORGE A CHASE JR DBA G AND C SERVICE		O		ACTIVE	7/9/2008
961	30-015-36978	D	31 17S	28E	990N	330W	ENRON STATE NO. 015	LIME ROCK RESOURCES A, LP		O		ACTIVE	7/3/2009
962	30-015-36554	L	32 17S	28E	1770S	550W	NW STATE NO. 029	LIME ROCK RESOURCES A, LP		O		ACTIVE	1/30/2009
963	30-015-36989	K	32 17S	28E	1630S	1710W	NW STATE NO. 030	LIME ROCK RESOURCES A, LP		O		NO COMPL	7/14/2009
964	30-015-37057	N	32 17S	28E	330S	1750W	NW STATE NO. 031	LIME ROCK RESOURCES A, LP		O		NO COMPL	7/28/2009
965	30-015-37058	M	32 17S	28E	330S	330W	NW STATE NO. 032	LIME ROCK RESOURCES A, LP		O		NO COMPL	8/23/2009
966	30-015-37428	G	31 17S	28E	1980N	1980E	MALCO STATE NO. 3	G&C SERVICE		O		ACTIVE	2/10/2010
30-015-36281	1	18S	27E	2193S	1520W		SUN DEVILS FEDERAL NO. 001	MACK ENERGY CORPORATION		O		PERMIT TO DRILL	
967	30-015-38240	G	36 17S	27E	1425N	1520E	KIOWA STATE NO. 3	COG OPERATING, LLC		O	4/11/12	PERMIT TO DRILL	
968	30-015-39029	G	36 17S	27E	2210N	2310E	CONKLIN STATE NO. 1-Y	G AND C SERVICE		O		ACTIVE	
969	30-015-39321	M	36 17S	27E	990S	890W	BIG BOY STATE NO. 1	COG OPERATING, LLC		O		PERMIT TO DRILL	
970	30-015-39322	M	36 17S	27E	840S	425W	BIG BOY STATE NO. 3	COG OPERATING, LLC		O		PERMIT TO DRILL	
971	30-015-39323	O	36 17S	27E	870S	1560E	BIG BOY STATE NO. 5	COG OPERATING, LLC		O		PERMIT TO DRILL	
972	30-015-39324	O	36 17S	27E	480S	2210E	BIG BOY STATE NO. 6	COG OPERATING, LLC		O		PERMIT TO DRILL	
973	30-015-39325	O	36 17S	27E	990S	2210E	BIG BOY STATE NO. 7	COG OPERATING, LLC		O		PERMIT TO DRILL	
974	30-015-39326	O	36 17S	27E	275S	1560E	BIG BOY STATE NO. 8	COG OPERATING, LLC		O		PERMIT TO DRILL	
975	30-015-39401	P	36 17S	27E	1110S	630E	EMPIRE ABO UNIT NO. 417	APACHE CORPORATION		O		PERMIT TO DRILL	
976	30-015-39009	G	2 18S	27E	1650N	2430E	EMPIRE ABO UNIT NO. 415	APACHE CORPORATION		O		PERMIT TO DRILL	
977	30-015-39066	L	2 18S	27E	2551S	1170W	EMPIRE ABO UNIT NO. 416	APACHE CORPORATION		O		PERMIT TO DRILL	
978	30-015-38234	P	30 17S	28E	430S	800E	ANTHONY NO. 2	LIME ROCK RESOURCES		O		ACTIVE	
979	30-015-39299	M	30 17S	28E	990S	990W	MAPLE STATE NO. 5	COG OPERATING, LLC		O		PERMIT TO DRILL	
980	30-015-39300	M	30 17S	28E	330S	330W	MAPLE STATE NO. 6	COG OPERATING, LLC		O		PERMIT TO DRILL	
981	30-015-38512	D	30 17S	28E	990N	940W	ENRON STATE NO. 16	LIME ROCK RESOURCES		O		ACTIVE	
982	30-015-39004	P	31 17S	28E	150S	1300E	EMPIRE ABO UNIT NO. 401	APACHE CORPORATION		O		PERMIT TO DRILL	
983	30-015-39011	O	31 17S	28E	1190S	1320E	EMPIRE ABO UNIT NO. 419	APACHE CORPORATION		O		PERMIT TO DRILL	
984	30-015-39020	O	31 17S	28E	140S	2560E	EMPIRE ABO UNIT NO. 408	APACHE CORPORATION		O		PERMIT TO DRILL	

1. 3 II
Tabulation of Wells Within One Mile Area of Review

ID	NO	API	Unit	TOWNS	Sect	HIP	RNG	NS FTG	EW FTG	WELL NAME	OPERATOR	WELL TYPE	PLUG DATE	STATUS	DATE - Comp or Plug
985	30-015-38513	J	32	17S	28E	2310S	2032E	JEFFER 32 STATE NO. 3		LIME ROCK RESOURCES	O		ACTIVE		
986	30-015-39006	J	32	17S	28E	2400S	2450E	EMPIRE ABO UNIT NO. 407		APACHE CORPORATION	O		PERMIT TO DRILL		
987	30-015-39007	M	32	17S	28E	70S	100W	EMPIRE ABO UNIT NO. 409		APACHE CORPORATION	O		PERMIT TO DRILL		
988	30-015-39064	O	32	17S	28E	1175S	1310E	EMPIRE ABO UNIT NO. 403		APACHE CORPORATION	O		PERMIT TO DRILL		
989	30-015-39008	D	6	18S	28E	160N	1300W	EMPIRE ABO UNIT NO. 410		APACHE CORPORATION	O		PERMIT TO DRILL		
990	30-015-39021	D	6	18S	28E	40N	145W	EMPIRE ABO UNIT NO. 411		APACHE CORPORATION	O		PERMIT TO DRILL		
992	30-015-00715	D	1	18S	27E	330N	330W	SOUTH RED LAKE II UNIT NO. 37		LEGACY RESERVES OPERATING LP	O				
993	30-015-32307	4	1	18S	27E	330N	990W	AAO FEDERAL NO. 1		APACHE CORPORATION	O		PERMIT TO DRILL		
994	30-015-32959	E	1	18S	27E	1650N	875W	AAO FEDERAL NO. 5		APACHE CORPORATION	O		PERMIT TO DRILL		
995	30-015-33473	G	1	18S	27E	1750N	1650E	AAO FEDERAL NO. 7		APACHE CORPORATION	O		PERMIT TO DRILL		
996	30-015-33784	H	1	18S	27E	1650N	330E	AAO FEDERAL NO. 8		APACHE CORPORATION	O		PERMIT TO DRILL		
997	30-015-34071	F	1	18S	27E	2169N	1963W	AAO FEDERAL NO. 6		APACHE CORPORATION	O		PERMIT TO DRILL		
998	30-015-34555	M	1	18S	27E	890S	660W	AAO FEDERAL NO. 11		APACHE CORPORATION	O		PERMIT TO DRILL		
999	30-015-34576	K	1	18S	27E	2060S	2160W	AAO FEDERAL NO. 10		APACHE CORPORATION	O		PERMIT TO DRILL		
1000	30-015-00735	K	2	18S	27E	1980S	1830W	EMPIRE ABO UNIT NO. 14B		APACHE CORPORATION	O		PERMIT TO DRILL		
1001	30-015-22777	M	2	18S	27E	10S	640W	EMPIRE ABO UNIT NO. 134		APACHE CORPORATION	O		PERMIT TO DRILL		
1002	30-015-22824	M	2	18S	27E	800S	950W	EMPIRE ABO UNIT NO. 133		APACHE CORPORATION	O		PERMIT TO DRILL		
1003	30-015-22952	K	2	18S	27E	1310S	1400W	EMPIRE ABO UNIT NO. 142A		APACHE CORPORATION	O		PERMIT TO DRILL		
1004	30-015-39956	G	36	17S	27E	2176N	1858E	KIOWA STATE NO. 8		COG OPERATING, LLC	O		ACTIVE	4/30/2012	
1005	30-015-40428	M	36	17S	27E	200S	485W	BIG BOY STATE NO. 2		COG OPERATING, LLC	O		PERMIT TO DRILL		
1006	30-015-40429	M	36	17S	27E	492S	806W	BIG BOY STATE NO. 4		COG OPERATING, LLC	O		PERMIT TO DRILL		
1007	30-015-39898	A	1	18S	27E	1258E	1005E	EMPIRE ABO UNIT NO. 412		APACHE CORPORATION	O		PERMIT TO DRILL		
1008	30-015-39899	3	1	18S	27E	1305N	2535W	EMPIRE ABO UNIT NO. 413		APACHE CORPORATION	O		PERMIT TO DRILL		
1009	30-015-39900	4	1	18S	27E	1120N	1205W	EMPIRE ABO UNIT NO. 414		APACHE CORPORATION	O		PERMIT TO DRILL		
1011	30-015-36564	O	30	17S	28E	330S	2210E	STALEY STATE NO. 9		LRE OPERATING, LLC	O		ACTIVE	5/5/2009	
1012	30-015-37673	N	30	17S	28E	330S	1650W	STALEY STATE NO. 12		LRE OPERATING, LLC	O		ACTIVE	7/7/2010	
1013	30-015-38203	P	30	17S	28E	330S	990W	MAPLE STATE NO. 8		COG OPERATING, LLC	O		PERMIT TO DRILL		
1014	30-015-40026	N	30	17S	28E	330S	2410W	STALEY STATE NO. 17		LRE OPERATING, LLC	O		ACTIVE	4/4/2012	
1015	30-015-39011	O	31	17S	28E	1190S	1320E	EMPIRE ABO UNIT NO. 419		APACHE CORPORATION	O		T/A	11/7/2011	
1016	30-015-39020	O	31	17S	28E	140S	2560E	EMPIRE ABO UNIT NO. 408		APACHE CORPORATION	O		ACTIVE	11/9/2011	
1017	30-015-40257	D	31	17S	28E	184N	257W	BIG GIRL 31 STATE NO. 1		COG OPERATING, LLC	O		PERMIT TO DRILL		
1018	30-015-40258	D	31	17S	28E	195N	990W	BIG GIRL 31 STATE NO. 2		COG OPERATING, LLC	O		PERMIT TO DRILL		
1019	30-015-40259	G	31	17S	28E	2160N	2310E	BIG GIRL 31 STATE NO. 5		COG OPERATING, LLC	O		PERMIT TO DRILL		
1020	30-015-40260	D	31	17S	28E	1155N	990W	BIG GIRL 31 STATE NO. 7		COG OPERATING, LLC	O		PERMIT TO DRILL		
1021	30-015-40409	L	31	17S	28E	1920S	330W	BIG GIRL 31 STATE NO. 9H		COG OPERATING, LLC	O		PERMIT TO DRILL		
1022	30-015-40410	M	31	17S	28E	615S	10W	BIG GIRL 31 STATE NO. 11H		COG OPERATING, LLC	O		PERMIT TO DRILL		
1023	30-015-39927	K	32	17S	28E	1750S	1765W	AA STATE NO. 2		APACHE CORPORATION	O		PERMIT TO DRILL		
1024	30-015-40339	D	32	17S	28E	990N	330W	ENRON STATE NO. 18		LRE OPERATING, LLC	O		PERMIT TO DRILL		

TABLE III

Well Changes in the Combined One Mile Area of Review Since the 2011 Annual Report for Navajo's WDW-1, WDW-2, and WDW-3

ID	API No.	Unit	Sect	Town	Range	Footages	Well Name	Operator	Changes	Change of Owner	P&A	T&A	Prod	Recomp	New	Total
5	30 015 00690	G	36	17S	27E	1830 FNL & 2205 FEL	Conklin #2	G & C Service	Recompletion: Install 4-1/2" liner to 480 ft and cement in place with 100 sks. Well is back in production.							
8	30 015 00697	G	36	17S	27E	2310FNL & 2310 FEL	South Red Lake Grayburg Unit #01	Legacy Reserves Operating LP	Changed owner from Frainway Resources Operating Inc to Legacy Reserves Operating LP	1						1
47	30 015 10833	I	31	17S	28E	1980 FSL & 960 FEL	Northwest Artesia Unit No. 10	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
61	30 015 20042	O	31	17S	28E	990 FSL & 690 FEL	Northwest Artesia Unit No. 11	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
70	30 015 20043	M	32	17S	28E	990 FSL & 790 FWL	Northwest Artesia Unit No. 12	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
82	30 015 02802	F	05	18S	28E	1650 FNL & 1650 FWL	Empire Abo Unit No. 028D	Apache Corporation	Recompletion: Added perforations in Upper Abo formation at 5990'-5990', 6018'-6030', 6090'-6095' with 2 SPF and acidized. Changed to production 9/20/11. This is a SWD well. Perfs from 7518' to 7812'			1				1
83	30 015 25522	L	05	18S	28E	2240 FSL & 400 FWL	Waller Split State No. 001	Waller Split, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
87	30 015 20019	A	06	18S	28E	330 FNL & 330 FEL	Northwest Artesia Unit No. 16	LRE Operating, LLC	Recompletion: Perforate Abo shale at 5330'-5332', 5390'-5392', 5430'-5432' with 4 SPF, frac the new perfs.							
355	30 015 00676	M	36	17S	27E	330 FNL & 990 FWL	Empire Abo unit # 17	Apache Corporation	Recompletion: Perforate Abo shale at 5444'-5446', 5480'-5482', 5512'-5514', 5290'-5292', 5340'-5342', 5392'-5394' with 4 SPF acidize and frac.							
785	015 00724	1	02	18S	27E	990 FNL & 330 FEL	Empire Abo Unit No. 16B	Apache Corporation	Recompletion: Perforate Abo shale at 5795'-8605', 5811'-5816', 5860'-5860', 5890'-5900', 5900'-5920', 5950'-5955' with 2 SPF and 120 deg phasing and acidize perfs. Well placed back into T&A status.			1				1
797	015 22885	O	02	18S	27E	1040 FSL & 2025 FEL	Empire Abo Unit No. 15S	Apache Corporation	P&A: set CIBP at 5525 ft and fill wellbore with cement.							
814	30 015 22051	K	02	18S	27E	1370 FSL & 2445 FWL	Empire Abo Unit No. 141A	Apache Corporation	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
911	30 015 31123	H	36	17S	27E	1980 FNL & 760 FEL	No Bluff 36 State Com #2	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
917	30 015 30784	A	31	17S	28E	330 FNL & 480 FEL	NW State No. 12	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
918	30 015 30893	A	31	17S	28E	973 FNL & 959 FEL	NW State No. 28	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
919	30 015 32182	D	31	17S	28E	480 FNL & 990 FWL	Enron State No. 4	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
920	015 30783	H	31	17S	28E	1650 FNL & 330 FEL	NW State No. 11	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
921	30 015 30849	I	31	17S	28E	2310 FSL & 270 FEL	NW State No. 9	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
922	30 015 30780	P	31	17S	28E	735 FSL & 330 FEL	NW State No. 10	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
923	015 31820	D	32	17S	28E	990 FNL & 990 FWL	Enron State No. 2	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
924	30 015 30781	K	32	17S	28E	1900 FSL & 2146 FWL	NW State No. 5	LRE Operating, LLC	Recompletion: Perforations in the Glenfarfeso at 3350'-3765' with 47 holes.							
925	30 015 30777	L	32	17S	28E	2310 FSL & 990 FWL	NW State No. 6	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						1
928	30 015 30885	M	32	17S	28E	990 FSL & 990 FWL	NW State No. 7	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
927	30 015 30615	N	32	17S	28E	1090 FSL & 2126 FWL	NW State No. 8	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
938	30 015 30785	A	06	18S	28E	430 FNL & 330 FEL	NW State #015	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
954	30 015 35050	D	32	17S	28E	330 FNL & 500 FWL	Enron State No. 12	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
961	30 015 36978	D	31	17S	28E	990 FNL & 330 FWL	Enron State No. 15	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
962	30 015 39554	L	32	17S	28E	1770 FSL & 1550 FWL	NW State No. 29	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
963	30 015 39889	K	32	17S	28E	1630 FSL & 1710 FWL	NW State No. 30	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
964	30 015 37057	N	32	17S	28E	330 FSL & 1750 FWL	NW State No. 31	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
965	30 015 37058	M	32	17S	28E	330 FSL & 330 FWL	NW State No. 32	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
967	30 015 38420	M	36	17S	27E	840 FSL & 425 FWL	Kiowa State No. 3	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
969	30 015 39321	M	36	17S	27E	990 FSL & 890 FWL	Big Boy State No. 1	Cog Operating LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1						
970	30 015 39322	M	36	17S	27E	840 FSL & 425 FWL	Big Boy State No. 3	Cog Operating LLC	NEW: Drilled to TD of 5030'; perforations at 3755'-3960', 4040'-4290', 4350'-4600' 1 SPF in Yeso formation. Completed on 12/19/11							1
971	30 015 39323	O	36	17S	27E	870 FSL & 1560 FEL	Big Boy State No. 5	Cog Operating LLC	NEW: Drilled to TD of 5015'; perforations at 3740'-3960', 4050'-4300', 4360'-4610' 1 SPF in Yeso formation. Completed on 11/01/12							1
972	015 39324	O	36	17S	27E	480 FSL & 2210 FEL	Big Boy State No. 6	Cog Operating LLC	NEW: Drilled to TD of 4953'; perforations at 4375'-4600', 4900'-4315', 3805'-4030', 3410'-3960' 1 SPF in Yeso formation. Completed on 5-21-12							1
973	015 39325	O	36	17S	27E	990 FSL & 2210 FEL	Big Boy State No. 7	Cog Operating LLC	NEW: Drilled to TD of 5072'; perforations at 3430'-3980', 3780'-4030', 4000'-4340', 4400'-4650' 1 SPF in Yeso formation. Completed on 1-19-12							1
									NEW: Drilled to TD of 5120'; perforations at 3960'-3615', 3795'-4020', 4080'-4305', 4385'-4590' 1 SPF in Yeso formation. Completed on 1-30-12							1

TABLE III

Well Changes in the Combined One Mile Area of Review Since the 2011 Annual Report for Navajo's WDW-1, WDW-2, and WDW-3

ID	API No.	Unit	Sec	Town	Range	Footages	Well Name	Operator	Changes	Change of Owner	P&A	T&A	Prod	Recomp	New	Total
975	30 015 39401	P	36	17S	27E	1110 FSL & 630 FEL	Empire Abo Unit No. 417	Apache Corp	NEW: Drilled to TD of 6300'; perforations at 5734-5831' 2 SPF in Abo formation. Completed on 3-21-12	1					1	1
976	30 015 39009	G	02	18S	27E	1650 FNL & 2430 FEL	Empire Abo Unit No. 415	Apache Corp	NEW: Drilled to TD to 6300'; perforations at 5388-5700' 2 SPF in Abo formation. Completed on 1-17-12	1					1	1
977	30 015 39066	E	02	18S	27E	2420 FNL & 185 FWL	Empire Abo Unit No. 416	Apache Corp	NEW: Permit to Drill, changed surface hole location. Changed to production on 10/22/2011. Perfs at 3215-3543'. Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1					1	1
981	30 015 39512	D	31	17S	28E	990 FNL & 940 FWL	Enron State No. 16	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC	1			1		1	1
985	30 015 39513	J	32	17S	28E	2310 FSL & 2032 FEL	Jeffer 32 State No. 3	LRE Operating, LLC	Changed to production on 12/17/2011. Perfs at 5838-6030' in Abo Formation	1			1		1	1
988	30 015 39006	J	32	17S	28E	2400 FSL & 2450 FEL	Empire Abo Unit No. 407	Apache Corp	New drill. Changed to production. Perforations in th Abo at 5774-5938' (2 SPF, 188 holes). Started production on 1/14/2012.	1			1		1	1
990	30 015 39021	D	06	18S	28E	40 FNL & 145 FWL	Empire Abo Unit No. 411	Apache Corp	NEW: Drilled to TD of 4000'; perforations at 3280-3510'; 3765-3990', 4050-4300', 4380-4610' 1 SPF in Yesso formation. Completed on 4-30-12	1			1		1	1
1004	015 39656	G	36	17S	27E	2176 FNL & 1858 FEL	Kowee State No. 8	Cog Operating LLC	NEW: Permit To Drill						1	1
1005	30 015 40428	M	36	17S	27E	200 FSL & 485 FWL	Big Boy State No. 2	Cog Operating LLC	NEW: Permit To Drill						1	1
1006	30 015 40420	M	36	17S	27E	492 FSL & 896 FWL	Big Boy State No. 4	Cog Operating LLC	NEW: Permit To Drill						1	1
1007	30 015 39868	A	01	18S	27E	1258 FNL & 1005 FEL	Empire Abo Unit No. 412	Apache Corp	NEW: Permit To Drill						1	1
1008	30 015 39866	3	01	18S	27E	1305 FNL & 2535 FWL	Empire Abo Unit No. 413	Apache Corp	NEW: Permit To Drill						1	1
1009	30 015 39600	4	01	18S	27E	1120 FNL & 1205 FWL	Empire Abo Unit No. 414	Apache Corp	NEW: Permit To Drill						1	1
1011	30 015 36564	O	30	17S	28E	330 FSL & 2210 FEL	Saley State No. 9	LRE Operating, LLC	NEW to AOR: Perforations: 3666-3942'. Changed operator from Lime Rock Resources to LRE Operating, LLC	1					1	1
1012	30 015 37673	N	30	17S	28E	330 FSL & 1650 FWL	Saley State No. 12	LRE Operating, LLC	NEW to AOR: Perforations in Yesso: 3623-3859', 3924-4222', 4290'-4588'. Changed operator from Lime Rock Resources to LRE Operating, LLC	1					1	1
1013	30 015 38203	M	30	17S	28E	330 FSL & 990 FWL	Maple State No. 8	Cog Operating LLC	NEW to AOR: Permit to drill.						1	1
1014	30 015 40026	N	30	17S	28E	330 FSL & 2410 FWL	Saley State No. 17	LRE Operating, LLC	NEW: Drilled to TD of 5108'. Perforations in Yesso: 3316-3574' (45 holes), 3634-3928' (40 holes), 4013-4280' (40 holes), 4345-4680' (44 holes) at 5000'. Completed on 4-4-12.						1	1
1015	30 015 39011	O	31	17S	28E	1190 FSL & 1320 FEL	Empire Abo Unit No. 419	Apache Corp	NEW to AOR: Well drilled to TD of 6310' on 11-7-11. Perforated in Abo at 5810-5920'. Well was temporarily abandoned on 7-5-12 due to lack of production.			1			1	1
1016	015 39020	O	31	17S	28E	140 FSL & 2560 FEL	Empire Abo Unit No. 408	Apache Corp	NEW to AOR: Well drilled to TD of 6273' on 11-9-11. Perforated in Abo at 5770-5780', 5786', 5790', 5798-5803', 5820-5838', 5846', 5860', 5860-5878', 5904-5924', 5940-5962', 6022-6032' with 2 SPF and acidized.						1	1
1017	30 015 40257	D	31	17S	28E	184 FNL & 257 FWL	Big Girl 31 State No. 1	Cog Operating, LLC	NEW: Permit To Drill						1	1
1018	30 015 40258	D	31	17S	28E	195 FNL & 990 FWL	Big Girl 31 State No. 2	Cog Operating, LLC	NEW: Permit To Drill						1	1
1019	30 015 40259	G	31	17S	28E	2160 FNL & 2310 FEL	Big Girl 31 State No. 5	Cog Operating, LLC	NEW: Permit To Drill						1	1
1020	30 015 40260	D	31	17S	28E	1155 FNL & 990 FWL	Big Girl 31 State No. 7	Cog Operating, LLC	NEW: Permit To Drill						1	1
1021	30 015 40409	L	31	17S	28E	1920 FSL & 330 FWL	Big Girl 31 State No. 9H	Cog Operating, LLC	NEW: Permit To Drill						1	1
1022	30 015 40410	M	31	17S	28E	615 FSL & 10 FWL	Big Girl 31 State No. 11H	Cog Operating, LLC	NEW: Permit To Drill						1	1
1023	30 015 39627	K	32	17S	28E	1750 FSL & 1765 FWL	AA State No. 2	Apache Corp	NEW: Permit To Drill						1	1
1024	30 015 40336	D	32	17S	28E	990 FNL & 330 FWL	Enron State No. 18	LRE Operating, LLC	NEW: Permit To Drill						1	1

TABLE IV

Wells that have been Plugged and Abandoned since the 2011 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	Change of Owner	P&A	T&A	Prod	Recomp	New	Total
814	30 015 22051	K	02	18S	27E	1370 FSL & 2445 FWL	Empire Abo Unit No. 141A	Apache Corporation	P&A set OIBP at 5625 ft and fill wellbore with cement.							

TABLE V
Wells that have been Temporally Abandoned since the 2011 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	Change of Owner	P&A	T&A	Prod	Recomp	New	Total
30	015 22885	O	02	18S	27E	1040 FSL & 2025 FEL	Empire Abo Unit No. 165	Apache Corporation	Perforate Abo shale at 5795-5805, 5811-5816, 5860-5867, 5890-5907, 5909-5920, 5950-5955 with 2 SP+ and 120 deg phasing and acidize perfs. Well placed back into T&A status.			1		1		
30	015 39011	O	31	17S	28E	1190 FSL & 1320 FEL	Empire Abo Unit No. 419	Apache Corp	NEW to AOR: Well drilled to TD of 6310' on 11-7-11. Perforated in Abo at 5810-5920'. Well was temporarily abandoned on 7-5-12 due to lack of production.			1			1	

TABLE VI
Wells that have been put back into Production Since the 2011 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	Change of Owner	P&A	T&A	Prod	Recomp	New	Total
984	30 015 38512	D	31	17S	28E	990 FNL & 940 FWL	Emron State No. 16	LRE Operating, LLC	Changed to production on 10/2/2011. Perfs at 3215'-3543'					1		
986	30 015 39006	J	32	17S	28E	2400 FSL & 2450 FEL	Empire Abo Unit No. 407	Apache Corp	Changed to production on 12/17/2011. Perfs at 5535'-6030'				1			1
83	30 015 25522	L	05	18S	28E	2240 FSL & 400 FWL	Waller Soil State No. 001	Waller Soil, LLC	Changed to production 9/20/11. This is a SWD well. Perfs from 7518' to 7812'				1			1
990	015 39021	D	06	18S	28E	40 FNL & 145 FWL	Empire Abo Unit No. 411	Apache Corp	New drill. Changed to production. Perforations in th Abo at 5774'-5938' (2 SPF, 188 holes). Started production on 1/14/2012.				1			1

TABLE VII
Wells that have been Recompleted in Upper Zones since the 2011 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	Change of Owner	P&A	T&A	Prod	Recomp	New	Total
355	30 015 00676	M	36	17S	27E	330 FNL & 990 FWL	Empire Abo unit # 17	Apache Corporation	Perforate Abo shale at 5330'-5332', 5380'-5382', 5430'-5432' with 4 SPF, frac the new perfs.						1	1
5	30 015 00690	G	36	17S	27E	1830 FNL & 2205 FEL	Conklin #2	G & C Service	Install 4-1/2" liner to 480 ft and cement in place with 100 sks. Well is back in production						1	1
765	30 015 00724	1	02	18S	27E	990 FNL & 330 FEL	Empire Abo Unit No. 169	Apache Corporation	Perforate Abo shale at 5444'-5446', 5480'-5482', 5512'-5514', 5290'-5292', 5340'-5342', 5392'-5394' with 4 SPF acidize and frac.						1	1
797	015 22885	O	02	18S	27E	1040 FSL & 2025 FEL	Empire Abo Unit No. 155	Apache Corporation	Perforate Abo shale at 5795'-8505', 5811'-5816', 5860'-5869', 5890'-5900', 5909'-5920', 5950'-5955' with 2 SPF and 120 deg phasing and acidize perfs. Well placed back into T&A status.			1			1	1
923	30 015 31920	D	32	17S	28E	990 FNL & 990 FWL	Enron State No. 2	LRE Operating, LLC	Changed owner from Lime Rock Resources A, LP to LRE Operating, LLC. Perforations in the Glorieta/Yeso at 3350'-3765' with 47 holes.		1					1
82	30 015 02602	F	05	18S	28E	1650 FNL & 1650 FWL	Empire Abo Unit No. 036D	Apache Corporation	Added perforations in Upper Abo formation at 5849'-5960', 6018'-6030', 6060'-6065' with 2 SPF and acidized.						1	1

TABLE VIII
Newly Drilled Wells in the Area of Review since the 2011 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	Change of Owner	P&A	T&A	Prod	Recomp	New	Total
987	30 015 38420	M	36	17S	27E	840 FSL & 425 FWL	Kiowa State No. 3	Cog Operating LLC	NEW: Drilled to TD of 4873' perforated at 3770'-4020'; 4080'-4330'; 4380'-4640' all at 1 SPF and in the Yaso formation. Completed on 11/11/11						1	1
989	30 015 39321	M	36	17S	27E	990 FSL & 860 FWL	Big Boy State No. 1	Cog Operating LLC	NEW: Drilled to TD of 5030'; perforations at 3755'-3980', 4040'-4290', 4350'-4600' 1 SPF in Yaso formation. Completed on 12/19/11						1	1
970	30 015 39322	M	36	17S	27E	840 FSL & 425 FWL	Big Boy State No. 3	Cog Operating LLC	NEW: Drilled to TD of 5015'; perforations at 3740'-3990', 4050'-4300', 4360'-4610' 1 SPF in Yaso formation. Completed on 11/10/12						1	1
971	30 015 39323	O	36	17S	27E	870 FSL & 1560 FEL	Big Boy State No. 5	Cog Operating LLC	NEW: Drilled to TD of 4953'; perforations at 4375'-4600', 4090'-4315', 3905'-4030', 3410'-3660' 1 SPF in Yaso formation. Completed on 5-21-12						1	1
972	30 015 39324	O	36	17S	27E	480 FSL & 2210 FEL	Big Boy State No. 6	Cog Operating LLC	NEW: Drilled to TD of 5072'; perforations at 3430'-3680', 3780'-4030', 4090'-4340', 4400'-4650' 1 SPF in Yaso formation. Completed on 1-19-12						1	1
973	30 015 39325	O	36	17S	27E	990 FSL & 2210 FEL	Big Boy State No. 7	Cog Operating LLC	NEW: Drilled to TD of 5100'; perforations at 3360'-3615', 3795'-4020', 4085'-4305', 3965'-4590' 1 SPF in Yaso formation. Completed on 1-30-12						1	1
975	30 015 39401	P	36	17S	27E	1110 FSL & 630 FEL	Empire Abo Unit No. 417	Apache Corp	NEW: Drilled to TD of 6300'; perforations at 5734'-5831' 2 SPF in Abo formation. Completed on 3-21-12						1	1
1004	30 015 39956	G	36	17S	27E	2176 FNL & 1858 FEL	Kiowa State No. 8	Cog Operating LLC	NEW: Drilled to TD of 4900'; perforations at 3260'-3510', 3765'-3990', 4050'-4300', 4380'-4610' 1 SPF in Yaso formation. Completed on 4-30-12						1	1
1005	30 015 40428	M	36	17S	27E	200 FSL & 485 FWL	Big Boy State No. 2	Cog Operating LLC	NEW: Permit To Drill						1	1
1006	30 015 40429	M	36	17S	27E	492 FSL & 806 FWL	Big Boy State No. 4	Cog Operating LLC	NEW: Permit To Drill						1	1
1007	30 015 39888	A	01	18S	27E	1258 FNL & 1005 FEL	Empire Abo Unit No. 412	Apache Corp	NEW: Permit To Drill						1	1
1008	30 015 39899	S	01	18S	27E	1305 FNL & 2535 FWL	Empire Abo Unit No. 413	Apache Corp	NEW: Permit To Drill						1	1
1009	30 015 39900	4	01	18S	27E	1120 FNL & 1205 FWL	Empire Abo Unit No. 414	Apache Corp	NEW: Permit To Drill						1	1
976	30 015 39009	G	02	18S	27E	1650 FNL & 2430 FEL	Empire Abo Unit No. 415	Apache Corp	NEW: Drilled to TD to 6300'; perforations at 5385'-5700' 2 SPF in Abo formation. Completed on 1-17-12						1	1
977	30 015 39086	E	02	18S	27E	2420 FNL & 1185 FWL	Empire Abo Unit No. 416	Apache Corp	NEW: Permit To Drill						1	1
1011	30 015 36564	O	30	17S	28E	330 FSL & 2210 FEL	Slaley State No. 9	LRE Operating, LLC	NEW to AOR Perforations: 3666'-3942'; Changed operator from Lime Rock Resources to LRE Operating, LLC	1					1	1
1012	30 015 37673	N	30	17S	28E	330 FSL & 1650 FWL	Slaley State No. 12	LRE Operating, LLC	NEW to AOR: Perforations in Yaso: 3623'-3859' 3924'-4222' 4290'-4598' Changed operator from Lime Rock Resources to LRE Operating, LLC	1					1	1
1013	30 015 38203	M	30	17S	28E	330 FSL & 990 FWL	Slaley State No. 8	Cog Operating LLC	NEW: Drilled to TD of 5108'. Perforations in Yaso: 3318'-3574' (45 holes), 3634'-3928' (40 holes), 4013'-4280' (40 holes), 4345'-4680' (44 holes) at 2 SPF. Completed on 4-4-12						1	1
1014	30 015 40026	N	30	17S	28E	330 FSL & 2410 FWL	Slaley State No. 17	LRE Operating, LLC	NEW to AOR: Well drilled 11-7-11. TD at 6310'. Perforated in Abo at 5810'-5920'. Well was temporarily abandoned on 7-5-12 due to lack of production.			1			1	1
1015	30 015 39011	O	31	17S	28E	1190 FSL & 1320 FEL	Empire Abo Unit No. 419	Apache Corp	NEW to AOR: Well drilled to TD of 6275' on 11-9-11. Perforated in Abo at 5175'-5769', 5769'-5798', 5798'-5803', 5820'-5838', 5846'-5860', 5875'-5916', 5940'-5954', 5940'-5962', 6022'-6032' with 2 SPF and address						1	1
1016	30 015 39020	O	31	17S	28E	140 FSL & 2560 FEL	Empire Abo Unit No. 408	Apache Corp	NEW: Permit To Drill						1	1
1017	30 015 40257	O	31	17S	28E	184 FNL & 257 FWL	Big Girl 31 State No. 1	Cog Operating LLC	NEW: Permit To Drill						1	1
1018	30 015 40258	D	31	17S	28E	195 FNL & 990 FWL	Big Girl 31 State No. 2	Cog Operating LLC	NEW: Permit To Drill						1	1
1019	30 015 40259	D	31	17S	28E	2160 FNL & 2310 FEL	Big Girl 31 State No. 5	Cog Operating LLC	NEW: Permit To Drill						1	1
1020	30 015 40260	D	31	17S	28E	1155 FNL & 990 FWL	Big Girl 31 State No. 7	Cog Operating LLC	NEW: Permit To Drill						1	1
1021	30 015 40409	L	31	17S	28E	1920 FSL & 330 FWL	Big Girl 31 State No. 9H	Cog Operating LLC	NEW: Permit To Drill						1	1
1022	30 015 40410	M	31	17S	28E	615 FSL & 10 FWL	Big Girl 31 State No. 11H	Cog Operating LLC	NEW: Permit To Drill						1	1
1023	30 015 39927	K	32	17S	28E	1750 FSL & 1765 FWL	AA State No. 2	Apache Corp	NEW: Permit To Drill						1	1
1024	30 015 40359	D	32	17S	28E	990 FNL & 330 FWL	Emron State No. 18	LRE Operating, LLC	NEW: Permit To Drill						1	1

TABLE IX**FIGURES INCLUDED IN THE REPORT**

Figure	Description	OCD Reference
1	Chukka Well #2 Schematic	Section VI.1 and IX.3
2	Plot of Bottom Hole Pressure and Temperature Data Mewbourne Well #1	n/a
3	Mewbourne Well #1 Schematic	n/a
4	Gaines Well #3 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	Chukka Well #2 Wellhead Schematic	Section IX.14
8	Diagram of Valve Locations for Shut-in on Chukka Well #2	Section IX.14
9	Chukka Well #2 Test Overview	Section IX.18.f
10	Chukka Well #2 Cartesian Plot of Bottom-Hole Pressure and Temperature vs. Time	Section IX.18.a
11	Chukka Well #2 Cartesian Plot of Injection Rate vs. Time	Section IX.18.b
12	Chukka Well #2 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	Chukka Well #2 Derivative Log-Log Plot	Section IX.18.c
15	Chukka Well #2 Superposition Horner (Semi-Log) Plot	Section IX.18.d
16	Chukka Well #2 Expanded Superposition Horner (Semi-Log) Plot	Section IX.18.d
17	Chukka Well #2 Hall Plot	Section IX.18.h
18	Chukka Well #2 Static Pressure Gradient Survey	n/a

TABLE X**Comparison of Permeability, Transmissibility,
Skin, False Extrapolated Pressure, and Fill Depth**

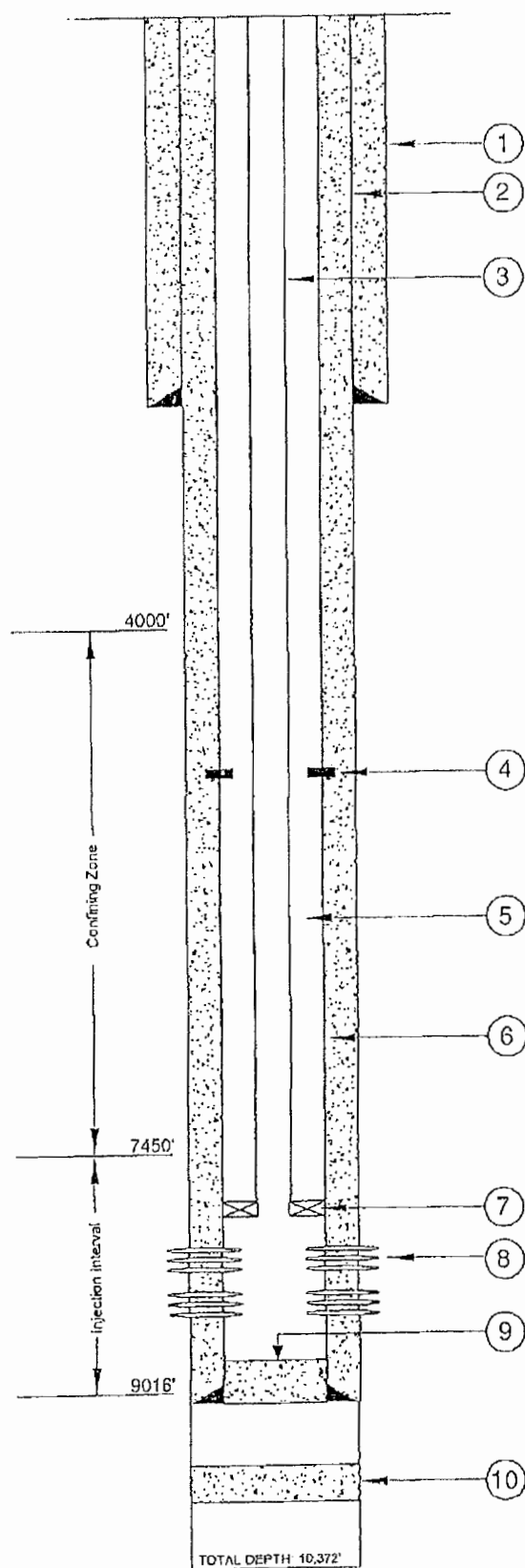
Date of Test	Permeability (k)	Transmissibility (kh/u)	Skin (s)	False Extrapolated Pressure (p*)	Fill Depth
November 2-3, 2012	1,848 md	548,069 md-ft/cp	25.99	3898.55 psia	8,775 feet
October 17-22, 2011	1,451 md	430,405 md-ft/cp	29.41	3697.29 psia	8,335 feet
September 28- October 1, 2010	820 md	243,351 md-ft/cp	86.50	3576.58 psia	8,775 feet
October 1-4, 2009	856 md	253,821 md-ft/cp	39.74	3445.89 psia	8,775 feet
April 1-4, 2008	1,091 md	265,300 md-ft/cp	155	3393.47 psia	N/A
April 3-6, 2006	2,183.54 md	707,629 md-ft/cp	81.55	3393.63 psia	N/A
April 2005	2,496.17 md	808,946 md-ft/cp	23.45	3347.95 psia	N/A
April 2001	2,211.07 md	716,551 md-ft/cp	54.07	3236.42 psia	N/A
April 1999	4,712.07 md	1,527,060 md-ft/cp	59.71	2844.45	N/A
Permit Parameters	250 md	40,094 md-ft-cp	N/A	N/A	N/A

TABLE XI

**NAVAJO REFINING COMPANY
STATIC PRESSURE GRADIENT SURVEY – CHUKKA WELL #2
NOVEMBER 3, 2012**

Depth (ft)	Pressure (psia)	Pressure Gradient (psi/ft)	Temperature (°F)
7570	3900.58		104.36
7000	3651.71	0.437	108.19
6000	3216.89	0.435	108.19
5000	2783.31	0.434	97.71
4000	2347.46	0.436	93.2543
3000	1911.58	0.436	89.54
2000	1477.48	0.434	86.53
1000	1043.07	0.434	82.01
0	596.43	0.447	56.06

FIGURES



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 $\frac{5}{8}$ ", 32 lb/ft, set at 1995' in an 11" hole. Cemented to surface with 800 sacks of cement.
3. Injection Tubing: 3 $\frac{1}{2}$ ", 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 $\frac{1}{2}$ ", 17 lb/ft, L-80, LT&C: 8869' to the surface and set in a 7 $\frac{7}{8}$ " hole. Casing cemented in two stages as follows:

First Stage - 575 sacks of modified Class "H" with 0.4 % CFR-3, 5 lb/sk Gilsomite, 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 Gilsomite, 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 $\frac{1}{2}$ " x 2 $\frac{7}{8}$ " Weatherford Completion Tools (Arrow) Model X-1 retrievable packer set at 7628'. Minimum ID is 2.4375". Wireline re-entry guide is on bottom. To release: turn $\frac{1}{4}$ 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.	
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 1

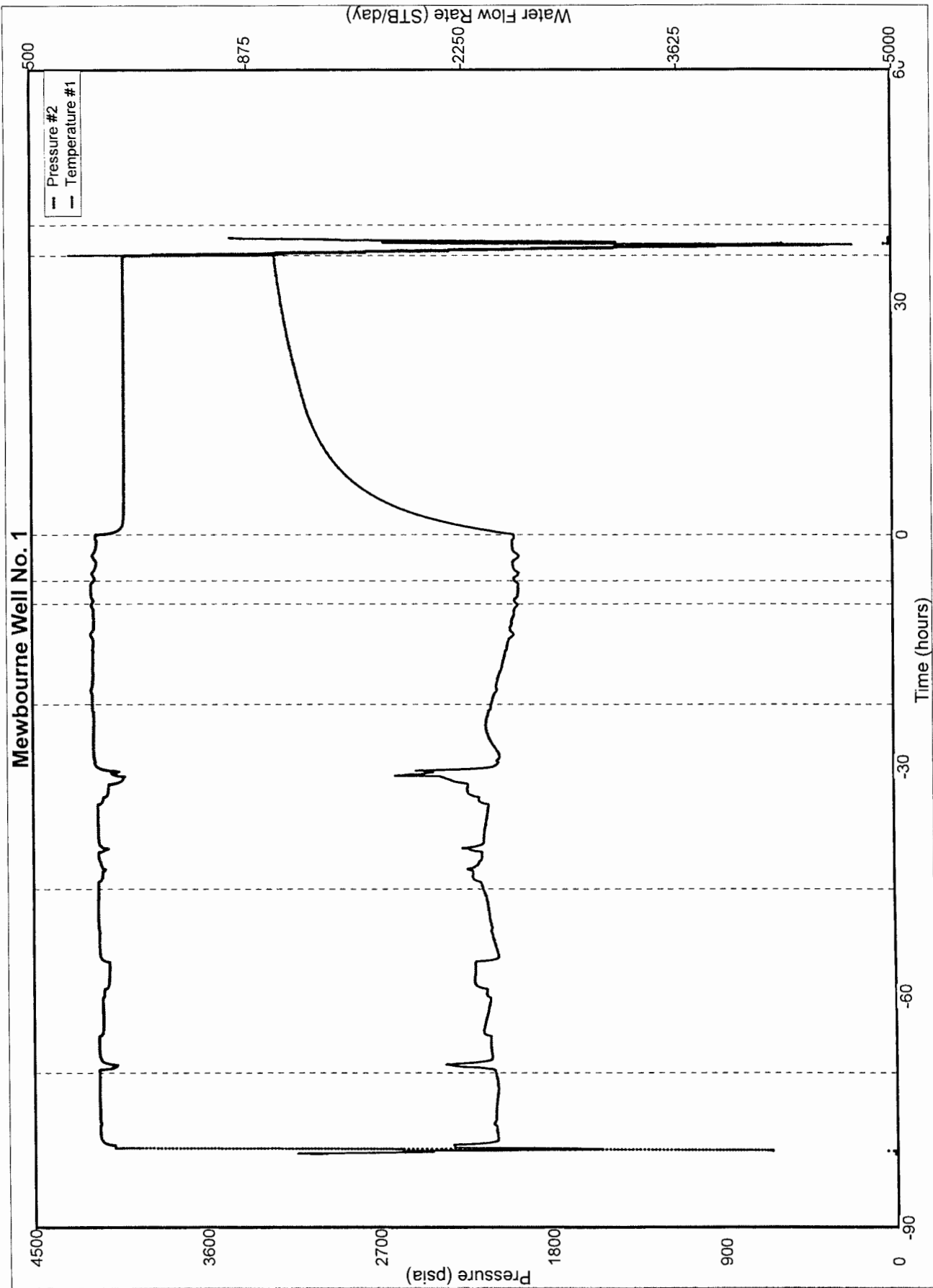


FIGURE 2

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 3/4", 48 lb/ft, J-55, ST&C set at 390' in a 17 1/2" hole. Cemented with 150 sx Class C with 3 % calcium chloride, 375 sx Class C Lite w/3 % calcium chloride and 1/2 lb/sx flocele. Circulated 86 sx to surface.
2. Intermediate Casing: 9 5/8", 36 lb/ft, J-55, ST&C set at 2,555' in a 12 1/4" hole. Cemented w/800 sx of Class C Lite w/ 1/2 lb/sx flocele and 2 lb/sx Gilsomite 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 1/2", 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 Gilsomite, 0.5 % Halad-344, and 1 lb/sx salt mixed at 13.0 ppg. Opened DV tool at 5490' 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, Gilsomite, 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 1/4 turn to the right and pick up.

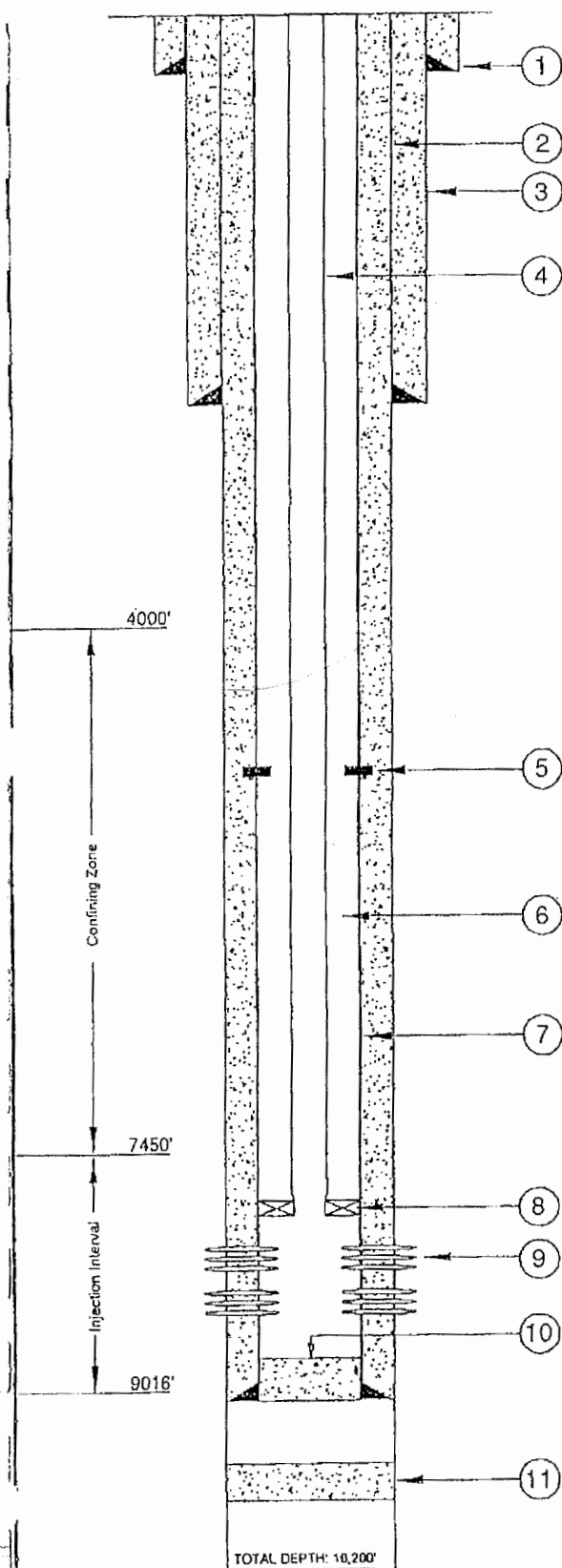
9. Perforations (2 SPF):

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.

NAVAJO REFINING COMPANY
ARTESIA, NEW MEXICO

BELOW GROUND DETAILS WASTE DISPOSAL WELL NO. 1

DATE: 07/13/01	CHECKED BY:	JOB NO: 7005255
DRAWN BY: WDL	APPROVED BY:	DWG. NO:

FIGURE 3

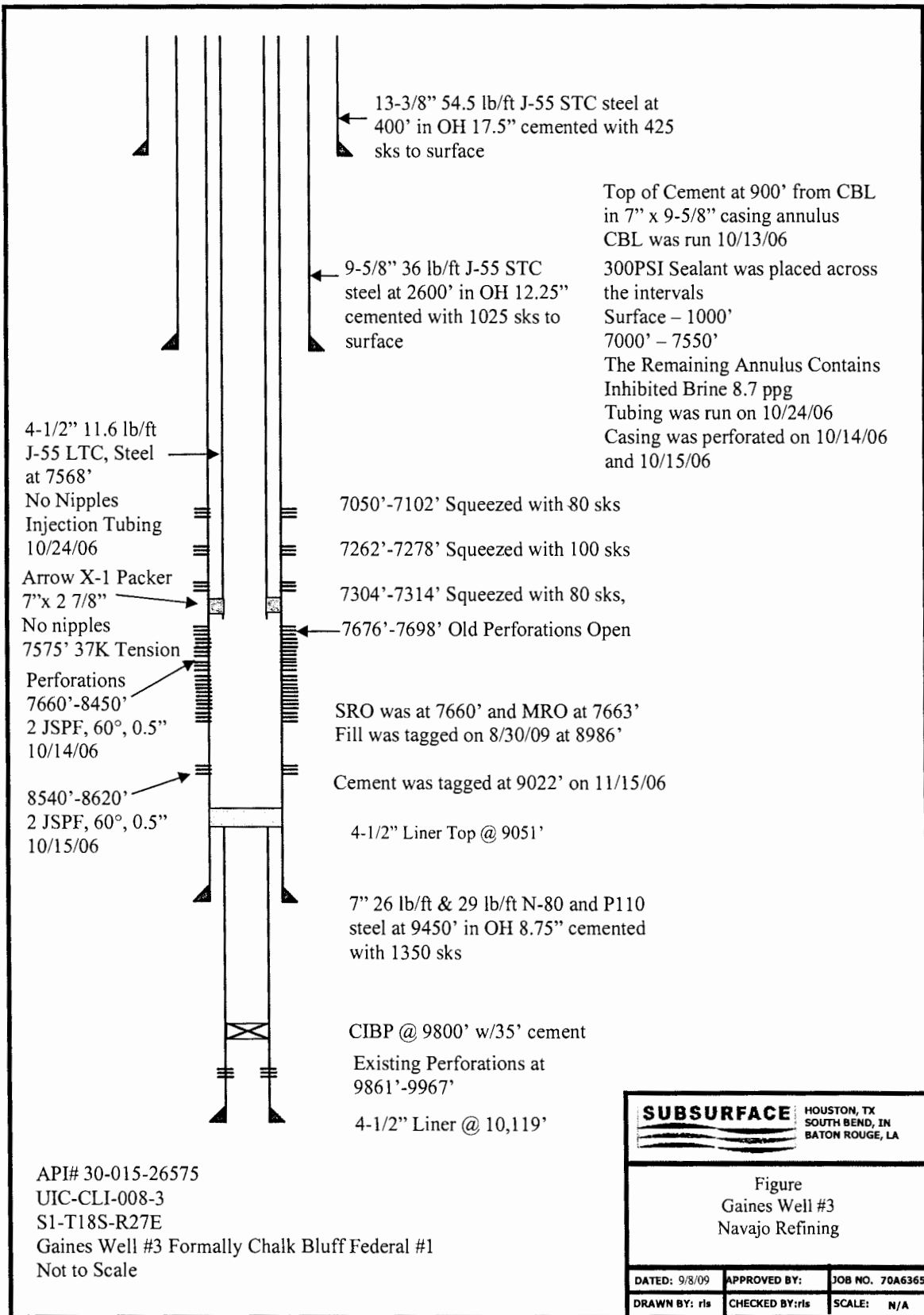


FIGURE 4

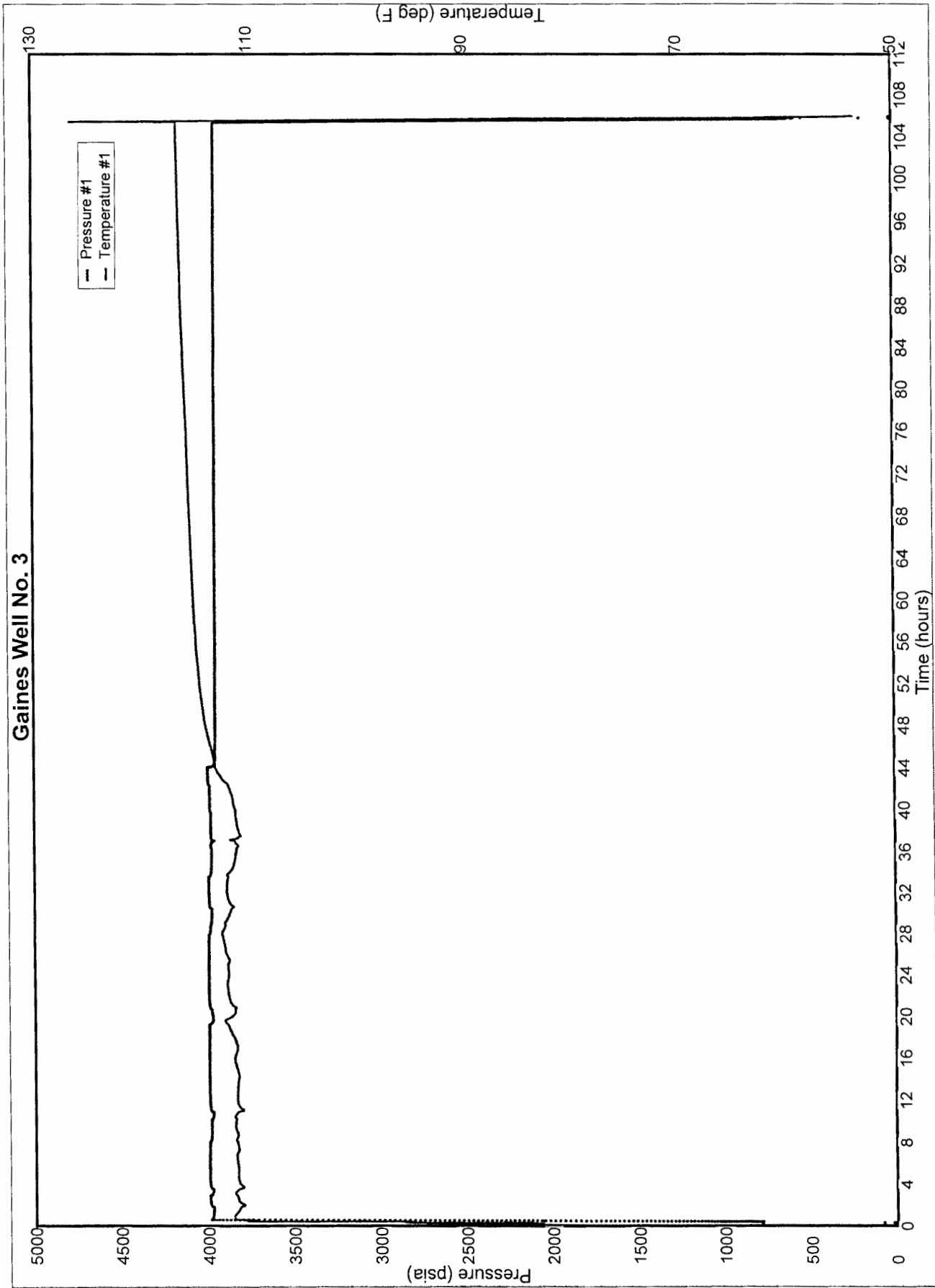
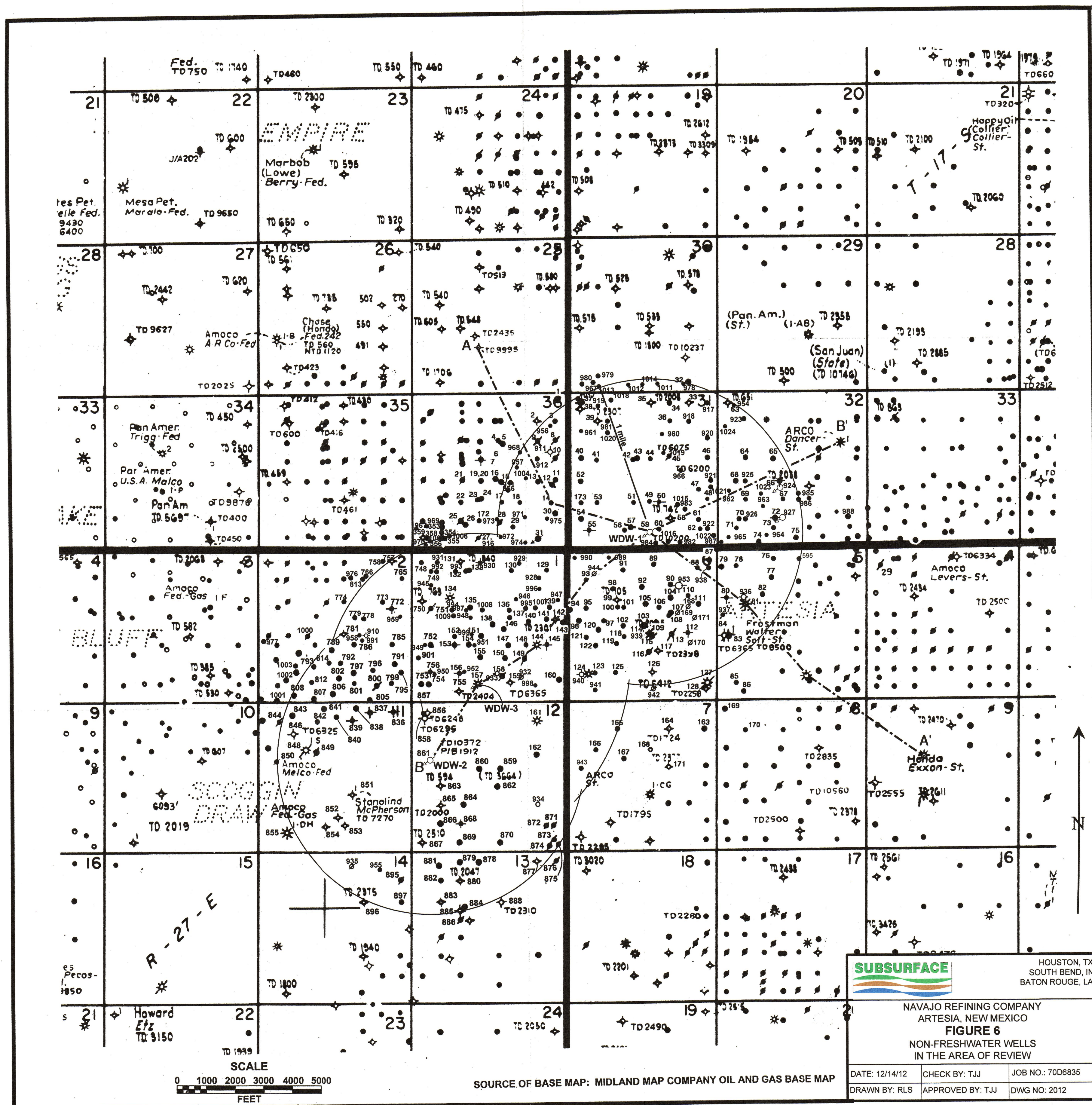


FIGURE 5



SUBSURFACE TECHNOLOGY

FIGURE 7

WELL: NAVAJO REFINING WDW #2

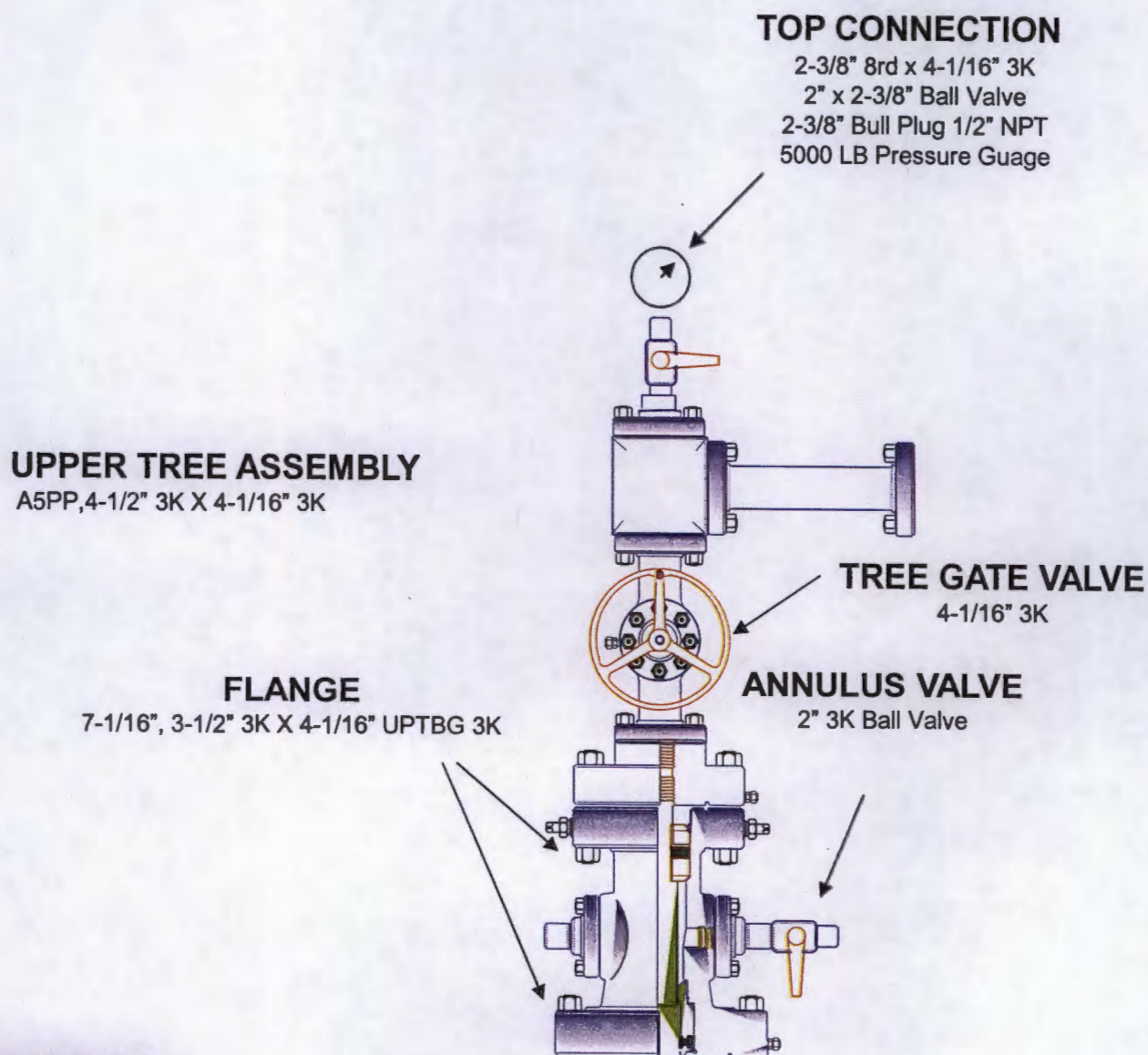
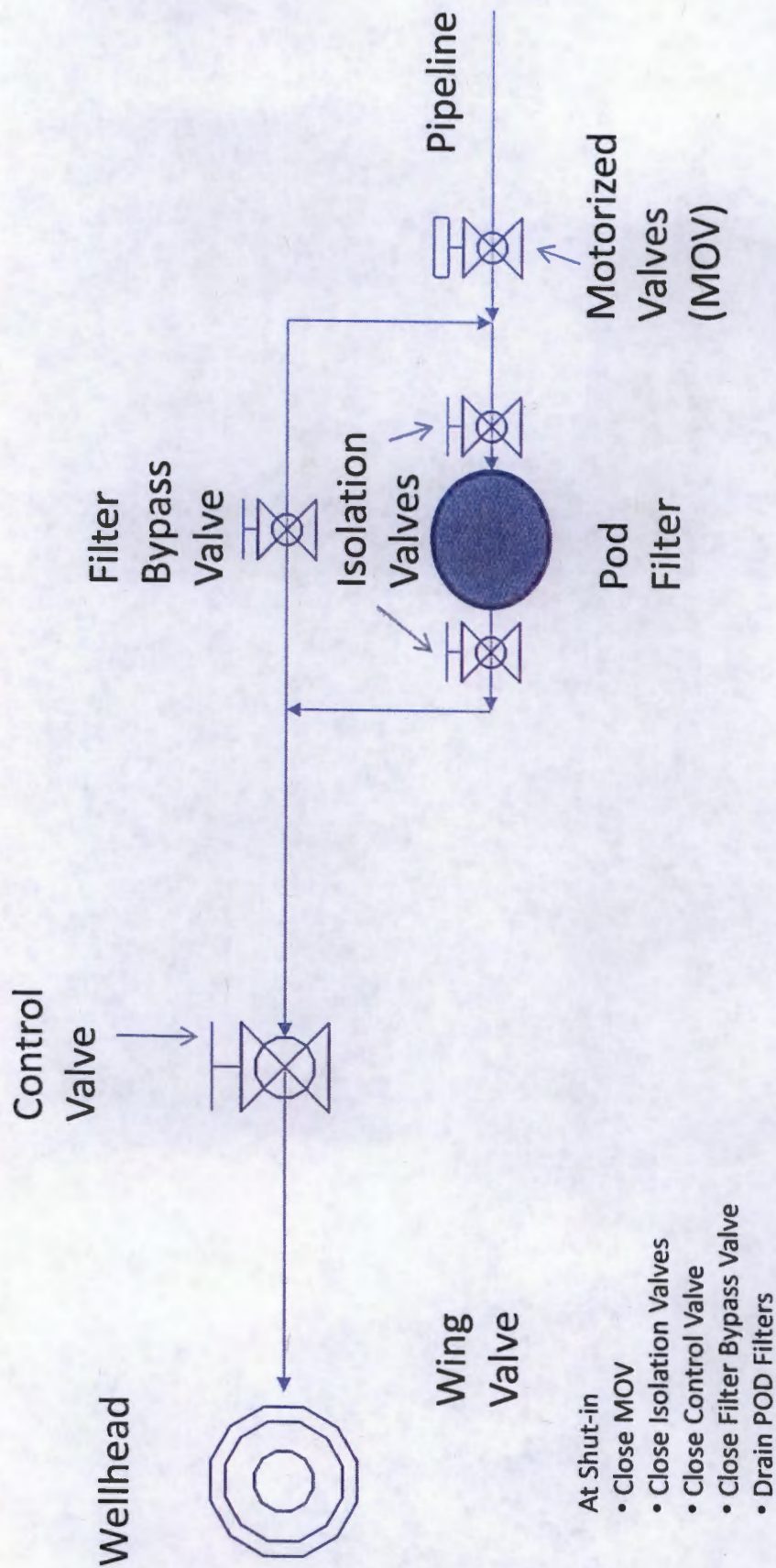


FIGURE 8
Chukka Well #2
Diagram of Shut-in Valve Control



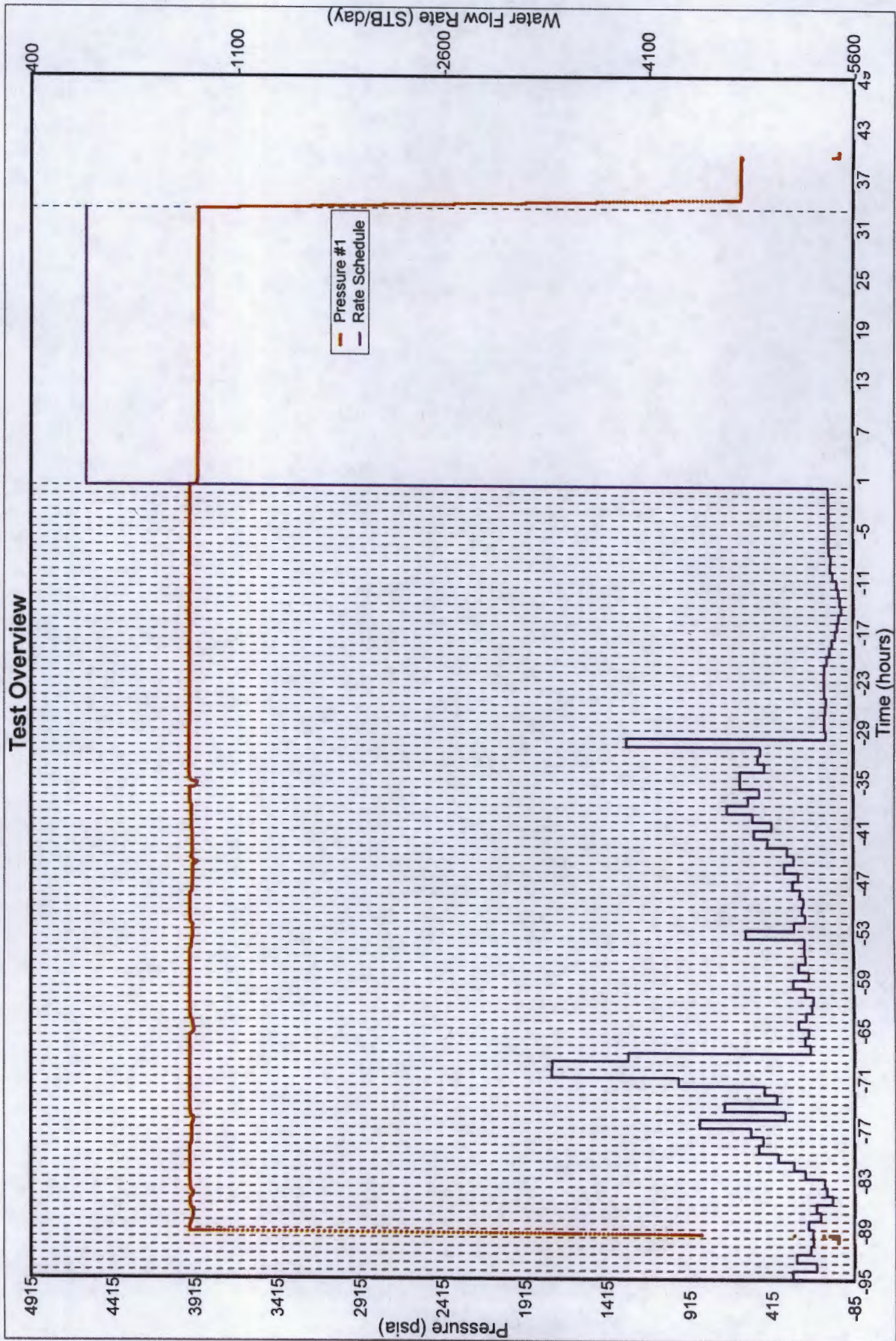


FIGURE 9

FIGURE 9

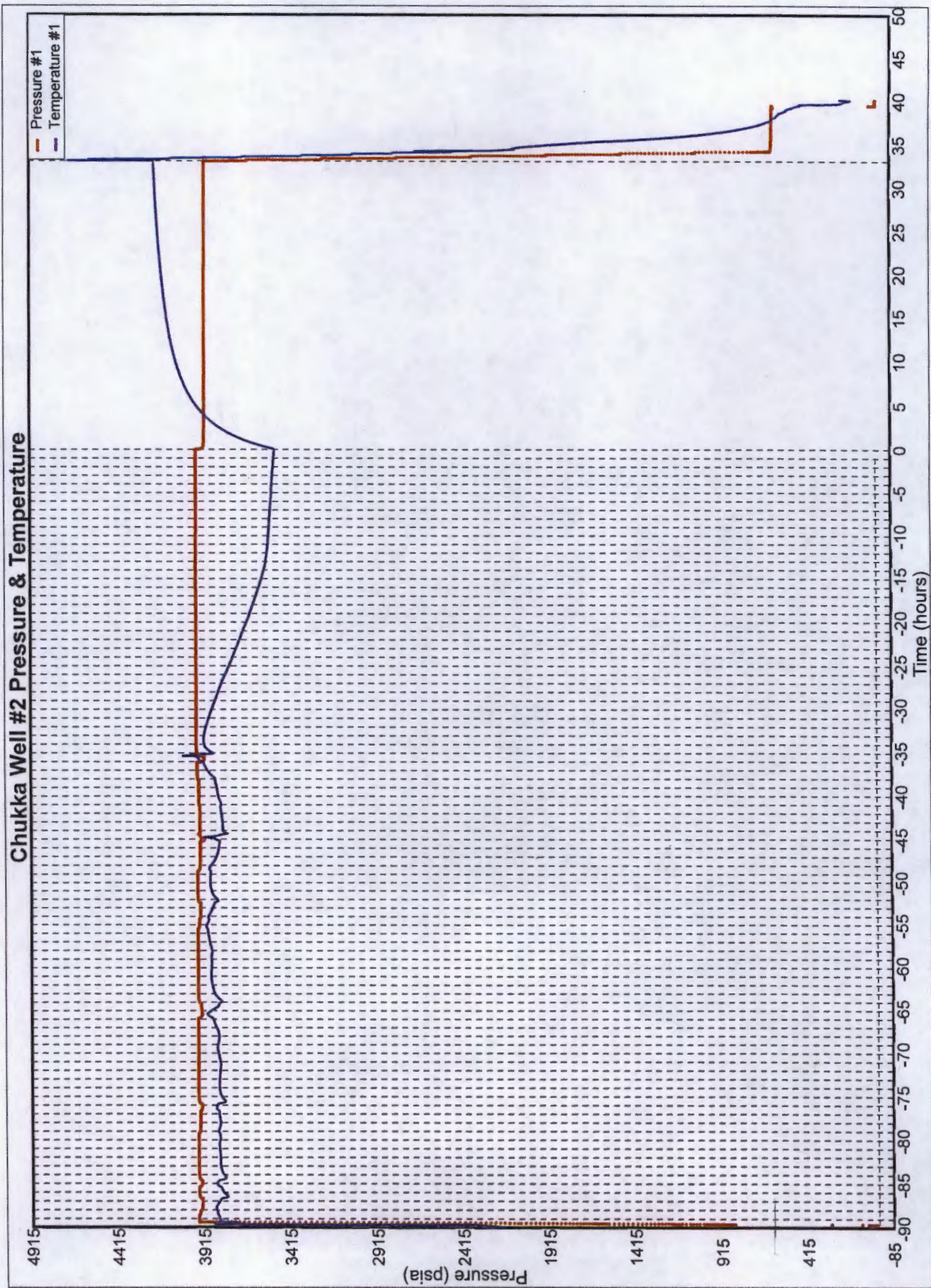


FIGURE 10

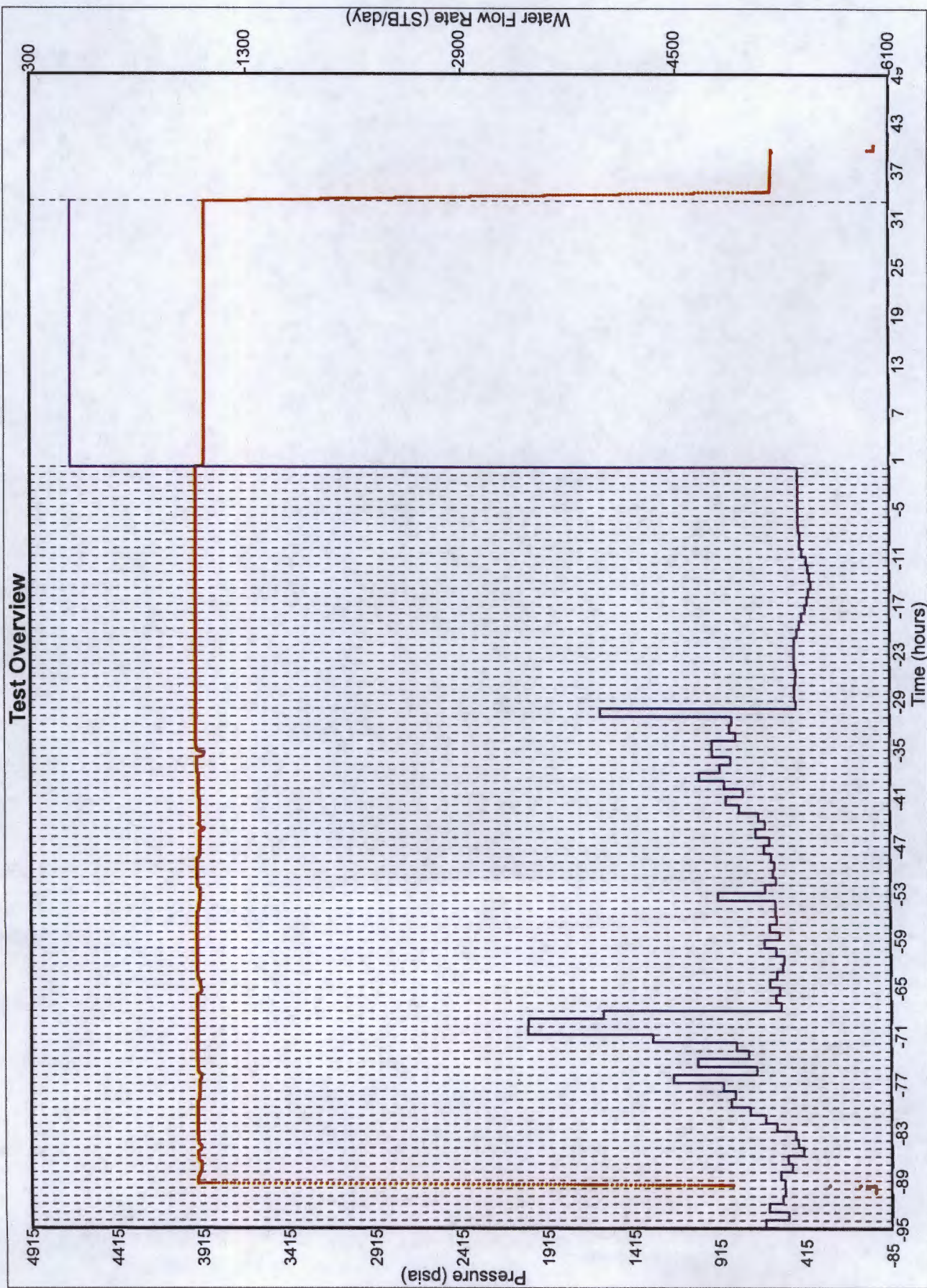
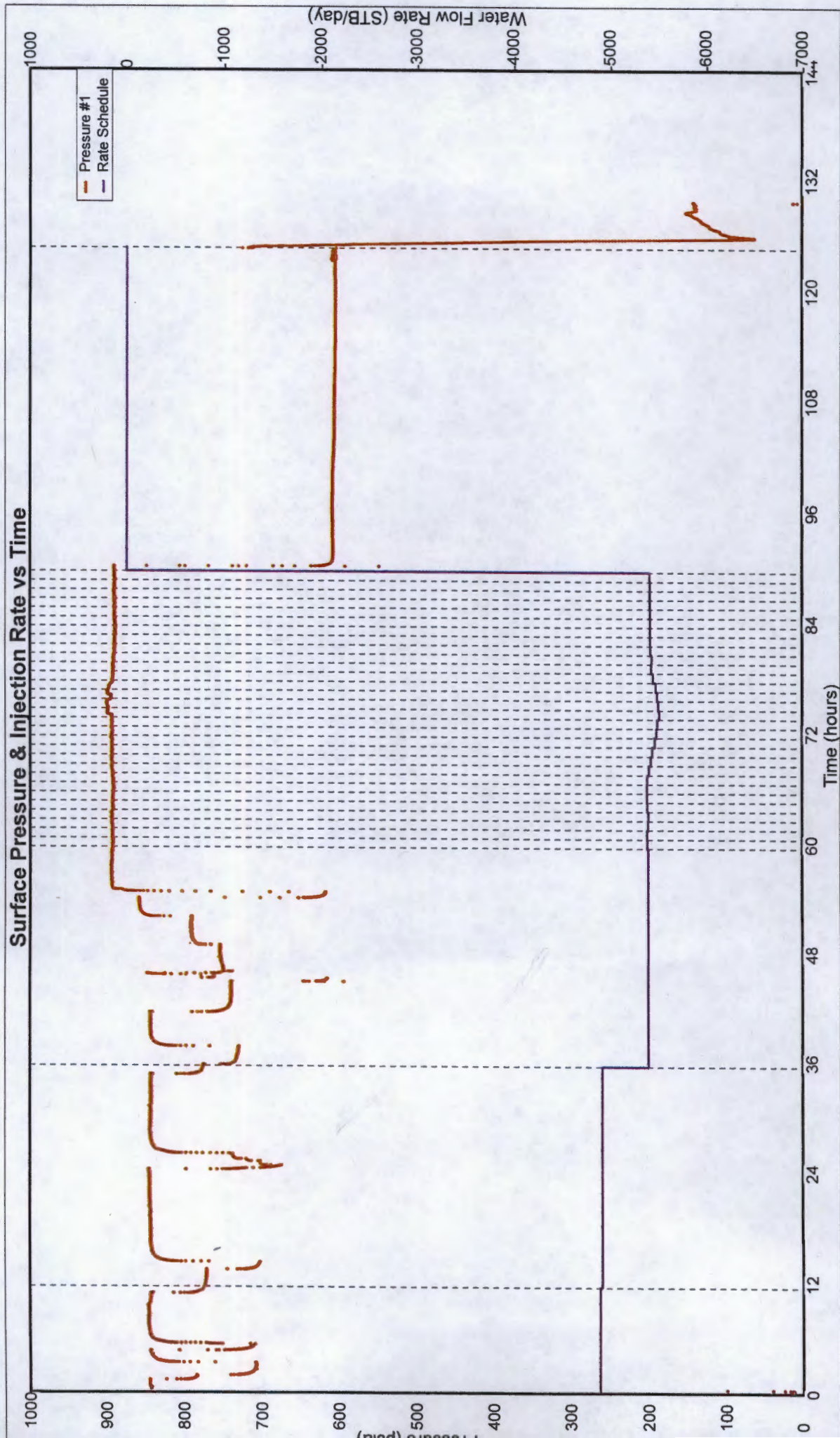


FIGURE 11

Surface Pressure & Injection Rate vs Time



Chukka Well No. 2
 Cartesian Plot of Surface Pressure and Injection Rates
 December 24, 2000 to October 31, 2012

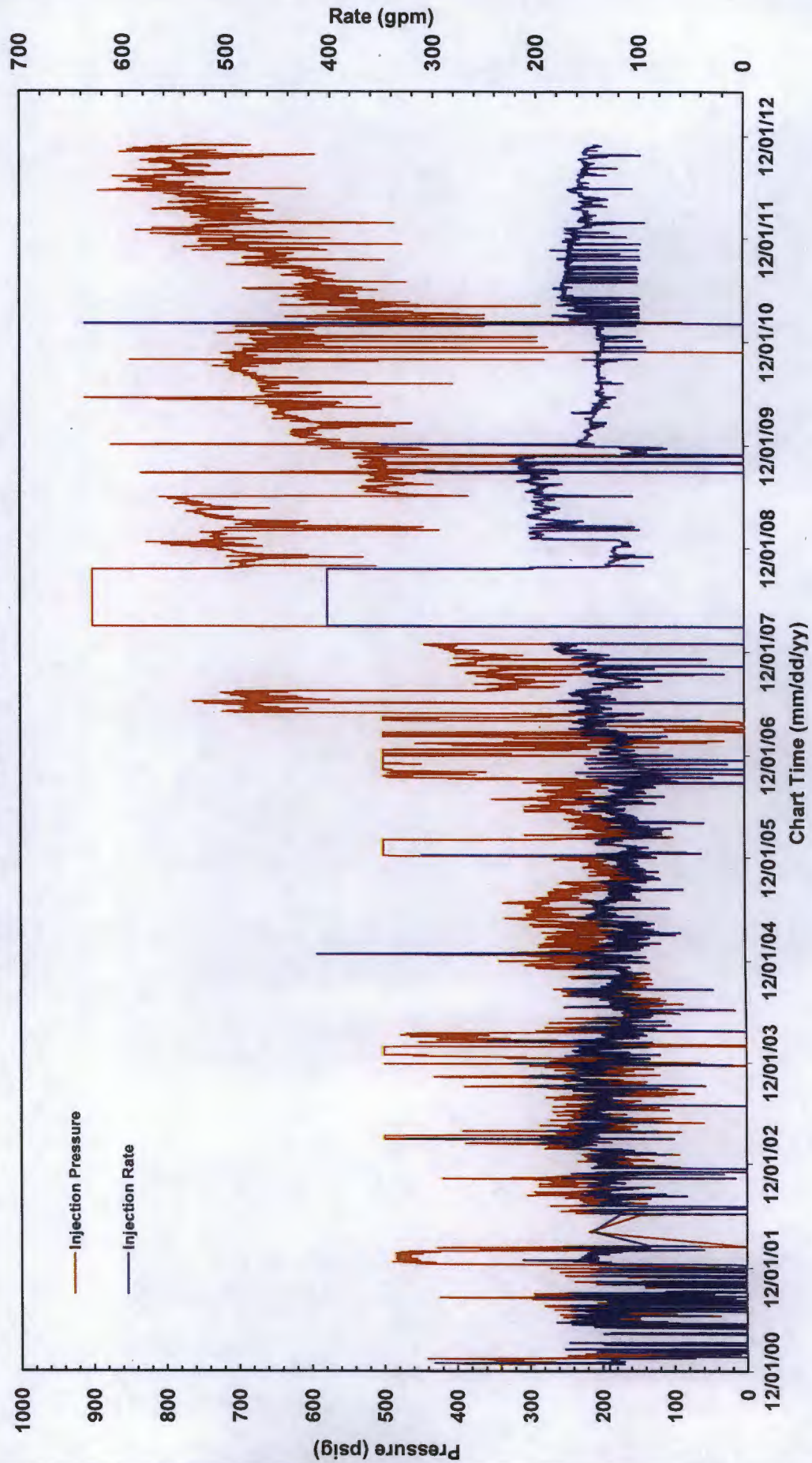


FIGURE 13

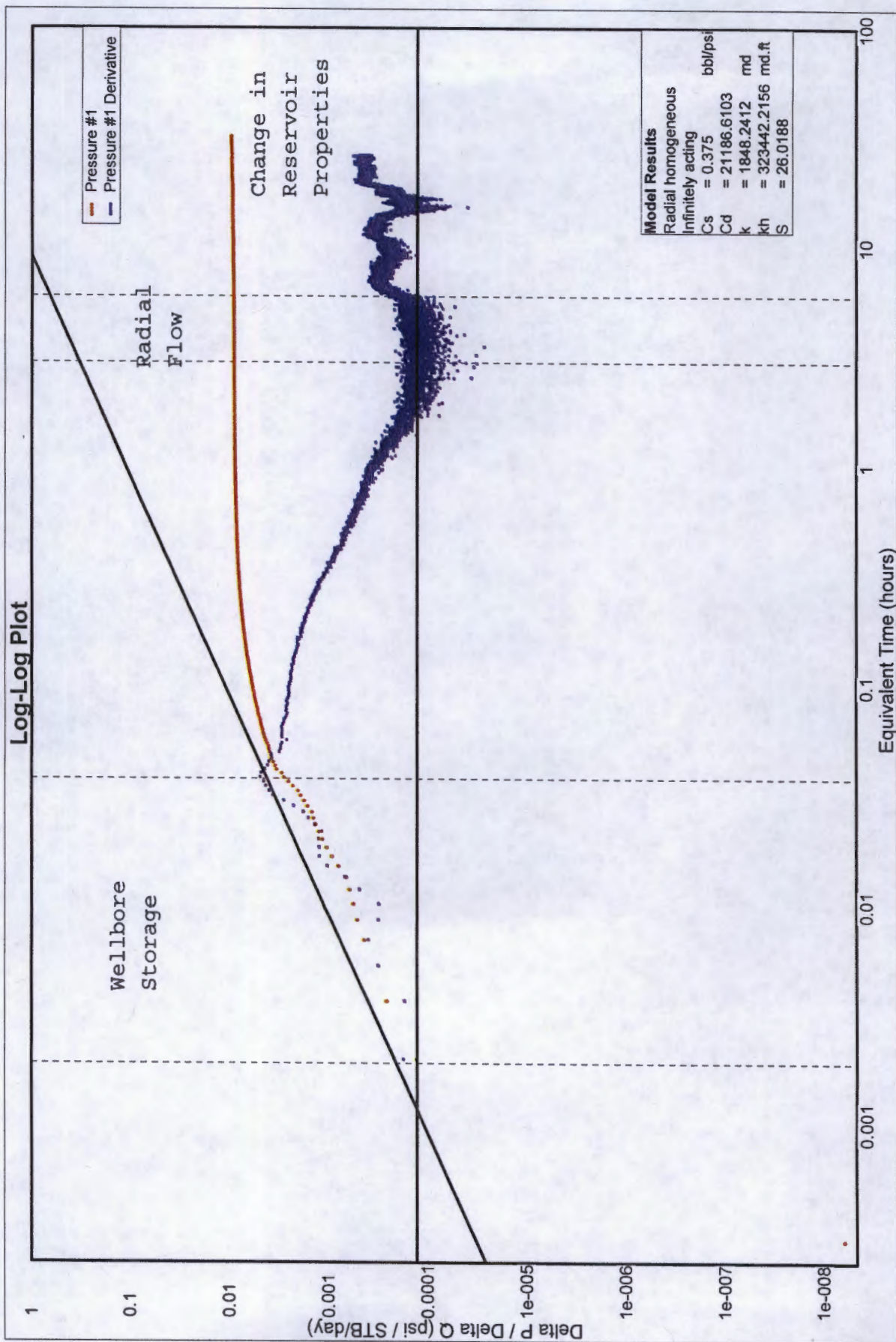


FIGURE 14

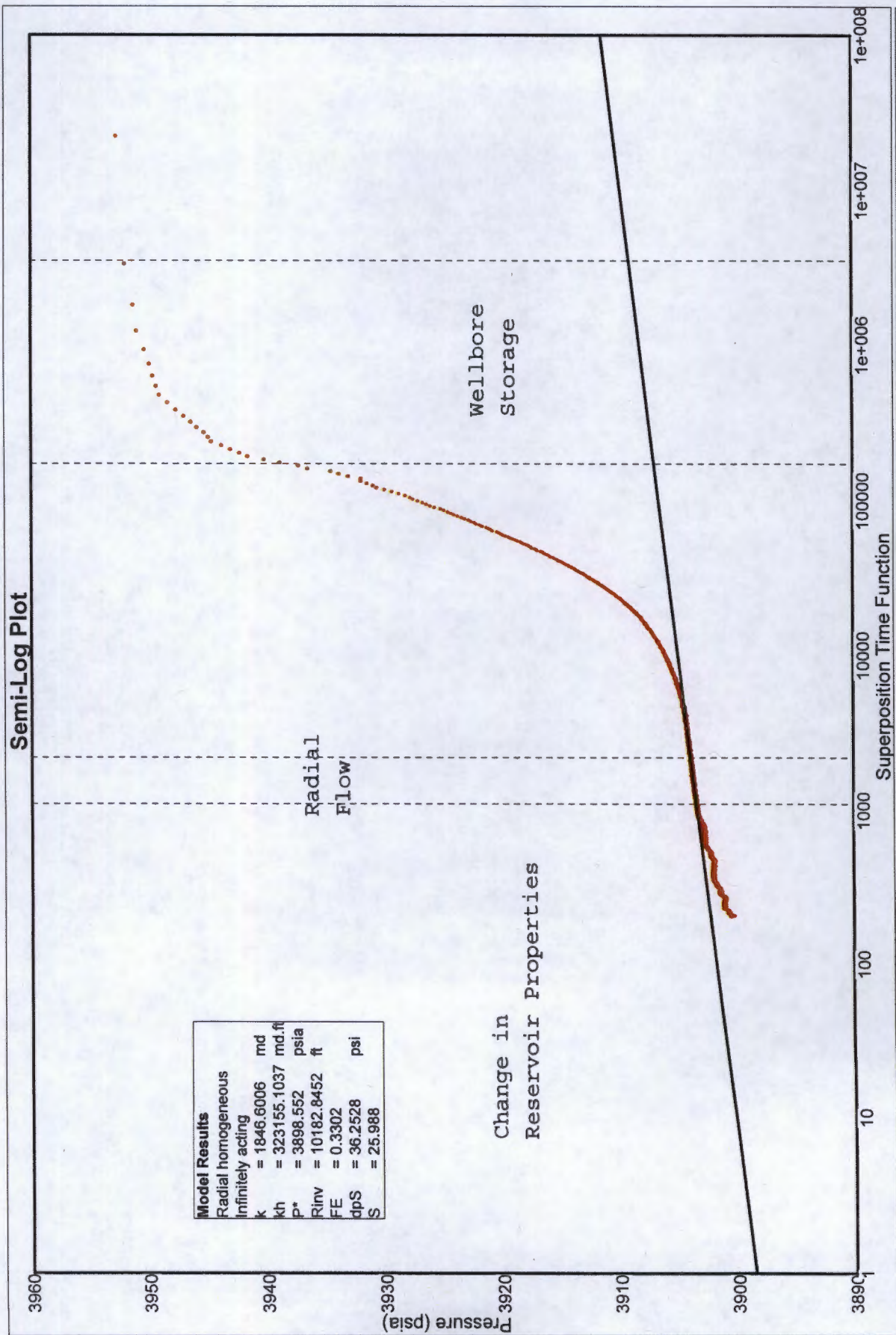


FIGURE 15

Expanded View of Semi-Log Plot

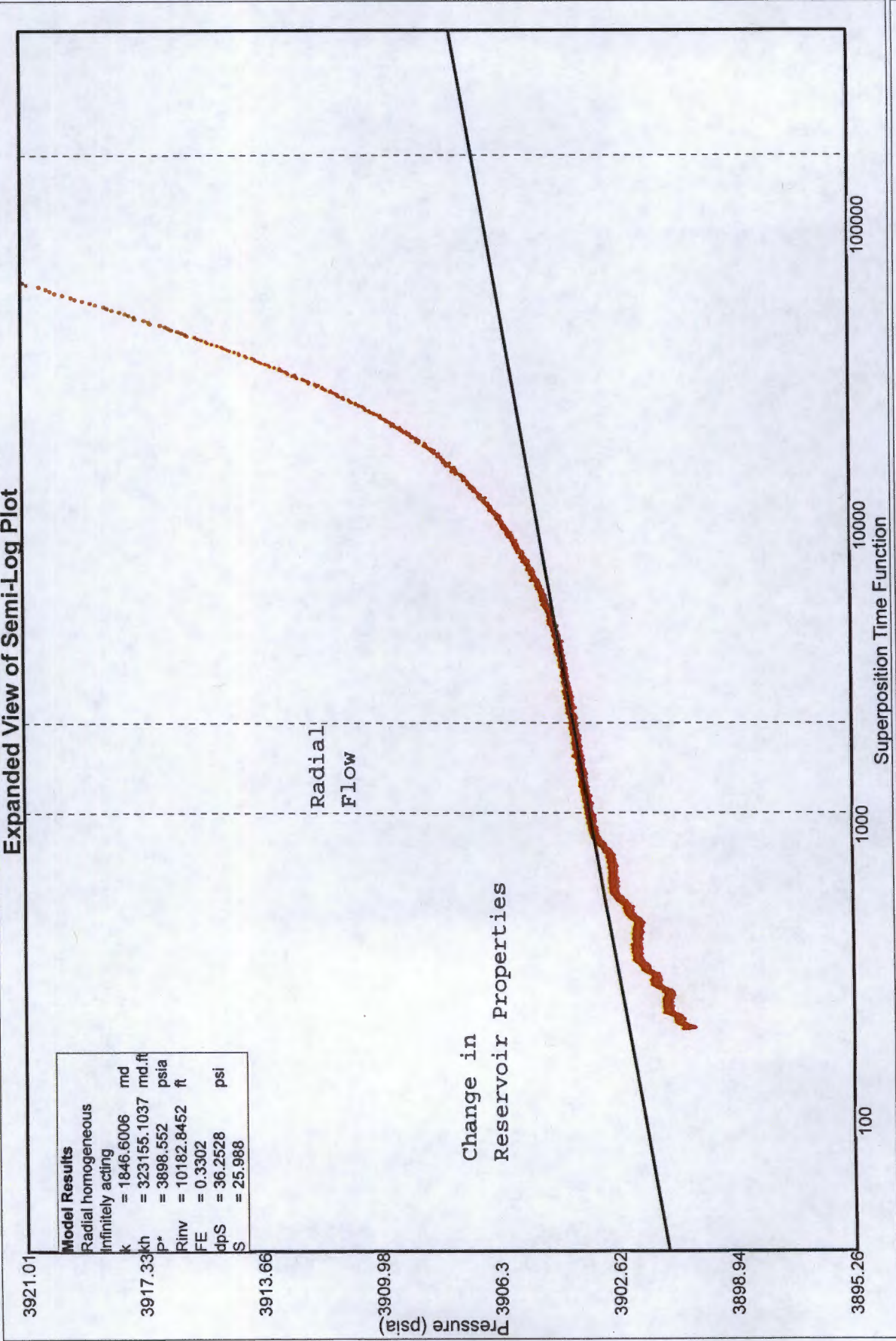


FIGURE 16

Chukka Well No. 2
Hall Plot
September 29, 2012 to November 1, 2012

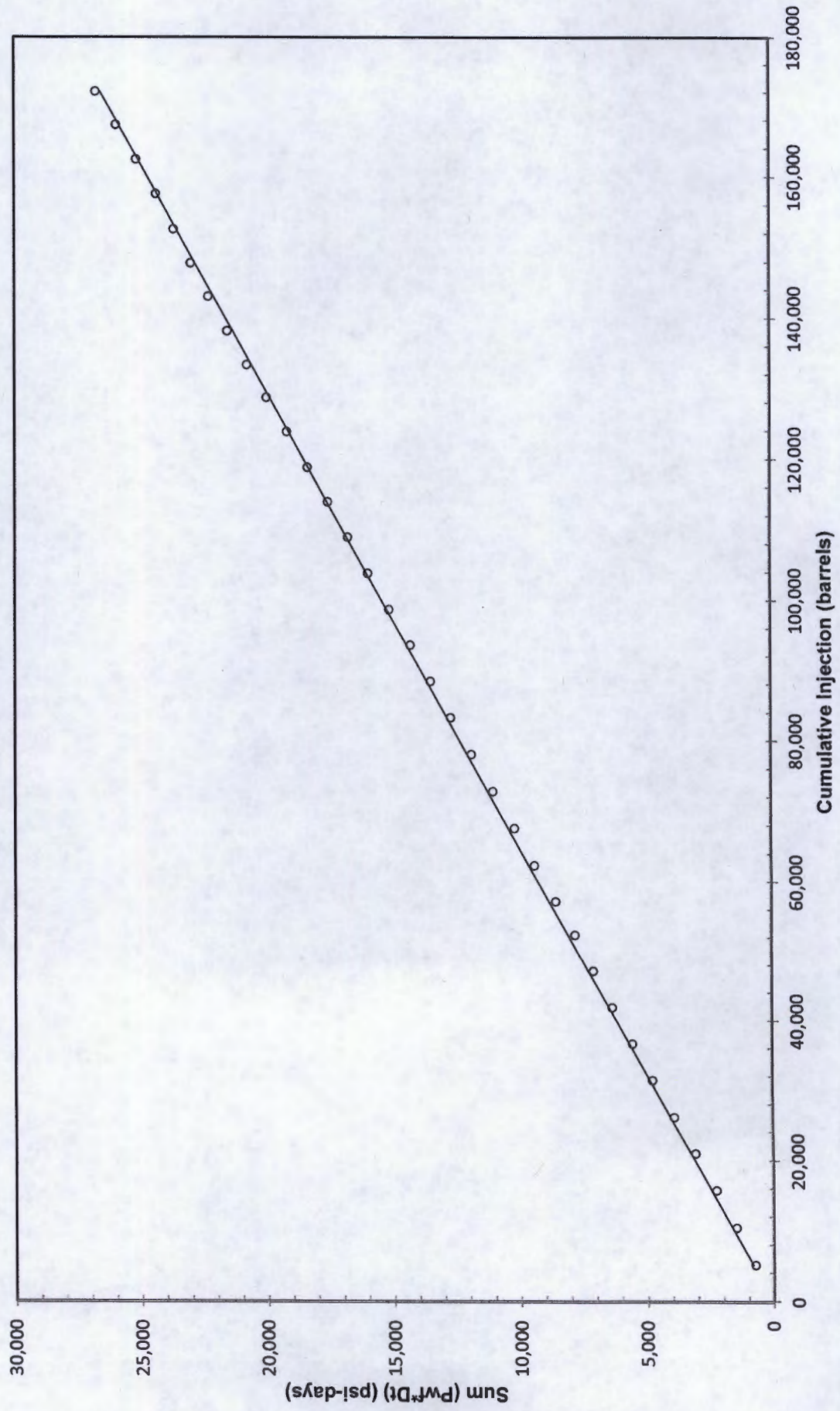


FIGURE 17

Navajo Refining Company
Static Pressure Gradient Survey
Chukka Well No. 2
November 3, 2012

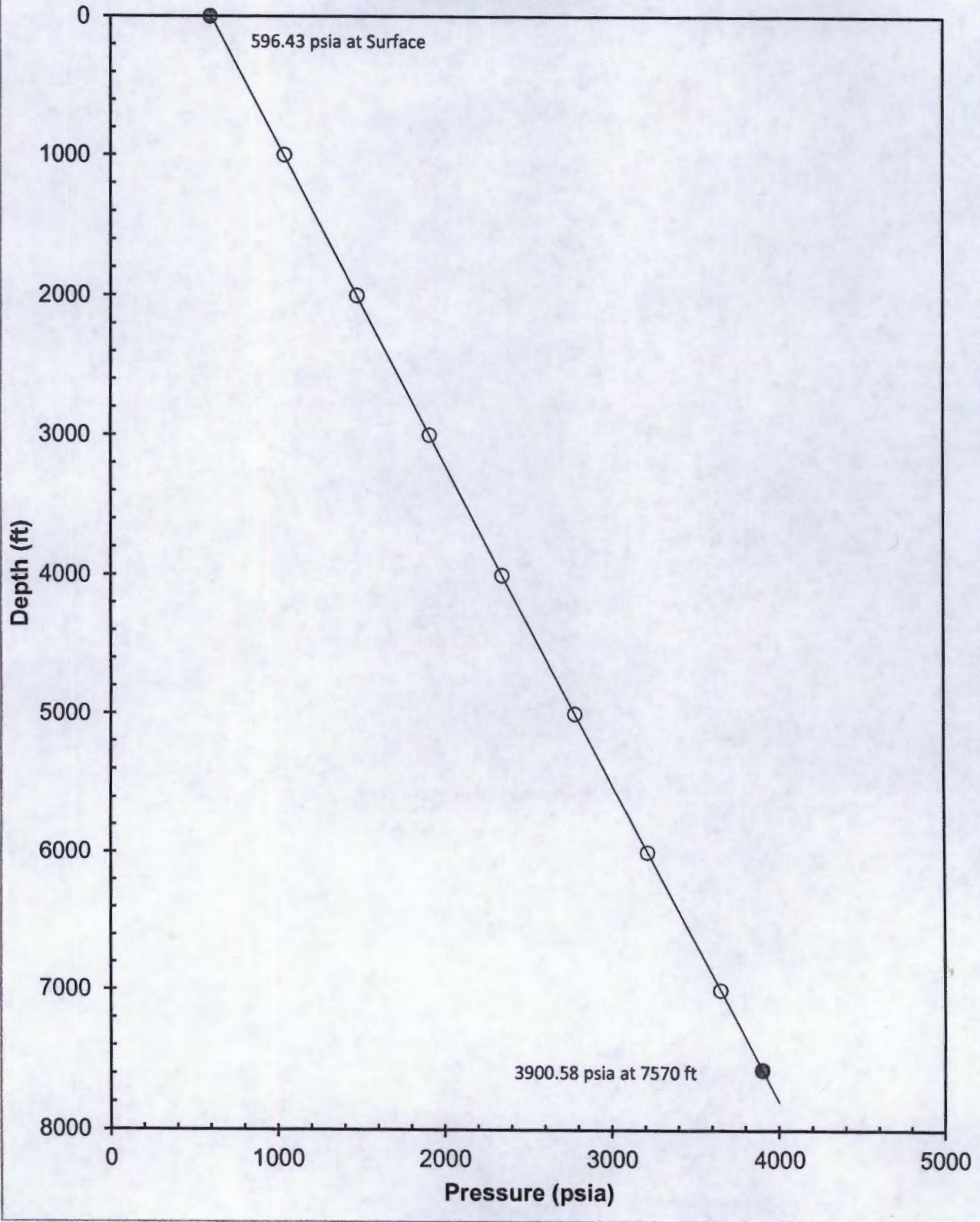


FIGURE 18

Eastman Select
125 COTTON

APPENDICES

James H. Brown & Son
INCORPORATED

APPENDIX A

DUAL INDUCTION LOG SECTIONS FROM 7,660 FEET TO 8,620 FEET

APPENDIX B

**NEUTRON DENSITY LOG SECTIONS FROM
7,660 FEET TO 8,620 FEET**

APPENDIX C
COMPRESSIBILITY OF FLUID

APPENDIX C

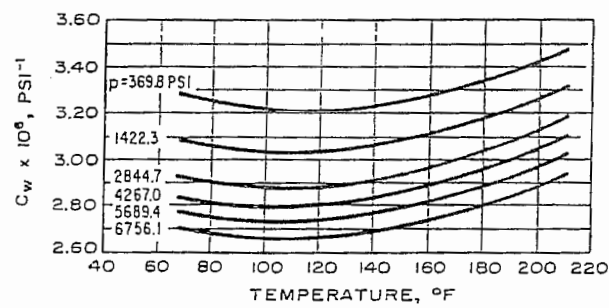


Fig. D.16 Average compressibility of distilled water. After Long and Chierici.¹³

Source: Earlougher, 1977, Advances in Well Test Analysis

COMPRESSIBILITY OF PORE VOLUME AND DISTILLED WATER

APPENDIX D

COMPRESSIBILITY OF PORE VOLUME

APPENDIX D

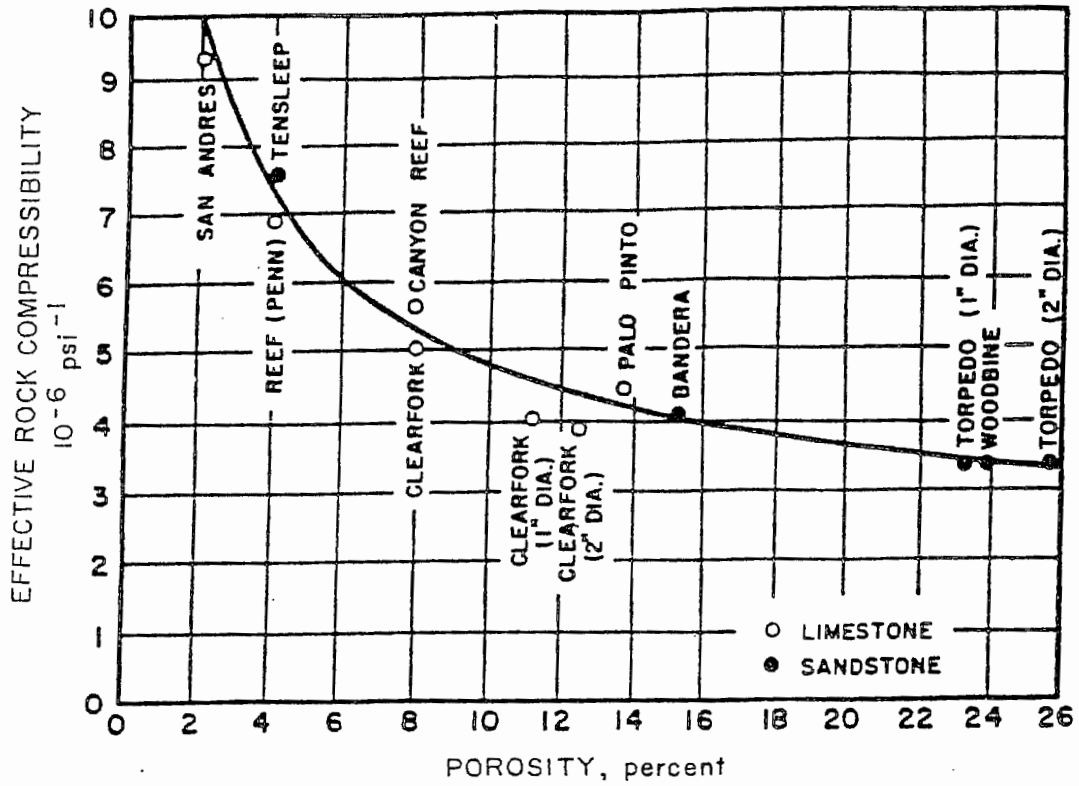


Fig. G.5 Effective formation (rock) compressibility. From Hall, *Trans.*, AIME (1953) 198, 309.

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

APPENDIX E

**CHUKKA WELL NO. 2 MAY 28, 1999 AND
JUNE 5, 1999 TEMPERATURE LOG
SECTIONS FROM 7,500 FEET TO 8,770 FEET**

APPENDIX F

**WATER VISCOSITIES AT VARIOUS SALINITIES
AND TEMPERATURES**

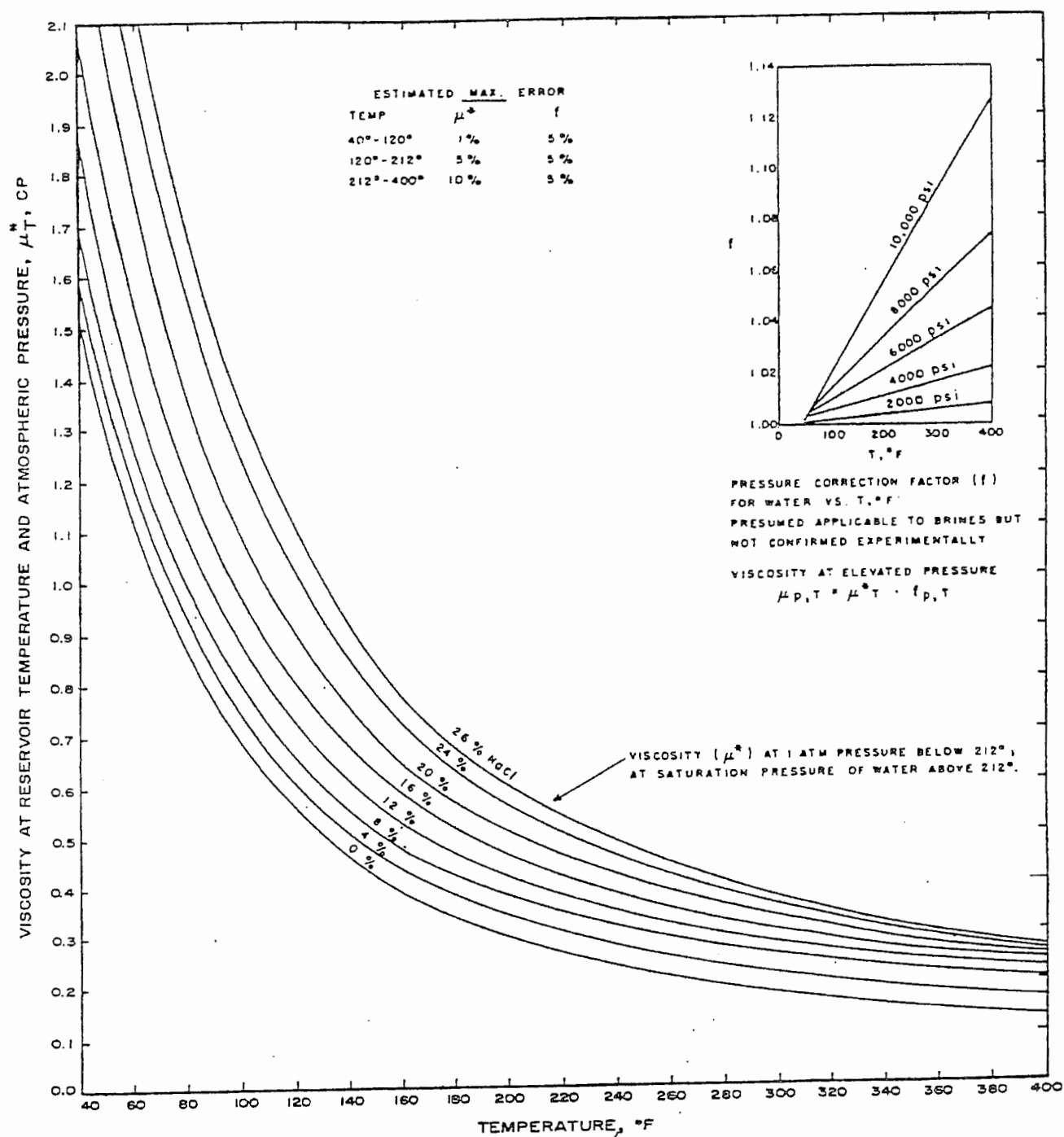


Fig. D.35 Water viscosity at various salinities and temperatures. After Matthews and Russell, data of Chesnut.¹⁸

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

APPENDIX G

DAILY RATE HISTORY DATA

APPENDIX G

Date	Time	Hours	Pressure	Rate
mm/dd/yyyy	hh:mm:ss	ΔT	psig	bpd
10/20/2011	00:00:00	-9102.5	684.23	5875.60
10/21/2011	00:00:00	-9078.5	760.44	6030.09
10/22/2011	00:00:00	-9054.5	580.52	3423.43
10/23/2011	00:00:00	-9030.5	575.14	4350.22
10/24/2011	00:00:00	-9006.5	678.85	5724.31
10/25/2011	00:00:00	-8982.5	710.04	5650.85
10/26/2011	00:00:00	-8958.5	732.78	5800.27
10/27/2011	00:00:00	-8934.5	704.11	5662.69
10/28/2011	00:00:00	-8910.5	585.51	5774.37
10/29/2011	00:00:00	-8886.5	635.38	5627.26
10/30/2011	00:00:00	-8862.5	676.53	5721.08
10/31/2011	00:00:00	-8838.5	705.62	5626.75
11/01/2011	00:00:00	-8814.5	725.93	5784.85
11/02/2011	00:00:00	-8790.5	771.90	5684.75
11/03/2011	00:00:00	-8766.5	711.49	5773.85
11/04/2011	00:00:00	-8742.5	682.79	5697.14
11/05/2011	00:00:00	-8718.5	725.32	5687.38
11/06/2011	00:00:00	-8694.5	741.36	5808.26
11/06/2011	23:00:00	-8671.5	740.54	5677.21
11/07/2011	23:00:00	-8647.5	747.08	5791.85
11/08/2011	23:00:00	-8623.5	701.07	5425.67
11/09/2011	23:00:00	-8599.5	684.72	5254.70
11/10/2011	23:00:00	-8575.5	622.25	4417.78
11/11/2011	23:00:00	-8551.5	470.88	3369.44
11/12/2011	23:00:00	-8527.5	517.42	3398.61
11/13/2011	23:00:00	-8503.5	627.29	5390.45
11/14/2011	23:00:00	-8479.5	705.94	5784.47
11/15/2011	23:00:00	-8455.5	711.33	5731.95
11/16/2011	23:00:00	-8431.5	708.33	5637.70
11/17/2011	23:00:00	-8407.5	656.20	5529.91
11/18/2011	23:00:00	-8383.5	703.93	5866.68
11/19/2011	23:00:00	-8359.5	744.96	5965.73
11/20/2011	23:00:00	-8335.5	752.47	5863.06
11/21/2011	23:00:00	-8311.5	722.19	5962.90
11/22/2011	23:00:00	-8287.5	741.02	5786.93
11/23/2011	23:00:00	-8263.5	748.62	5807.61
11/24/2011	23:00:00	-8239.5	744.73	5533.81
11/25/2011	23:00:00	-8215.5	738.93	5522.09
11/26/2011	23:00:00	-8191.5	701.11	5652.76
11/27/2011	23:00:00	-8167.5	699.94	5398.42
11/28/2011	23:00:00	-8143.5	750.99	5709.41
11/29/2011	23:00:00	-8119.5	714.59	5843.75
11/30/2011	23:00:00	-8095.5	748.31	5863.75
12/01/2011	23:00:00	-8071.5	676.78	5727.52
12/02/2011	23:00:00	-8047.5	570.19	5453.91
12/03/2011	23:00:00	-8023.5	624.89	5469.39
12/04/2011	23:00:00	-7999.5	640.58	5579.06
12/05/2011	23:00:00	-7975.5	623.76	5463.42
12/06/2011	23:00:00	-7951.5	703.46	3836.81
12/07/2011	23:00:00	-7927.5	635.98	4051.27
12/08/2011	23:00:00	-7903.5	663.85	5624.37
12/09/2011	23:00:00	-7879.5	670.11	5448.02
12/10/2011	23:00:00	-7855.5	673.87	4873.45
12/11/2011	23:00:00	-7831.5	697.04	5512.19
12/12/2011	23:00:00	-7807.5	736.90	5547.03

Date	Time	Hours	Pressure	Rate
mm/dd/yyyy	hh:mm:ss	ΔT	psig	bpd
12/13/2011	23:00:00	-7783.5	762.66	5689.42
12/14/2011	23:00:00	-7759.5	794.87	5569.66
12/15/2011	23:00:00	-7735.5	750.06	5647.83
12/16/2011	23:00:00	-7711.5	761.90	5671.84
12/17/2011	23:00:00	-7687.5	775.48	5495.29
12/18/2011	23:00:00	-7663.5	818.59	5603.44
12/19/2011	23:00:00	-7639.5	779.67	5880.86
12/20/2011	23:00:00	-7615.5	762.06	5907.20
12/21/2011	23:00:00	-7591.5	742.59	4405.07
12/22/2011	23:00:00	-7567.5	705.97	4968.88
12/23/2011	23:00:00	-7543.5	636.81	4504.43
12/24/2011	23:00:00	-7519.5	628.96	5027.84
12/25/2011	23:00:00	-7495.5	629.70	5462.03
12/26/2011	23:00:00	-7471.5	751.80	5475.39
12/27/2011	23:00:00	-7447.5	724.16	5322.29
12/28/2011	23:00:00	-7423.5	704.54	5756.36
12/29/2011	23:00:00	-7399.5	764.17	5823.32
12/30/2011	23:00:00	-7375.5	803.04	5801.07
12/31/2011	23:00:00	-7351.5	837.58	5697.70
01/01/2012	23:00:00	-7327.5	752.82	5730.86
01/02/2012	23:00:00	-7303.5	745.17	5484.05
01/03/2012	23:00:00	-7279.5	757.81	5892.33
01/04/2012	23:00:00	-7255.5	752.44	5606.24
01/05/2012	23:00:00	-7231.5	791.94	5900.77
01/06/2012	23:00:00	-7207.5	815.54	5602.83
01/07/2012	23:00:00	-7183.5	754.38	5458.51
01/08/2012	23:00:00	-7159.5	753.20	5268.90
01/09/2012	23:00:00	-7135.5	720.83	5009.23
01/10/2012	23:00:00	-7111.5	755.15	5150.10
01/11/2012	23:00:00	-7087.5	760.69	5192.22
01/12/2012	23:00:00	-7063.5	709.77	5071.05
01/13/2012	23:00:00	-7039.5	725.09	5282.05
01/14/2012	23:00:00	-7015.5	743.17	5116.58
01/15/2012	23:00:00	-6991.5	748.81	5200.40
01/16/2012	23:00:00	-6967.5	756.45	5045.73
01/17/2012	23:00:00	-6943.5	705.01	4860.95
01/18/2012	23:00:00	-6919.5	688.88	5147.76
01/19/2012	23:00:00	-6895.5	742.23	5022.66
01/20/2012	23:00:00	-6871.5	718.04	5216.78
01/21/2012	23:00:00	-6847.5	684.63	4625.26
01/22/2012	23:00:00	-6823.5	650.88	4208.77
01/23/2012	23:00:00	-6799.5	642.64	4548.43
01/24/2012	23:00:00	-6775.5	612.51	4159.34
01/25/2012	23:00:00	-6751.5	482.38	3235.78
01/26/2012	23:00:00	-6727.5	494.17	3239.32
01/27/2012	23:00:00	-6703.5	543.68	4481.60
01/28/2012	23:00:00	-6679.5	614.79	5143.71
01/29/2012	23:00:00	-6655.5	652.90	5434.90
01/30/2012	23:00:00	-6631.5	695.95	5444.33
01/31/2012	23:00:00	-6607.5	749.99	5425.40
02/01/2012	23:00:00	-6583.5	728.34	5081.04
02/02/2012	23:00:00	-6559.5	720.05	5208.81
02/03/2012	23:00:00	-6535.5	671.77	5107.64
02/04/2012	23:00:00	-6511.5	660.65	5308.23
02/05/2012	23:00:00	-6487.5	683.07	5423.66

APPENDIX G

Date	Time	Hours	Pressure	Rate
mm/dd/yyyy	hh:mm:ss	ΔT	psig	bpd
02/06/2012	23:00:00	-6463.5	685.43	5328.76
02/07/2012	23:00:00	-6439.5	670.34	4986.14
02/08/2012	23:00:00	-6415.5	683.44	5377.05
02/09/2012	23:00:00	-6391.5	726.15	5375.50
02/10/2012	23:00:00	-6367.5	742.21	5356.43
02/11/2012	23:00:00	-6343.5	712.55	5393.42
02/12/2012	23:00:00	-6319.5	675.96	5352.67
02/13/2012	23:00:00	-6295.5	745.16	5356.98
02/14/2012	23:00:00	-6271.5	762.27	5124.90
02/15/2012	23:00:00	-6247.5	735.64	5002.90
02/16/2012	23:00:00	-6223.5	712.75	5073.76
02/17/2012	23:00:00	-6199.5	694.40	4978.64
02/18/2012	23:00:00	-6175.5	705.35	5230.92
02/19/2012	23:00:00	-6151.5	735.38	5180.97
02/20/2012	23:00:00	-6127.5	726.61	4842.31
02/21/2012	23:00:00	-6103.5	724.40	4872.73
02/22/2012	23:00:00	-6079.5	738.02	5121.94
02/23/2012	23:00:00	-6055.5	749.30	5175.02
02/24/2012	23:00:00	-6031.5	677.65	5274.75
02/25/2012	23:00:00	-6007.5	707.77	5252.31
02/26/2012	23:00:00	-5983.5	763.94	5270.00
02/27/2012	23:00:00	-5959.5	726.89	5195.72
02/28/2012	23:00:00	-5935.5	749.51	5099.51
02/29/2012	23:00:00	-5911.5	740.93	5267.29
03/01/2012	23:00:00	-5887.5	761.32	5292.46
03/02/2012	23:00:00	-5863.5	703.92	5161.80
03/03/2012	23:00:00	-5839.5	684.15	5211.53
03/04/2012	23:00:00	-5815.5	746.34	5243.89
03/05/2012	23:00:00	-5791.5	755.52	5211.17
03/06/2012	23:00:00	-5767.5	771.20	5313.33
03/07/2012	23:00:00	-5743.5	766.35	5109.89
03/08/2012	23:00:00	-5719.5	658.59	5201.15
03/09/2012	23:00:00	-5695.5	648.65	5292.53
03/10/2012	23:00:00	-5671.5	668.30	5281.86
03/12/2012	00:00:00	-5646.5	756.68	5461.04
03/13/2012	00:00:00	-5622.5	814.22	5471.91
03/14/2012	00:00:00	-5598.5	810.40	5513.35
03/15/2012	00:00:00	-5574.5	806.45	5576.32
03/16/2012	00:00:00	-5550.5	789.64	5615.80
03/17/2012	00:00:00	-5526.5	795.65	5643.25
03/18/2012	00:00:00	-5502.5	803.54	5557.79
03/19/2012	00:00:00	-5478.5	786.12	5553.49
03/20/2012	00:00:00	-5454.5	696.08	5308.51
03/21/2012	00:00:00	-5430.5	674.96	5288.59
03/22/2012	00:00:00	-5406.5	729.86	5120.23
03/23/2012	00:00:00	-5382.5	773.78	4918.05
03/24/2012	00:00:00	-5358.5	733.37	4474.20
03/25/2012	00:00:00	-5334.5	736.23	4915.48
03/26/2012	00:00:00	-5310.5	758.05	5370.58
03/27/2012	00:00:00	-5286.5	736.64	4937.47
03/28/2012	00:00:00	-5262.5	736.32	5264.00
03/29/2012	00:00:00	-5238.5	721.13	4807.97
03/30/2012	00:00:00	-5214.5	675.79	4648.11
03/31/2012	00:00:00	-5190.5	682.15	4963.67
04/01/2012	00:00:00	-5166.5	710.92	5254.95

Date	Time	Hours	Pressure	Rate
mm/dd/yyyy	hh:mm:ss	ΔT	psig	bpd
04/02/2012	00:00:00	-5142.5	721.57	5157.51
04/03/2012	00:00:00	-5118.5	673.33	5116.51
04/04/2012	00:00:00	-5094.5	655.12	5109.37
04/05/2012	00:00:00	-5070.5	726.81	5307.05
04/06/2012	00:00:00	-5046.5	792.83	4983.35
04/07/2012	00:00:00	-5022.5	744.93	5219.03
04/08/2012	00:00:00	-4998.5	736.85	5273.38
04/09/2012	00:00:00	-4974.5	743.68	5413.70
04/10/2012	00:00:00	-4950.5	762.38	5301.59
04/11/2012	00:00:00	-4926.5	777.28	5382.79
04/12/2012	00:00:00	-4902.5	771.96	5206.05
04/13/2012	00:00:00	-4878.5	754.62	4791.04
04/14/2012	00:00:00	-4854.5	744.35	4723.55
04/15/2012	00:00:00	-4830.5	726.23	4723.54
04/16/2012	00:00:00	-4806.5	673.63	4466.73
04/17/2012	00:00:00	-4782.5	686.36	4707.45
04/18/2012	00:00:00	-4758.5	703.12	4655.42
04/19/2012	00:00:00	-4734.5	741.14	4961.34
04/20/2012	00:00:00	-4710.5	726.10	4535.13
04/21/2012	00:00:00	-4686.5	707.29	5266.04
04/22/2012	00:00:00	-4662.5	754.49	5278.24
04/23/2012	00:00:00	-4638.5	759.72	4736.13
04/24/2012	00:00:00	-4614.5	710.93	4885.82
04/25/2012	00:00:00	-4590.5	761.06	5185.84
04/26/2012	00:00:00	-4566.5	777.59	4939.06
04/27/2012	00:00:00	-4542.5	730.94	5276.44
04/28/2012	00:00:00	-4518.5	735.25	5410.49
04/29/2012	00:00:00	-4494.5	744.41	5408.62
04/30/2012	00:00:00	-4470.5	752.06	5420.72
05/01/2012	00:00:00	-4446.5	780.49	5275.53
05/02/2012	00:00:00	-4422.5	779.53	5387.44
05/03/2012	00:00:00	-4398.5	773.84	5308.20
05/04/2012	00:00:00	-4374.5	768.96	5319.25
05/05/2012	00:00:00	-4350.5	784.40	5410.00
05/06/2012	00:00:00	-4326.5	781.78	5440.77
05/07/2012	00:00:00	-4302.5	799.94	5438.96
05/08/2012	00:00:00	-4278.5	748.97	5433.63
05/09/2012	00:00:00	-4254.5	698.28	5387.79
05/10/2012	00:00:00	-4230.5	731.51	5379.39
05/11/2012	00:00:00	-4206.5	692.88	5305.47
05/12/2012	00:00:00	-4182.5	728.24	5394.45
05/13/2012	00:00:00	-4158.5	772.19	5627.87
05/14/2012	00:00:00	-4134.5	768.72	5572.98
05/15/2012	00:00:00	-4110.5	723.93	5671.69
05/16/2012	00:00:00	-4086.5	786.75	5734.82
05/17/2012	00:00:00	-4062.5	834.31	5500.48
05/18/2012	00:00:00	-4038.5	867.66	5646.39
05/19/2012	00:00:00	-4014.5	891.24	5604.36
05/20/2012	00:00:00	-3990.5	870.51	5756.82
05/21/2012	00:00:00	-3966.5	839.42	5631.10
05/22/2012	00:00:00	-3942.5	844.98	5810.42
05/23/2012	00:00:00	-3918.5	865.45	5620.15
05/24/2012	00:00:00	-3894.5	849.88	5464.99
05/25/2012	00:00:00	-3870.5	753.37	3979.79
05/26/2012	00:00:00	-3846.5	603.27	3647.97

APPENDIX G

Date	Time	Hours	Pressure	Rate
mm/dd/yyyy	hh:mm:ss	ΔT	psig	bpd
05/27/2012	00:00:00	-3822.5	684.51	5612.12
05/28/2012	00:00:00	-3798.5	748.97	5567.66
05/29/2012	00:00:00	-3774.5	781.35	5552.71
05/30/2012	00:00:00	-3750.5	803.24	5449.46
05/31/2012	00:00:00	-3726.5	813.98	5387.96
06/01/2012	00:00:00	-3702.5	743.30	5120.14
06/02/2012	00:00:00	-3678.5	767.22	5439.13
06/03/2012	00:00:00	-3654.5	815.03	5454.54
06/04/2012	00:00:00	-3630.5	830.17	5337.28
06/05/2012	00:00:00	-3606.5	787.64	5393.41
06/06/2012	00:00:00	-3582.5	771.41	5287.36
06/07/2012	00:00:00	-3558.5	789.42	5319.48
06/08/2012	00:00:00	-3534.5	785.53	5471.02
06/09/2012	00:00:00	-3510.5	777.81	5391.47
06/10/2012	00:00:00	-3486.5	813.11	5328.72
06/11/2012	00:00:00	-3462.5	798.35	5353.74
06/12/2012	00:00:00	-3438.5	804.33	5332.05
06/13/2012	00:00:00	-3414.5	784.11	5342.74
06/14/2012	00:00:00	-3390.5	769.18	5396.29
06/15/2012	00:00:00	-3366.5	835.46	5414.81
06/16/2012	00:00:00	-3342.5	796.33	5106.43
06/17/2012	00:00:00	-3318.5	758.43	5394.80
06/18/2012	00:00:00	-3294.5	791.15	5461.92
06/19/2012	00:00:00	-3270.5	855.03	5425.60
06/20/2012	00:00:00	-3246.5	828.36	5416.10
06/21/2012	00:00:00	-3222.5	811.23	5472.19
06/22/2012	00:00:00	-3198.5	797.71	5404.90
06/23/2012	00:00:00	-3174.5	804.32	5398.09
06/24/2012	00:00:00	-3150.5	812.34	5464.45
06/25/2012	00:00:00	-3126.5	823.99	5469.52
06/26/2012	00:00:00	-3102.5	836.28	5396.95
06/27/2012	00:00:00	-3078.5	842.64	5459.00
06/28/2012	00:00:00	-3054.5	848.92	5417.02
06/29/2012	00:00:00	-3030.5	834.61	5446.25
06/30/2012	00:00:00	-3006.5	833.33	5405.76
07/01/2012	00:00:00	-2982.5	829.39	5381.51
07/02/2012	00:00:00	-2958.5	803.17	5376.86
07/03/2012	00:00:00	-2934.5	795.92	5375.02
07/04/2012	00:00:00	-2910.5	801.51	5407.71
07/05/2012	00:00:00	-2886.5	817.81	5396.18
07/06/2012	00:00:00	-2862.5	797.95	5374.06
07/07/2012	00:00:00	-2838.5	799.71	5263.69
07/08/2012	00:00:00	-2814.5	862.79	5315.25
07/09/2012	00:00:00	-2790.5	870.33	5378.36
07/10/2012	00:00:00	-2766.5	825.46	5371.63
07/11/2012	00:00:00	-2742.5	743.29	5398.71
07/12/2012	00:00:00	-2718.5	786.79	5262.11
07/13/2012	00:00:00	-2694.5	812.55	5261.65
07/14/2012	00:00:00	-2670.5	726.32	4517.77
07/15/2012	00:00:00	-2646.5	709.56	5449.71
07/16/2012	00:00:00	-2622.5	753.27	5349.36
07/17/2012	00:00:00	-2598.5	772.52	5222.36
07/18/2012	00:00:00	-2574.5	761.55	5311.80
07/19/2012	00:00:00	-2550.5	735.63	4839.57
07/20/2012	00:00:00	-2526.5	707.47	5290.15

Date	Time	Hours	Pressure	Rate
mm/dd/yyyy	hh:mm:ss	ΔT	psig	bpd
07/21/2012	00:00:00	-2502.5	734.09	5215.52
07/22/2012	00:00:00	-2478.5	746.31	5349.28
07/23/2012	00:00:00	-2454.5	767.02	5278.17
07/24/2012	00:00:00	-2430.5	769.79	5171.83
07/25/2012	00:00:00	-2406.5	753.03	5136.68
07/26/2012	00:00:00	-2382.5	776.73	5341.19
07/27/2012	00:00:00	-2358.5	783.39	5183.37
07/28/2012	00:00:00	-2334.5	744.40	5239.37
07/29/2012	00:00:00	-2310.5	803.74	5159.30
07/30/2012	00:00:00	-2286.5	834.58	5204.60
07/31/2012	00:00:00	-2262.5	819.52	5148.72
08/01/2012	00:00:00	-2238.5	800.52	5363.52
08/02/2012	00:00:00	-2214.5	806.36	5328.65
08/03/2012	00:00:00	-2190.5	797.94	5338.55
08/04/2012	00:00:00	-2166.5	765.72	5210.38
08/05/2012	00:00:00	-2142.5	771.94	4783.47
08/06/2012	00:00:00	-2118.5	770.16	5287.02
08/07/2012	00:00:00	-2094.5	792.07	4148.66
08/08/2012	00:00:00	-2070.5	784.72	4779.03
08/09/2012	00:00:00	-2046.5	774.18	5269.18
08/10/2012	00:00:00	-2022.5	776.82	5127.08
08/11/2012	00:00:00	-1998.5	778.79	5171.95
08/12/2012	00:00:00	-1974.5	777.14	5209.34
08/13/2012	00:00:00	-1950.5	787.54	5172.95
08/14/2012	00:00:00	-1926.5	735.45	5074.79
08/15/2012	00:00:00	-1902.5	763.51	5205.23
08/16/2012	00:00:00	-1878.5	781.21	5093.95
08/17/2012	00:00:00	-1854.5	778.52	5272.60
08/18/2012	00:00:00	-1830.5	738.36	5127.99
08/19/2012	00:00:00	-1806.5	762.41	5275.13
08/20/2012	00:00:00	-1782.5	763.45	5010.26
08/21/2012	00:00:00	-1758.5	784.47	5229.02
08/22/2012	00:00:00	-1734.5	798.35	5189.38
08/23/2012	00:00:00	-1710.5	779.09	5201.57
08/24/2012	00:00:00	-1686.5	770.80	5182.24
08/25/2012	00:00:00	-1662.5	793.88	4905.20
08/26/2012	00:00:00	-1638.5	819.71	5304.59
08/27/2012	00:00:00	-1614.5	792.34	5146.23
08/28/2012	00:00:00	-1590.5	790.23	5223.24
08/29/2012	00:00:00	-1566.5	783.45	5149.64
08/30/2012	00:00:00	-1542.5	788.76	5322.21
08/31/2012	00:00:00	-1518.5	784.53	5176.81
09/01/2012	00:00:00	-1494.5	789.89	5279.94
09/02/2012	00:00:00	-1470.5	807.12	5297.97
09/03/2012	00:00:00	-1446.5	825.34	5293.94
09/04/2012	00:00:00	-1422.5	831.17	5263.68
09/05/2012	00:00:00	-1398.5	810.68	5350.81
09/06/2012	00:00:00	-1374.5	795.17	5320.93
09/07/2012	00:00:00	-1350.5	802.92	5436.88
09/08/2012	00:00:00	-1326.5	819.52	5396.27
09/09/2012	00:00:00	-1302.5	709.87	5379.50
09/10/2012	00:00:00	-1278.5	743.29	5238.92
09/11/2012	00:00:00	-1254.5	808.65	5155.81
09/12/2012	00:00:00	-1230.5	803.86	5041.10
09/13/2012	00:00:00	-1206.5	786.42	4900.52

APPENDIX G

Date	Time	Hours	Pressure	Rate
mm/dd/yyyy	hh:mm:ss	ΔT	psig	bpd
09/14/2012	00:00:00	-1182.5	662.34	4931.00
09/15/2012	00:00:00	-1158.5	707.98	4841.07
09/16/2012	00:00:00	-1134.5	726.38	4468.43
09/17/2012	00:00:00	-1110.5	750.21	5093.83
09/18/2012	00:00:00	-1086.5	768.57	4650.60
09/19/2012	00:00:00	-1062.5	734.86	5032.62
09/20/2012	00:00:00	-1038.5	772.36	4942.81
09/21/2012	00:00:00	-1014.5	766.45	4315.43
09/22/2012	00:00:00	-0990.5	635.06	3389.60
09/23/2012	00:00:00	-0966.5	609.73	3391.86
09/24/2012	00:00:00	-0942.5	591.05	3948.84
09/25/2012	00:00:00	-0918.5	686.65	5277.19
09/26/2012	00:00:00	-0894.5	730.73	5238.86
09/27/2012	00:00:00	-0870.5	756.50	5265.06
09/28/2012	00:00:00	-0846.5	744.67	5192.32
09/29/2012	00:00:00	-0822.5	719.17	5247.71
09/30/2012	00:00:00	-0798.5	745.42	5290.88
10/01/2012	00:00:00	-0774.5	793.87	5301.93
10/02/2012	00:00:00	-0750.5	812.29	5241.95
10/03/2012	00:00:00	-0726.5	827.28	5153.69
10/04/2012	00:00:00	-0702.5	860.77	5266.81
10/05/2012	00:00:00	-0678.5	790.22	5193.61
10/06/2012	00:00:00	-0654.5	796.34	5245.14
10/07/2012	00:00:00	-0630.5	740.47	5238.35
10/08/2012	00:00:00	-0606.5	726.99	5238.30
10/09/2012	00:00:00	-0582.5	754.32	4806.69
10/10/2012	00:00:00	-0558.5	839.65	5161.95
10/11/2012	00:00:00	-0534.5	784.37	5243.71
10/12/2012	00:00:00	-0510.5	843.94	5221.65
10/13/2012	00:00:00	-0486.5	850.63	5232.35
10/14/2012	00:00:00	-0462.5	818.38	5206.63
10/15/2012	00:00:00	-0438.5	794.79	5153.07
10/16/2012	00:00:00	-0414.5	800.49	5192.63
10/17/2012	00:00:00	-0390.5	841.73	5091.05
10/18/2012	00:00:00	-0366.5	836.26	5159.94
10/19/2012	00:00:00	-0342.5	789.38	5112.61
10/20/2012	00:00:00	-0318.5	792.83	4968.15
10/21/2012	00:00:00	-0294.5	809.67	4867.69
10/22/2012	00:00:00	-0270.5	818.45	4995.91
10/23/2012	00:00:00	-0246.5	802.77	4857.27
10/24/2012	00:00:00	-0222.5	783.14	4669.62
10/25/2012	00:00:00	-0198.5	768.08	4824.24
10/26/2012	00:00:00	-0174.5	751.74	4906.84
10/27/2012	00:00:00	-0150.5	686.19	4765.35
10/28/2012	00:00:00	-0126.5	679.01	4764.33
10/29/2012	00:00:00	-0102.5	712.49	4943.40
10/30/2012	00:00:00	-0078.5	774.58	4896.70
10/31/2012	00:00:00	-0054.5	803.01	4914.83
11/01/2012	00:00:00	-0030.5	771.49	5396.00
11/01/2012	01:00:00	-0029.5	763.89	5385.71
11/01/2012	02:00:00	-0028.5	758.43	5385.14
11/01/2012	03:00:00	-0027.5	750.86	5392.24
11/01/2012	04:00:00	-0026.5	737.86	5396.90
11/01/2012	05:00:00	-0025.5	725.41	5385.71
11/01/2012	06:00:00	-0024.5	718.84	5384.57

Date	Time	Hours	Pressure	Rate
mm/dd/yyyy	hh:mm:ss	ΔT	psig	bpd
11/01/2012	07:00:00	-0023.5	717.77	5384.57
11/01/2012	08:00:00	-0022.5	717.16	5385.71
11/01/2012	09:00:00	-0021.5	755.74	5404.81
11/01/2012	10:00:00	-0020.5	781.37	5422.52
11/01/2012	11:00:00	-0019.5	834.85	5440.57
11/01/2012	12:00:00	-0018.5	894.78	5465.14
11/01/2012	13:00:00	-0017.5	922.53	5480.81
11/01/2012	14:00:00	-0016.5	944.07	5491.43
11/01/2012	15:00:00	-0015.5	942.97	5510.53
11/01/2012	16:00:00	-0014.5	929.51	5499.52
11/01/2012	17:00:00	-0013.5	920.28	5488.48
11/01/2012	18:00:00	-0012.5	882.40	5474.95
11/01/2012	19:00:00	-0011.5	823.32	5445.47
11/01/2012	20:00:00	-0010.5	798.36	5428.57
11/01/2012	21:00:00	-0009.5	788.01	5431.43
11/01/2012	22:00:00	-0008.5	773.02	5419.43
11/01/2012	23:00:00	-0007.5	764.39	5416.00
11/02/2012	00:00:00	-0006.5	756.50	5416.00
11/02/2012	01:00:00	-0005.5	750.29	5416.57
11/02/2012	02:00:00	-0004.5	743.79	5416.00
11/02/2012	03:00:00	-0003.5	735.24	5415.19
11/02/2012	04:00:00	-0002.5	729.62	5414.29
11/02/2012	05:00:00	-0001.5	722.78	5413.38
11/02/2012	06:00:00	-0000.5	718.79	5411.19

APPENDIX H
GAUGE CALIBRATION SHEETS



SPARTEK SYSTEMS

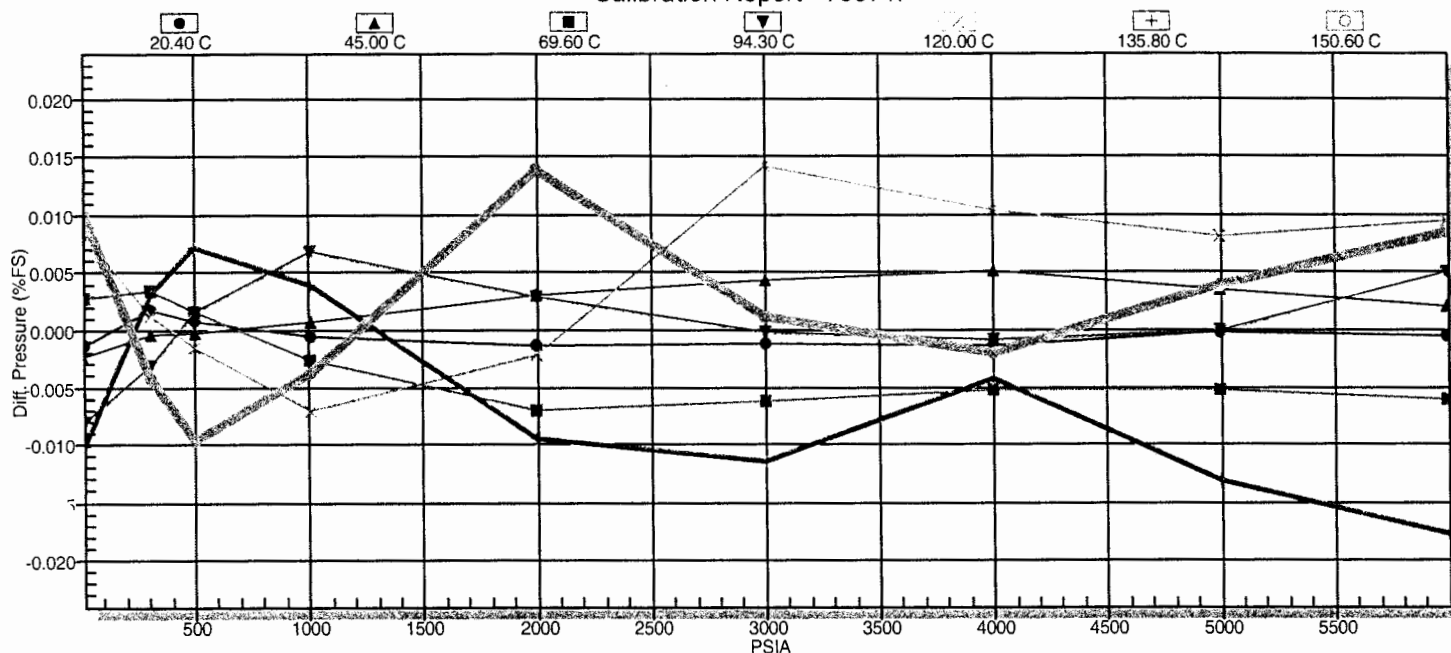
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URL www.sparteksystems.com

Pressure Gauge Certificate of Calibration

Calibration Report - 75871.



GAUGE NUMBER: 75871

2-D POLYNOMIAL LMS CURVEFIT

Source of f: Pres

Fit Order: 3

Prescale: $x_p = m * (f_p - f_{p0})$

m: 0.01

$f_{p0} = 678735$

Temp

4

$x_t = m * (f_t - f_{t0})$

0.01

$f_{t0} = 158408$

Pressure Equation:

Pressure (PSI) = $A + x_p(B + x_p(C + x_p(D)))$

Temperature Compensation:

$A = A_0 + x_t(A_1 + x_t(A_2 + x_t(A_3 + x_t(A_4))))$

$B = B_0 + x_t(B_1 + x_t(B_2 + x_t(B_3 + x_t(B_4))))$

$C = C_0 + x_t(C_1 + x_t(C_2 + x_t(C_3 + x_t(C_4))))$

$D = D_0 + x_t(D_1 + x_t(D_2 + x_t(D_3 + x_t(D_4))))$

0	1	2	3	4
Pressure (psi) STANDARD FIT COEFFICIENTS:				
A 12.97142642	0.11277823	-0.0001505740173	-1.823019195E-06	-3.301484115E-09
B 1.640874332	-0.001297519254	-3.71224205E-07	-1.385623931E-09	1.181939745E-12
C -4.03108653E-06	9.319688525E-09	1.006689622E-11	-5.12304544E-13	-1.763346489E-15
D 1.30010629E-10	-2.139856247E-12	-1.958534961E-15	7.951008165E-17	2.863833649E-19
Temperature (C) STANDARD FIT COEFFICIENTS				
A 20.19981389				
B -0.343470116				
C -2.629672432E-05				
D -2.249422711E-07				

0 points eliminated.

Error File: Gauge # 75871

Pressure psi	Temperature Deg. C	Count (Pres)	Count (Temp)	DIFF (press) psi
13.06	20.40	678735.67	158408.25	-0.08
303.58	20.30	696461.00	158422.00	0.11
499.73	20.40	708428.33	158434.00	0.05
1002.67	20.20	739155.33	158454.50	-0.03
1998.86	20.30	800150.00	158459.50	-0.08
3000.93	20.20	861624.33	158426.25	-0.07
3999.15	20.30	922915.67	158357.25	-0.08
4998.32	20.20	984256.67	158250.25	-0.01
5997.31	20.30	1045483.00	158099.75	-0.03
13.05	45.00	679208.00	151257.00	-0.14
303.57	44.90	695994.67	151273.75	-0.02
499.73	44.90	707335.00	151286.25	-0.01
1002.66	44.80	736447.67	151306.50	0.05
1998.85	44.80	794234.00	151319.50	0.19
3000.92	44.80	852472.33	151300.50	0.26
3999.14	44.80	910532.33	151243.50	0.31
4998.32	44.90	968636.00	151156.25	0.21
5997.31	44.90	1026665.33	151037.50	0.12
13.06	69.60	679587.67	144051.25	0.17
303.59	69.60	695525.00	144068.50	0.20
499.74	69.70	706286.00	144076.75	0.09
1002.67	69.60	733908.00	144095.75	-0.16
1998.86	69.60	788734.67	144111.00	-0.42
3000.92	69.60	843999.00	144099.00	-0.37
3999.15	69.60	899095.00	144055.75	-0.31
4998.32	69.60	954243.33	143988.25	-0.31
5997.31	69.70	1009316.33	143888.00	-0.37
13.06	94.30	679761.00	137072.75	-0.48
303.59	94.30	694940.67	137085.00	-0.18
499.73	94.30	705200.33	137093.75	0.09
1002.67	94.40	731510.33	137111.00	0.41
1998.86	94.40	783663.33	137127.50	0.18
3000.92	94.40	836203.67	137118.50	-0.01
3999.14	94.30	888588.67	137086.50	-0.05
4998.32	94.30	941030.67	137034.25	0.00
5997.30	94.40	993420.33	136953.00	0.30
13.06	120.00	679944.00	130197.25	0.50
303.59	120.00	694342.00	130207.75	0.08
499.74	119.90	704076.33	130217.50	-0.08
1002.68	120.10	729063.67	130229.25	-0.42
1998.86	120.10	778693.67	130244.25	-0.13
3000.92	120.10	828736.00	130243.50	0.85
3999.14	120.00	878567.00	130223.00	0.62
4998.31	120.00	928441.67	130180.00	0.49
5997.30	120.00	978274.67	130120.75	0.57
13.07	135.80	679988.67	126175.50	-0.61
303.59	135.80	694006.33	126188.00	0.19
499.74	135.80	703465.33	126195.50	0.43
1002.68	135.80	727711.33	126212.75	0.24
1998.86	135.80	775823.33	126229.00	-0.57
3000.92	135.90	824357.00	126229.50	-0.68
3999.13	135.80	872779.67	126211.50	-0.26
4998.30	135.80	921194.33	126173.25	-0.79
5997.29	135.80	969554.33	126117.75	-1.06
13.09	150.60	680190.00	122440.50	0.60
303.62	150.60	693715.00	122453.25	-0.25
499.77	150.60	702870.00	122461.25	-0.58
1002.69	150.50	726441.33	122479.50	-0.22
1998.86	150.60	773291.00	122498.50	0.83
3000.91	150.60	820468.33	122500.75	0.06
3999.12	150.60	867567.00	122490.25	-0.12
4998.28	150.60	914740.00	122463.25	0.24
5997.25	150.60	961847.33	122425.25	0.51



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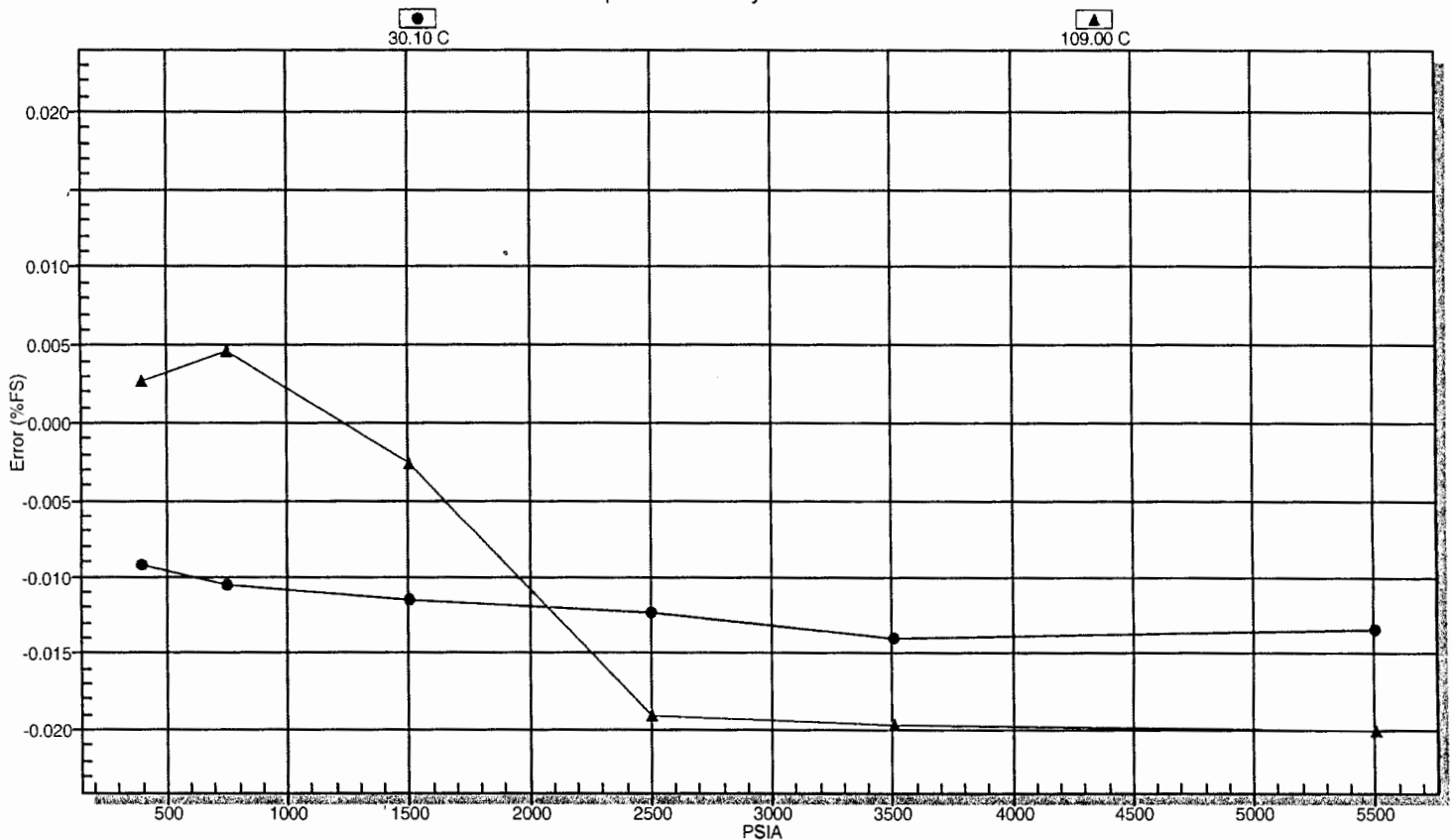
Pressure Gauge Certificate of Conformance

SERIAL NUMBER	75871	CALIBRATION DATE	MAR 25/11
MODEL NUMBER	0 FF0	PRESSURE REFERENCE	NIST Traceable
PRESSURE RANGE	13.06 - 5997.31 psi	TEMP. REFERENCE	NIST Traceable
TEMP. RANGE	20.40 - 150.60 °C	TRACEABILITY DOC.	CAL-STANDARD-001

ACCURACY

As shown in the graph below, this Spartek Gauge conformed to within $\pm 0.024\%$ F.S. of the pressure standard used in calibration, which is accurate to within $\pm 0.01\%$ of reading. This gives an overall accuracy of $\pm(0.024\% \text{ F.S.} + 0.01\% \text{ of reading})$

Spartek Quality Assurance



Accepted By: _____

Date: MAR 28/11

Ramp report: Serial # 75871

Gauge range = 5997.314 PSI. Max. DIFF. = 1.439

Ramp check result: PASS, Max Err = 0.020% F.S.

DW Pressure	Gauge Pressure	RPM4 Pressure	Differential	%F.S.	Oven Temp.	Gauge Temp.
5501.98	5502.78	5500.70	0.80	0.0134	30.10	30.57
3503.40	3504.24	3502.05	0.84	0.0141	30.20	29.92
2501.32	2502.06	2500.02	0.74	0.0124	30.10	29.77
1503.32	1504.01	1501.96	0.69	0.0115	30.20	29.76
753.27	753.90	751.71	0.63	0.0105	30.20	29.82
397.58	398.13	395.90	0.55	0.0092	30.20	29.89
5501.99	5503.19	5500.72	1.20	0.0200	109.00	109.09
3503.42	3504.60	3502.10	1.18	0.0196	109.20	108.84
2501.33	2502.48	2499.94	1.14	0.0191	109.10	108.85
1503.34	1503.49	1501.87	0.15	0.0026	109.20	108.93
753.29	753.01	751.73	-0.28	0.0046	109.10	109.02
397.59	397.43	395.90	-0.17	0.0028	109.20	109.09



SPARTEK SYSTEMS

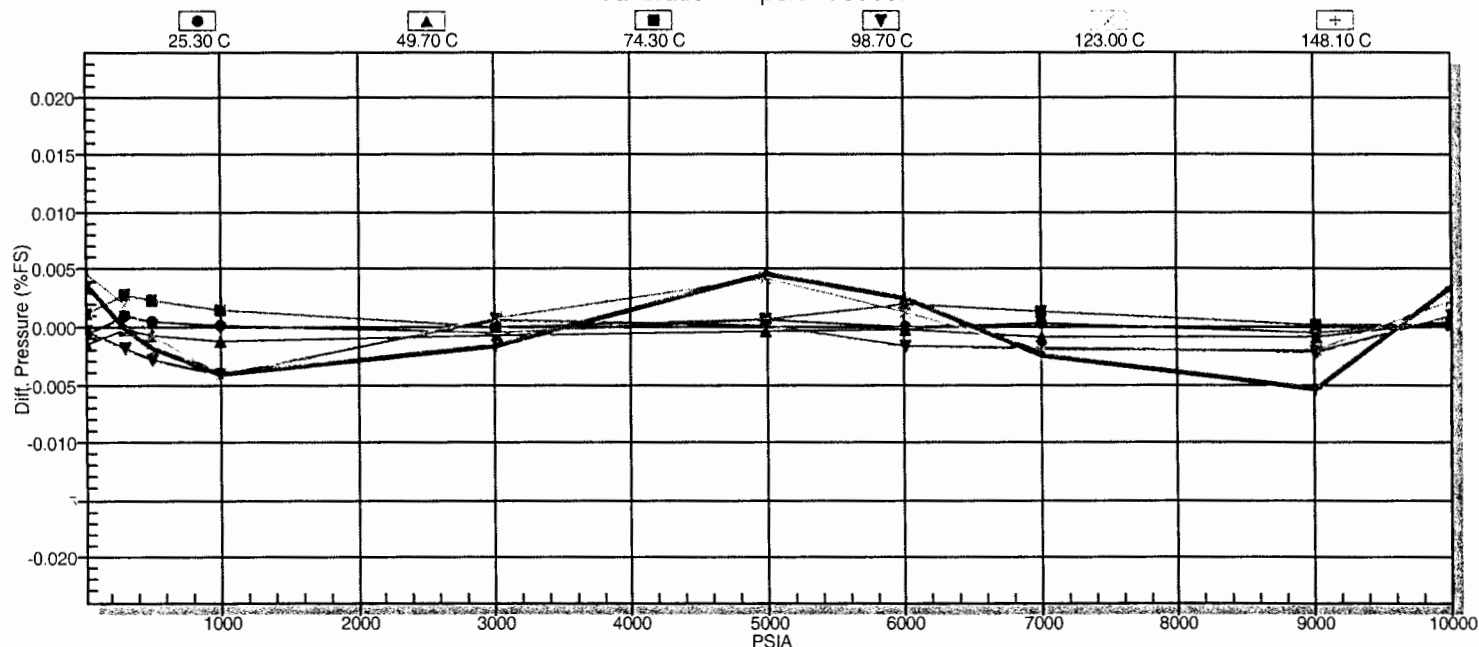
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URL www.sparteksystems.com

Pressure Gauge Certificate of Calibration

Calibration Report - 75900.



GAUGE NUMBER: 75900

2-D POLYNOMIAL LMS CURVEFIT

Source of f: Pres

Fit Order: 3

Prescale: $x_p = m * (f_p - f_{p0})$

m: 0.01

$f_{p0} = 699538$

Temp

4

$x_t = m * (f_t - f_{t0})$

0.01

$f_{t0} = 166637$

Pressure Equation:

Pressure (PSI) = $A + x_p(B + x_p(C + x_p(D)))$

Temperature Compensation:

$A = A_0 + x_t(A_1 + x_t(A_2 + x_t(A_3 + x_t(A_4))))$

$B = B_0 + x_t(B_1 + x_t(B_2 + x_t(B_3 + x_t(B_4))))$

$C = C_0 + x_t(C_1 + x_t(C_2 + x_t(C_3 + x_t(C_4))))$

$D = D_0 + x_t(D_1 + x_t(D_2 + x_t(D_3 + x_t(D_4))))$

0	1	2	3	4
Pressure (psi) STANDARD FIT COEFFICIENTS:				
A 13.00853743	0.05801425486	0.0001652165752	4.967798855E-07	-5.351374463E-10
B 1.833025732	-0.001405181555	-4.682730297E-07	-2.635051392E-09	-7.63332118E-13
C 1.153936164E-06	1.162571183E-08	1.216794333E-10	4.965639847E-13	2.028300563E-16
D 1.285303115E-10	-3.056931778E-12	-2.013721113E-14	-7.533232117E-17	-4.131924069E-20
Temperature (C) STANDARD FIT COEFFICIENTS				
A 24.66625687				
B -0.3354976137				
C -3.002206867E-05				
D -2.119199127E-07				

0 points eliminated.

Error File: Gauge # 75900

Pressure psi	Temperature Deg. C	Count (Pres)	Count (Temp)	DIFF (press) psi
13.08	25.30	699538.33	166637.00	-0.06
303.04	25.40	715365.33	166651.50	0.09
507.34	25.30	726507.33	166655.50	0.05
1002.92	25.50	753537.67	166674.25	0.01
3008.11	25.50	862746.33	166647.75	-0.06
4993.33	25.40	970370.33	166504.50	0.06
6008.92	25.50	1025095.00	166376.75	0.01
7006.13	25.30	1078602.00	166233.75	0.03
9008.61	25.50	1185100.67	165859.00	-0.06
10001.23	25.40	1237343.67	165629.50	0.03
13.13	49.70	699720.33	159370.50	-0.14
303.09	49.60	714722.67	159383.00	-0.02
507.39	49.70	725285.67	159392.00	-0.07
1002.98	49.70	750912.00	159405.00	-0.12
3008.17	49.70	854489.33	159390.75	-0.07
4993.39	49.70	956602.67	159271.50	-0.03
6008.97	49.70	1008573.00	159170.25	-0.01
7006.18	49.70	1059375.33	159046.75	-0.07
9008.66	49.80	1160602.00	158733.75	-0.09
10001.26	49.70	1210303.67	158540.25	0.05
13.18	74.30	699883.00	152029.75	0.11
303.14	74.30	714132.33	152043.00	0.28
507.44	74.20	724163.67	152052.25	0.22
1003.03	74.20	748500.00	152063.00	0.15
3008.21	74.20	846874.33	152055.00	-0.01
4993.41	74.20	943922.67	151962.25	0.07
6008.99	74.30	993349.33	151881.25	0.20
7006.20	74.30	1041684.00	151782.25	0.13
9008.67	74.30	1138039.00	151518.75	0.01
10001.27	74.30	1185398.33	151358.75	0.01
13.23	98.70	700064.00	144919.25	-0.04
303.19	98.60	713599.33	144932.25	-0.17
507.48	98.60	723136.33	144938.25	-0.28
1003.07	98.70	746280.67	144952.50	-0.41
3008.25	98.70	839916.67	144948.75	0.06
4993.45	98.70	932322.67	144874.50	0.02
6009.03	98.70	979399.67	144808.00	-0.16
7006.24	98.80	1025464.00	144723.50	-0.18
9008.72	98.70	1117367.00	144508.25	-0.21
10001.33	98.70	1162536.67	144363.75	0.09
13.26	123.00	700375.67	138147.75	0.48
303.22	123.10	713245.67	138160.25	0.20
507.51	123.00	722313.67	138165.75	-0.06
1003.10	123.10	744331.00	138175.00	-0.41
3008.29	123.00	833531.67	138180.00	0.09
4993.51	123.00	921675.67	138118.75	0.42
6009.09	123.10	966604.67	138066.75	0.13
7006.30	123.20	1010568.33	137995.00	-0.19
9008.78	123.00	1098342.67	137813.50	-0.19
10001.40	123.10	1141523.00	137697.75	0.23
13.28	148.10	700811.67	131565.00	0.37
303.24	148.10	713033.00	131573.00	-0.01
507.53	148.00	721653.33	131577.25	-0.17
1003.12	148.10	742588.33	131589.75	-0.41
3008.30	148.10	827483.33	131593.75	-0.17
4993.51	148.10	911543.33	131546.00	0.45
6009.09	148.10	954423.67	131501.00	0.24
7006.30	148.10	996402.67	131444.75	-0.25
9008.77	148.10	1080235.67	131292.25	-0.54
10001.37	148.30	1121505.00	131193.25	0.34



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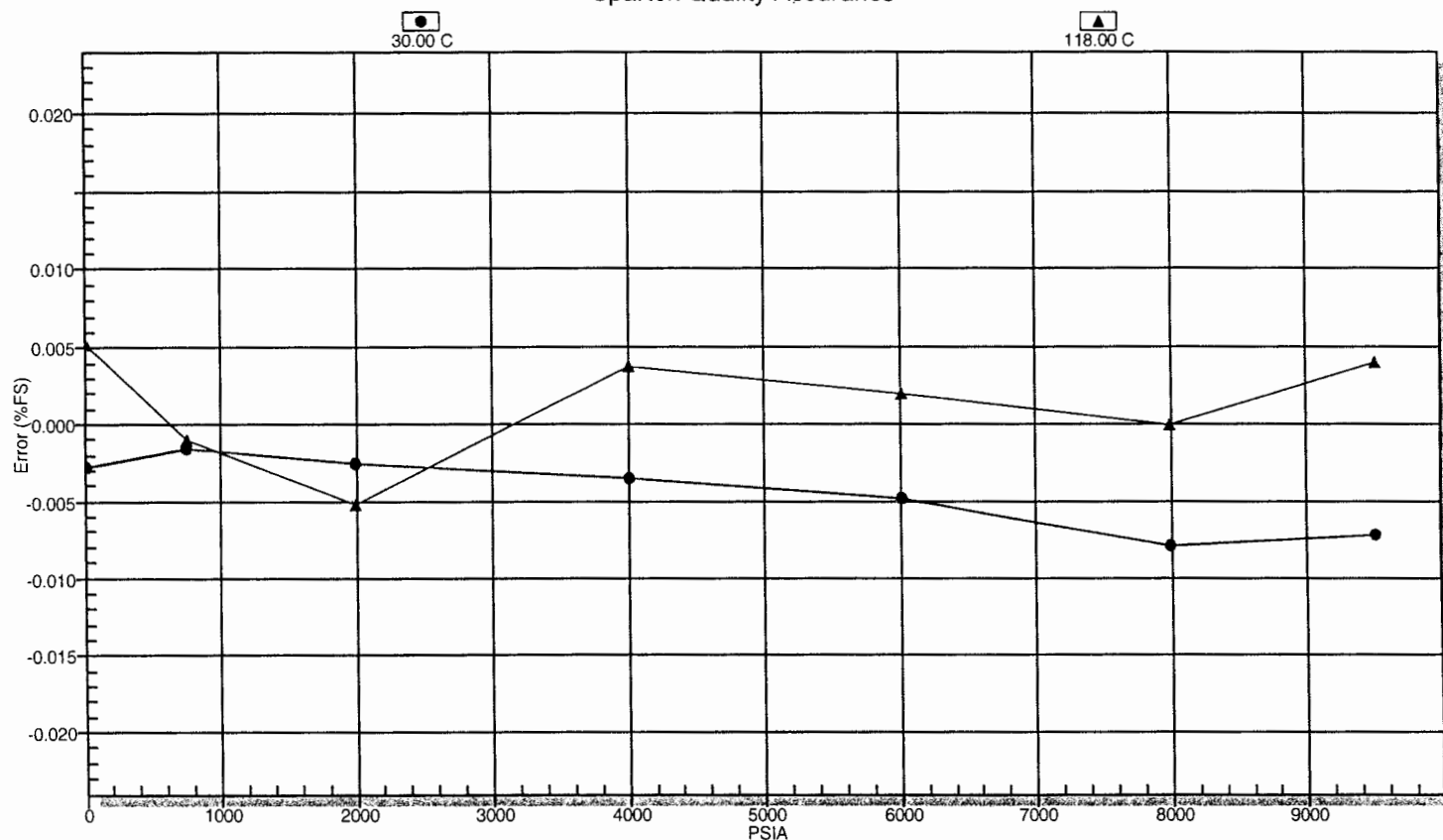
Pressure Gauge Certificate of Conformance

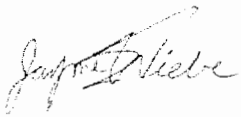
SERIAL NUMBER	75900	CALIBRATION DATE	SEP 03/11
MODEL NUMBER	0 FF0	PRESSURE REFERENCE	NIST Traceable
PRESSURE RANGE	13.08 - 10001.23 psi	TEMP. REFERENCE	NIST Traceable
TEMP. RANGE	25.30 - 148.10 °C	TRACEABILITY DOC.	CAL-STANDARD-001

ACCURACY

As shown in the graph below, this Spartek Gauge conformed to within $\pm 0.024\%$ F.S. of the pressure standard used in calibration, which is accurate to within $\pm 0.01\%$ of reading. This gives an overall accuracy of $\pm(0.024\% \text{ F.S.} + 0.01\% \text{ of reading})$

Spartek Quality Assurance



Accepted By: 

Date: SEP 06/11

Ramp report: Serial # 75900

Gauge range = 10001.400 PSI. Max. DIFF. = 2.400

Ramp check result: PASS, Max Err = 0.008% F.S.

DW Pressure	Gauge Pressure	RPM4 Pressure	Differential	%F.S.	Oven Temp.	Gauge Temp.
9506.55	9505.82	9507.75	-0.72	0.0072	30.00	32.27
7995.15	7994.36	7996.38	-0.79	0.0079	30.20	31.30
6008.87	6008.40	6010.04	-0.48	0.0048	30.10	30.27
4003.76	4003.41	4004.82	-0.35	0.0035	30.20	29.64
1992.05	1991.80	1993.06	-0.25	0.0025	30.00	29.34
741.47	741.31	742.28	-0.16	0.0016	30.10	29.40
13.08	12.80	13.54	-0.27	0.0027	30.30	29.50
9506.54	9506.95	9507.79	0.41	0.0041	118.00	118.62
7995.15	7995.15	7996.40	0.00	0.0000	117.90	118.17
6008.88	6009.08	6010.09	0.21	0.0021	118.10	117.73
4003.77	4004.16	4004.95	0.39	0.0039	118.10	117.50
1992.06	1991.55	1993.04	-0.51	0.0051	118.10	117.43
741.48	741.39	742.32	-0.09	0.0009	118.10	117.55
13.09	13.62	13.55	0.53	0.0053	118.20	117.66



SPARTEK SYSTEMS

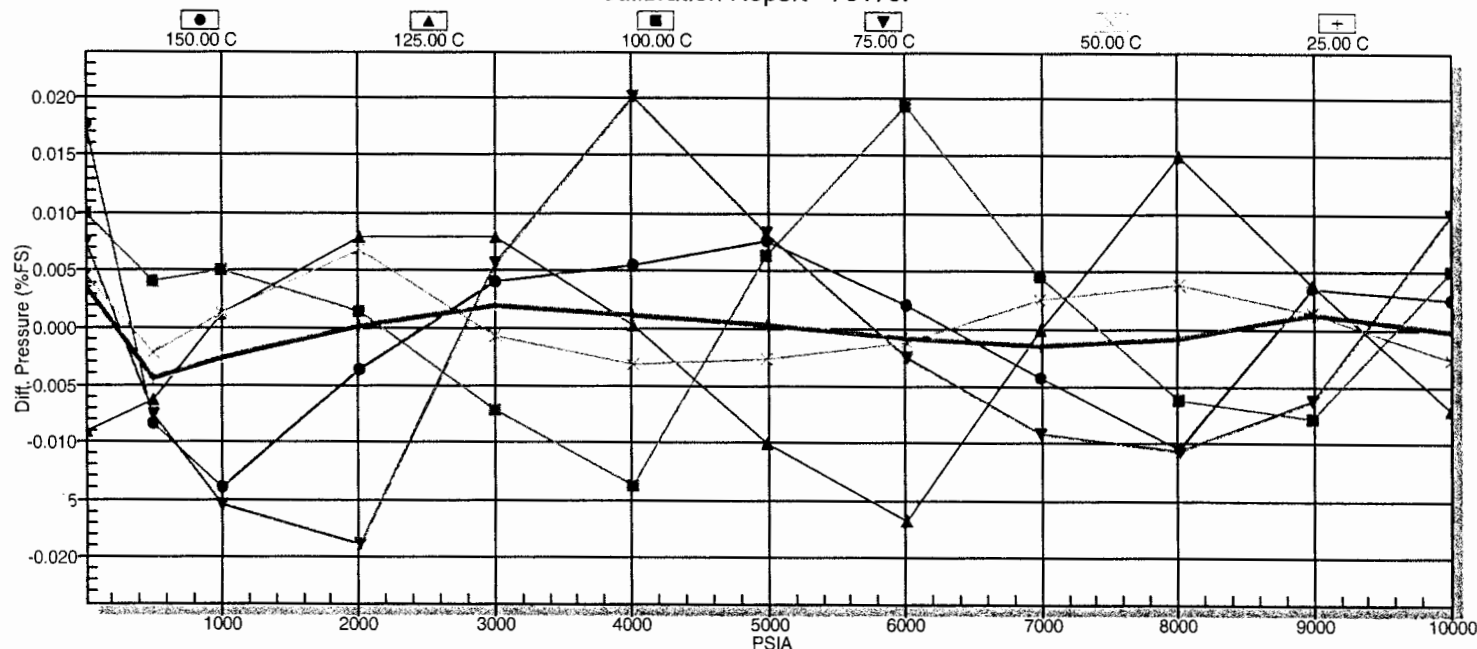
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Pressure Gauge Certificate of Calibration

Calibration Report - 76170.



GAUGE NUMBER: 76170

2-D POLYNOMIAL LMS CURVEFIT

Source of f: Pres

Fit Order: 3

Prescale: $x_p = m * (f_p - f_{p0})$

m: 0.01

$f_{p0} = 681324$

Temp

4

$x_t = m * (f_t - f_{t0})$

0.01

$f_{t0} = 119067$

Pressure Equation:

Pressure (PSI) = $A + x_p(B + x_p(C + x_p(D)))$

Temperature Compensation:

$A = A_0 + x_t(A_1 + x_t(A_2 + x_t(A_3 + x_t(A_4))))$

$B = B_0 + x_t(B_1 + x_t(B_2 + x_t(B_3 + x_t(B_4))))$

$C = C_0 + x_t(C_1 + x_t(C_2 + x_t(C_3 + x_t(C_4))))$

$D = D_0 + x_t(D_1 + x_t(D_2 + x_t(D_3 + x_t(D_4))))$

0	1	2	3	4
Pressure (psi) STANDARD FIT COEFFICIENTS:				
A 16.46492346	0.01276103041	0.0008198888413	-4.362306202E-06	6.74753504E-09
B 2.50094908	-0.001870680294	-3.664831424E-07	3.705725385E-09	-3.20079622E-12
C -5.972486686E-06	-7.897783757E-08	6.459430044E-10	-5.070109844E-13	-2.108794375E-15
D 4.647457089E-10	1.323420648E-11	-8.43412782E-14	-2.039667561E-17	4.497913976E-19
Temperature (C) STANDARD FIT COEFFICIENTS				
A 149.7999391				
B -0.4370831656				
C 0.0002239486897				
D -2.130126817E-07				

0 points eliminated.

Error File: Gauge # 76170

Pressure psi	Temperature Deg. C	Count (Pres)	Count (Temp)	DIFF (press) psi
14.70	150.00	681324.31	119067.25	1.77
507.13	150.00	700909.00	118996.75	-0.83
999.42	150.00	720591.31	119011.50	-1.39
2013.05	150.00	761257.31	119020.75	-0.37
2997.68	150.00	800817.69	119028.50	0.42
4011.27	150.00	841639.31	119086.50	0.55
4995.89	150.00	881259.00	119064.75	0.78
6009.45	150.00	922027.31	119036.50	0.21
6994.05	150.00	961626.31	119001.75	-0.43
8007.57	150.00	1002363.00	118953.75	-1.04
8992.13	150.00	1041990.69	118901.50	0.37
10005.64	150.00	1082678.38	118840.75	0.26
14.70	125.00	681093.69	125027.75	-0.90
507.13	125.00	701734.31	125033.50	-0.62
999.42	125.00	722421.00	125048.00	0.13
2013.05	125.00	765066.31	125063.25	0.81
2997.68	125.00	806550.00	125064.25	0.81
4011.27	125.00	849287.00	125058.00	0.03
4995.89	125.00	890820.00	125038.75	-1.00
6009.45	125.00	933579.69	125000.75	-1.67
6994.05	125.00	975194.31	124957.00	0.00
8007.57	125.00	1017957.31	124898.00	1.50
8992.13	125.00	1059316.63	124834.00	0.39
10005.64	125.00	1101771.00	124753.75	-0.71
14.70	100.00	680972.00	131135.00	1.00
507.13	100.00	702596.69	131117.50	0.41
999.42	100.00	724277.00	131129.00	0.51
2013.05	100.00	768979.00	131145.50	0.15
2997.68	100.00	812462.69	131148.00	-0.72
4011.27	100.00	857288.69	131137.50	-1.38
4995.89	100.00	900959.31	131108.50	0.65
6009.45	100.00	945857.00	131064.50	1.94
6994.05	100.00	989298.31	131009.00	0.46
8007.57	100.00	1033946.69	130938.75	-0.62
8992.13	100.00	1077234.63	130856.00	-0.79
10005.64	100.00	1121713.38	130760.75	0.51
14.70	75.00	680778.00	137763.00	0.76
507.13	75.00	703523.00	137729.50	-0.76
999.42	75.00	726317.69	137743.00	-1.53
2013.05	75.00	773367.69	137757.75	-1.89
2997.68	75.00	819253.31	137755.75	0.58
4011.27	75.00	866465.00	137740.00	2.01
4995.89	75.00	912195.00	137702.75	0.84
6009.45	75.00	959241.31	137649.00	-0.24
6994.05	75.00	1004899.31	137581.25	-0.93
8007.57	75.00	1051827.63	137494.00	-1.06
8992.13	75.00	1097318.00	137392.75	-0.62
10005.64	75.00	1144051.63	137275.25	0.99
14.70	50.00	680637.00	144569.50	0.46
507.13	50.00	704654.69	144583.00	-0.22
999.42	50.00	728729.69	144598.50	0.13
2013.05	50.00	778327.69	144616.00	0.68
2997.68	50.00	826468.69	144608.75	-0.06
4011.27	50.00	876060.31	144582.00	-0.31
4995.89	50.00	924239.31	144537.50	-0.26
6009.45	50.00	973800.69	144468.00	-0.11
6994.05	50.00	1021903.69	144380.50	0.26
8007.57	50.00	1071333.38	144271.25	0.40
8992.13	50.00	1119237.63	144146.50	0.14
10005.64	50.00	1168432.00	144001.25	-0.26
14.70	25.00	680421.31	151448.00	0.36
507.13	25.00	705681.69	151464.50	-0.44
999.42	25.00	731018.00	151481.50	-0.27
2013.05	25.00	783272.00	151497.00	0.02
2997.68	25.00	834109.31	151485.50	0.20
4011.27	25.00	886476.69	151449.00	0.12
4995.89	25.00	937352.00	151388.00	0.04
6009.45	25.00	989692.00	151302.25	-0.09
6994.05	25.00	1040472.69	151195.25	-0.15

8007.57	25.00	1092636.38	151057.50	-0.08
8992.13	25.00	1143202.00	150905.50	0.13
10005.64	25.00	1195079.00	150725.75	-0.01



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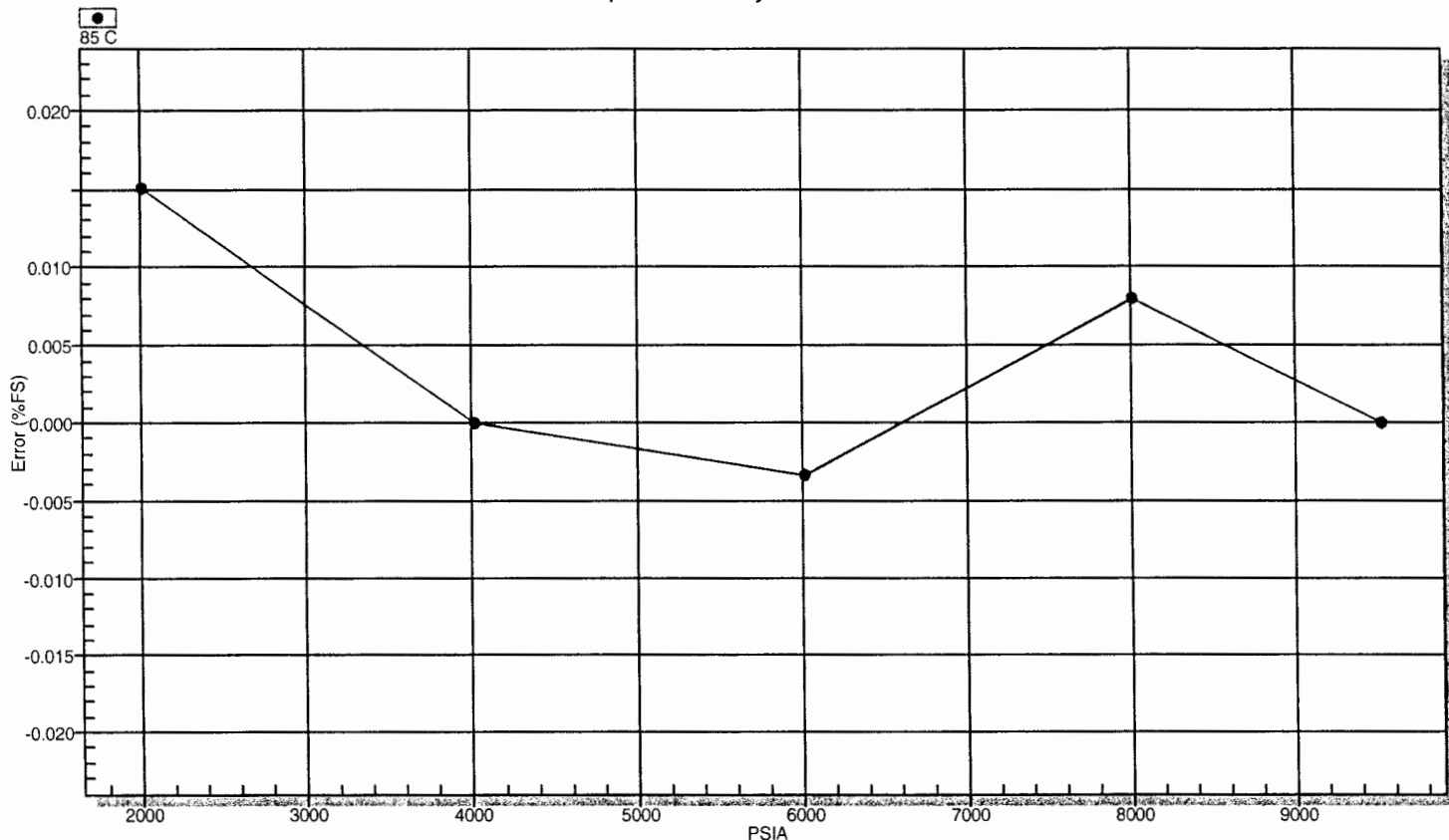
Pressure Gauge Certificate of Conformance

SERIAL NUMBER	76170	CALIBRATION DATE	JAN 13/11
MODEL NUMBER	1139 FF0	PRESSURE REFERENCE	NIST Traceable
PRESSURE RANGE	14.70 - 10005.64 psi	TEMP. REFERENCE	NIST Traceable
TEMP. RANGE	25.00 - 150.00 °C	TRACEABILITY DOC.	CAL-STANDARD-001

ACCURACY

As shown in the graph below, this Spartek Gauge conformed to within $\pm 0.024\%$ F.S. of the pressure standard used in calibration, which is accurate to within $\pm 0.01\%$ of reading. This gives an overall accuracy of $\pm(0.024\% \text{ F.S.} + 0.01\% \text{ of reading})$

Spartek Quality Assurance



Jeff Barnes

Accepted By: _____

Date: JAN 14/11 _____



SPARTEK SYSTEMS

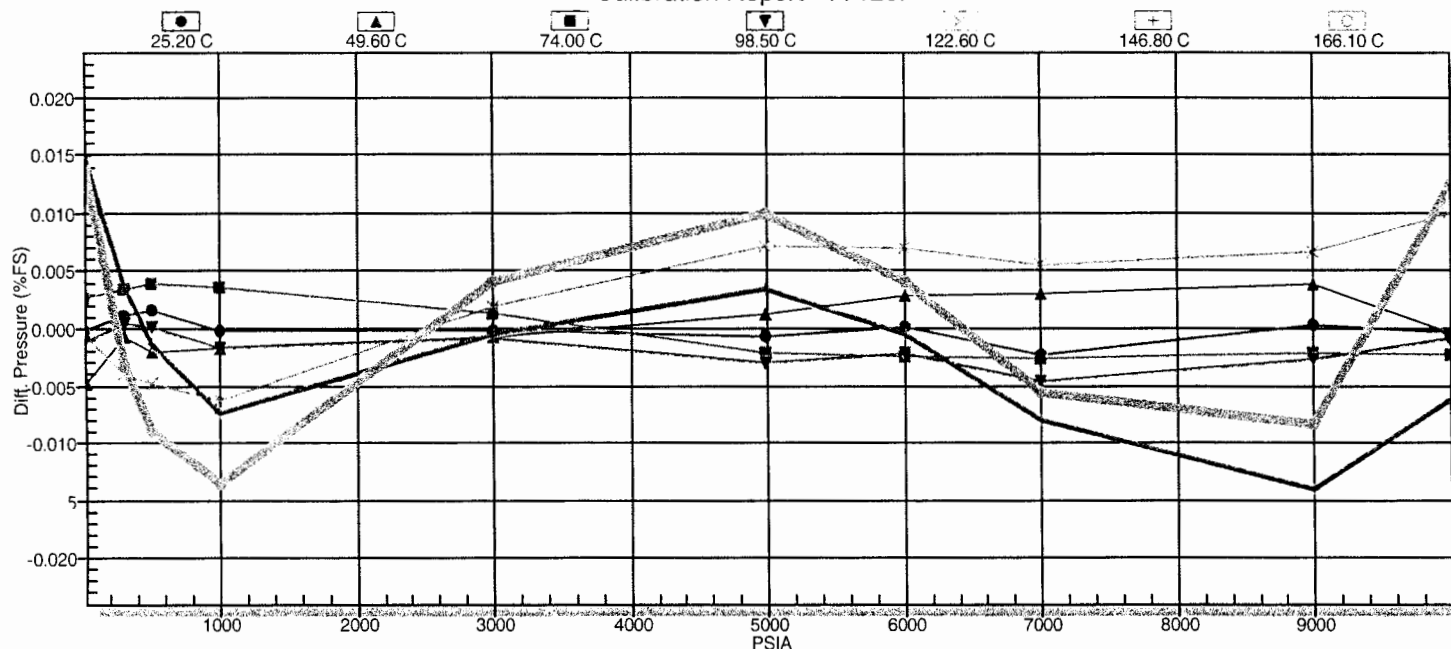
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URL www.sparteksystems.com

Pressure Gauge Certificate of Calibration

Calibration Report - 77120.



GAUGE NUMBER: 77120

2-D POLYNOMIAL LMS CURVEFIT

Source of f: Pres

Fit Order: 3

Prescale: $x_p = m * (f_p - f_{p0})$

m: 0.01

$f_{p0} = 699891$

Temp

4

$x_t = m * (f_t - f_{t0})$

0.01

$f_{t0} = 167028$

Pressure Equation:

Pressure (PSI) = $A + x_p(B + x_p(C + x_p(D)))$

Temperature Compensation:

$A = A_0 + x_t(A_1 + x_t(A_2 + x_t(A_3 + x_t(A_4))))$

$B = B_0 + x_t(B_1 + x_t(B_2 + x_t(B_3 + x_t(B_4))))$

$C = C_0 + x_t(C_1 + x_t(C_2 + x_t(C_3 + x_t(C_4))))$

$D = D_0 + x_t(D_1 + x_t(D_2 + x_t(D_3 + x_t(D_4))))$

0	1	2	3	4
Pressure (psi) STANDARD FIT COEFFICIENTS:				
A 13.0432838	0.1499180608	-3.080875207E-05	-1.263127066E-06	-3.057087791E-09
B 4.000558812	-0.003070597307	-5.067364471E-07	-9.711693386E-10	7.200526642E-12
C 2.702005388E-07	-3.059959235E-08	-7.953499894E-10	-5.804401761E-12	-1.267193684E-14
D 4.206977423E-10	1.411644212E-11	3.018115908E-13	1.922674542E-15	3.882800519E-18

Temperature (C) STANDARD FIT COEFFICIENTS

A 25.39179459

B -0.3341482087

C -1.996610629E-05

D -1.908812792E-07

0 points eliminated.

Error File: Gauge # 77120

Pressure psi	Temperature Deg. C	Count (Pres)	Count (Temp)	DIFF (press) psi
13.08	25.20	699891.33	167028.75	-0.02
300.10	25.30	707069.33	167038.00	0.11
504.31	25.10	712175.67	167043.75	0.16
1000.87	25.20	724587.67	167063.75	-0.02
3003.67	25.20	774683.33	167113.00	-0.02
4989.63	25.20	824350.00	167129.75	-0.06
6003.59	25.20	849698.67	167131.00	0.01
6996.87	25.10	874506.33	167124.50	-0.22
8995.48	25.10	924358.67	167081.75	0.03
9994.76	25.20	949234.67	167050.25	-0.04
13.09	49.60	700133.67	159748.50	-0.48
300.12	49.60	706942.00	159756.00	-0.06
504.32	49.50	711776.33	159765.00	-0.19
1000.88	49.70	723542.33	159784.75	-0.16
3003.69	49.60	771010.67	159828.75	-0.06
4989.66	49.50	818087.00	159854.00	0.13
6003.62	49.60	842114.00	159855.50	0.29
6996.92	49.50	865638.67	159852.50	0.32
8995.53	49.50	912920.00	159823.25	0.40
9994.82	49.60	936516.00	159798.75	-0.03
13.07	74.00	700346.67	152463.25	0.26
300.09	74.00	706808.33	152470.75	0.34
504.30	74.00	711406.00	152482.00	0.39
1000.86	74.10	722584.00	152497.00	0.35
3003.66	74.10	767679.00	152540.25	0.13
4989.63	74.00	812391.33	152561.00	-0.21
6003.60	74.00	835215.67	152565.50	-0.24
6996.88	74.00	857566.00	152565.50	-0.26
8995.49	74.00	902490.67	152544.25	-0.21
9994.78	74.10	924917.00	152522.25	-0.24
13.05	98.50	700484.00	145396.75	-0.11
300.06	98.40	706638.00	145405.00	0.05
504.27	98.30	711013.67	145413.25	0.02
1000.83	98.30	721653.33	145430.00	-0.16
3003.64	98.40	764589.67	145466.25	-0.08
4989.60	98.40	807156.33	145488.00	-0.30
6003.54	98.50	828883.67	145490.25	-0.21
6996.81	98.40	850155.00	145491.25	-0.45
8995.43	98.40	892930.00	145475.75	-0.26
9994.72	98.40	914281.67	145452.25	-0.08
13.03	122.60	700623.33	138676.00	-0.05
300.08	122.60	706476.33	138682.75	-0.39
504.28	122.60	710644.00	138690.75	-0.48
1000.82	122.60	720781.67	138703.00	-0.63
3003.61	122.60	761726.67	138742.00	0.19
4989.58	122.70	802337.00	138761.50	0.72
6003.54	122.60	823062.67	138766.50	0.70
6996.82	122.60	843354.00	138765.25	0.56
8995.43	122.60	884160.00	138756.25	0.67
9994.72	122.70	904535.67	138740.75	1.00
13.09	146.80	700837.67	132357.75	1.48
300.12	146.80	706393.00	132365.50	0.38
504.33	146.70	710353.00	132372.50	-0.14
1000.88	146.80	720002.33	132386.50	-0.73
3003.68	146.70	759062.67	132420.00	-0.05
4989.66	146.80	797869.33	132439.25	0.35
6003.62	146.70	817682.33	132446.00	-0.05
6996.91	146.70	837080.33	132448.75	-0.80
8995.52	146.80	876083.67	132443.50	-1.41
9994.80	146.90	895561.67	132431.25	-0.63
13.09	166.10	701051.00	127439.00	1.38
300.11	166.10	706365.00	127449.50	-0.32
504.32	166.00	710162.00	127457.50	-0.91
1000.88	166.10	719427.00	127469.50	-1.36
3003.68	166.10	757029.33	127498.75	0.40
4989.65	166.10	794474.00	127521.00	1.00
6003.60	166.10	813606.33	127528.00	0.41
6996.88	166.10	832345.67	127536.00	-0.56
8995.49	166.00	870021.67	127536.50	-0.83

9994.77

166.00

888846.00

127534.25

1.25



SPARTEK SYSTEMS

GEOPHYSICAL INSTRUMENTATION

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#1 Thevenaz Ind. Tr.
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Phone (403) 887-2443
Fax (403) 887-4050
URL www.sparteksystems.com

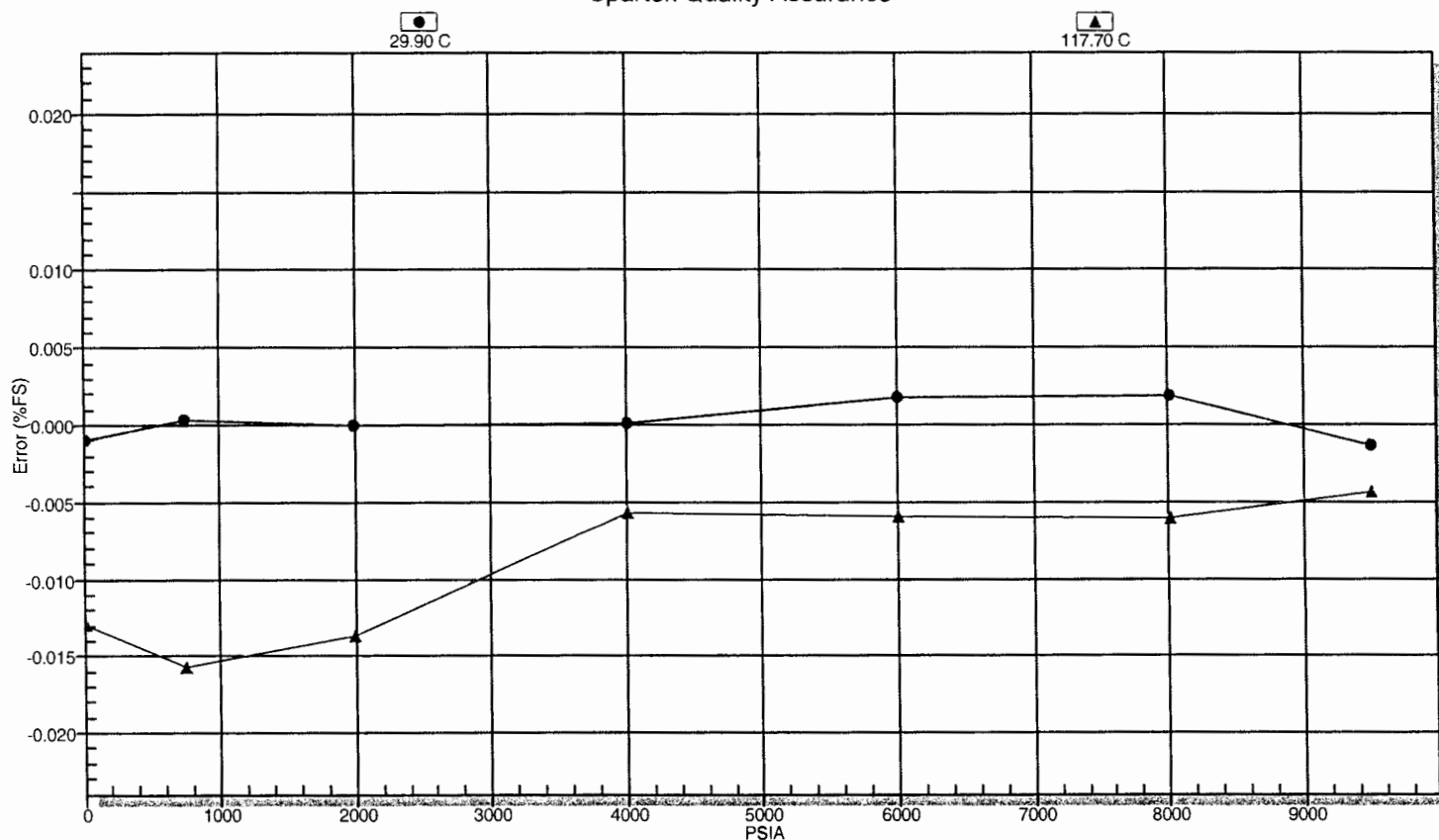
Pressure Gauge Certificate of Conformance

SERIAL NUMBER	77120	CALIBRATION DATE	JUL 19/11
MODEL NUMBER	0 FF0	PRESSURE REFERENCE	NIST Traceable
PRESSURE RANGE	13.08 - 9994.76 psi	TEMP. REFERENCE	NIST Traceable
TEMP. RANGE	25.20 - 166.10 °C	TRACEABILITY DOC.	CAL-STANDARD-001

ACCURACY

As shown in the graph below, this Spartek Gauge conformed to within $\pm 0.024\%$ F.S. of the pressure standard used in calibration, which is accurate to within $\pm 0.01\%$ of reading. This gives an overall accuracy of $\pm(0.024\% \text{ F.S.} + 0.01\% \text{ of reading})$

Spartek Quality Assurance



Accepted By: 

Date: JUL 21/11

Ramp report: Serial # 77120

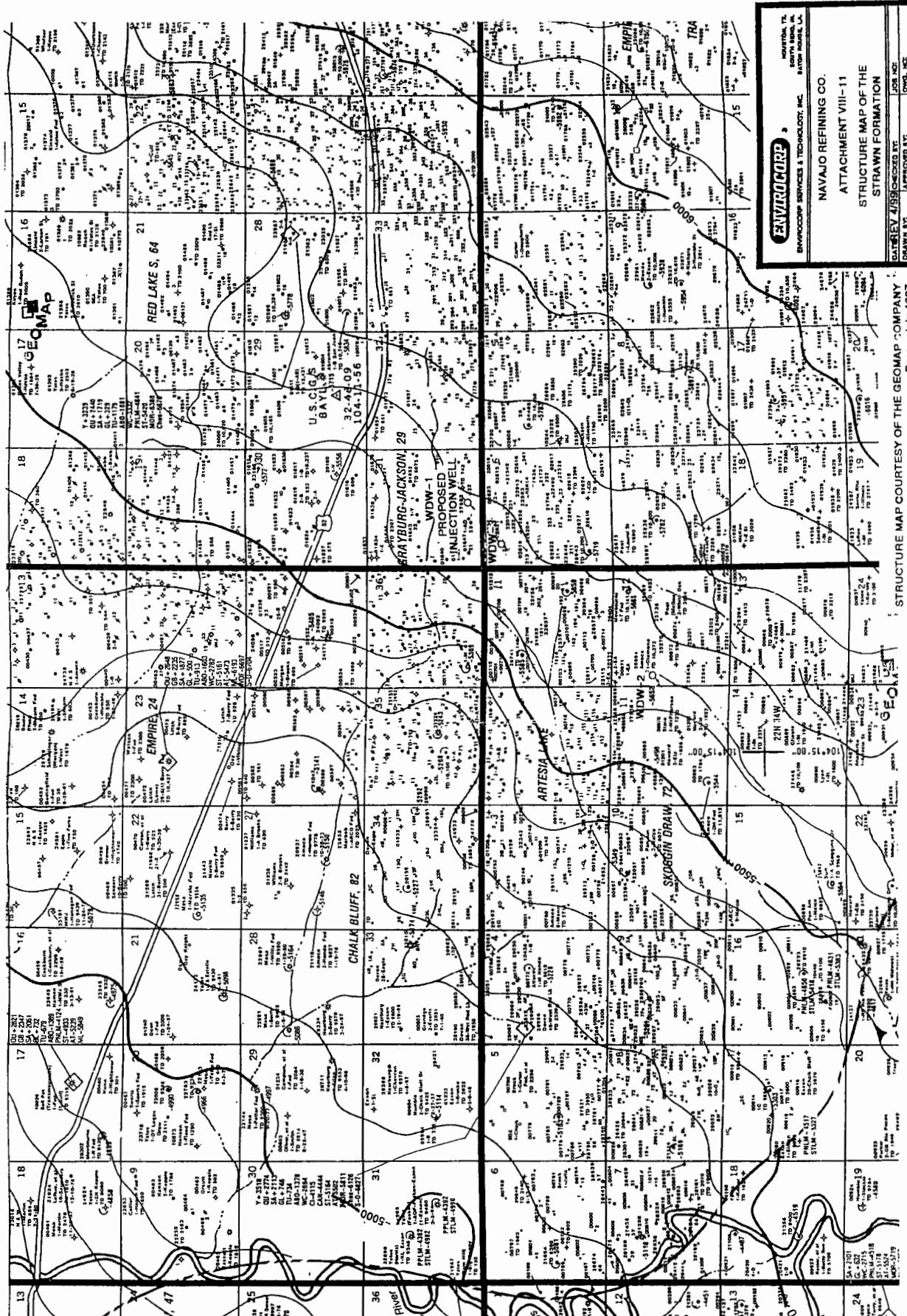
Gauge range = 9994.815 PSI. Max. DIFF. = 2.399

Ramp check result: PASS, Max Err = 0.016% F.S.

DW Pressure	Gauge Pressure	RPM4 Pressure	Differential	%F.S.	Oven Temp.	Gauge Temp.
9499.10	9498.97	9499.18	-0.13	0.0013	29.90	29.97
8014.48	8014.67	8014.66	0.19	0.0019	30.00	29.86
6003.61	6003.79	6003.85	0.18	0.0018	30.00	29.81
4000.87	4000.88	4000.93	0.01	0.0001	30.00	29.84
1989.27	1989.27	1989.30	0.00	0.0000	30.00	29.96
738.26	738.29	737.97	0.03	0.0003	30.10	30.10
13.08	12.99	12.45	-0.09	0.0009	30.00	30.20
9499.11	9498.67	9499.17	-0.43	0.0043	117.70	117.27
8014.49	8013.89	8014.59	-0.59	0.0059	117.70	117.33
6003.60	6003.01	6003.80	-0.59	0.0059	117.80	117.40
4000.86	4000.29	4000.94	-0.56	0.0056	117.70	117.53
1989.26	1987.89	1989.17	-1.37	0.0137	117.70	117.70
738.24	736.67	737.94	-1.57	0.0157	117.70	117.82
13.06	11.76	12.41	-1.29	0.0129	117.80	117.94

APPENDIX I

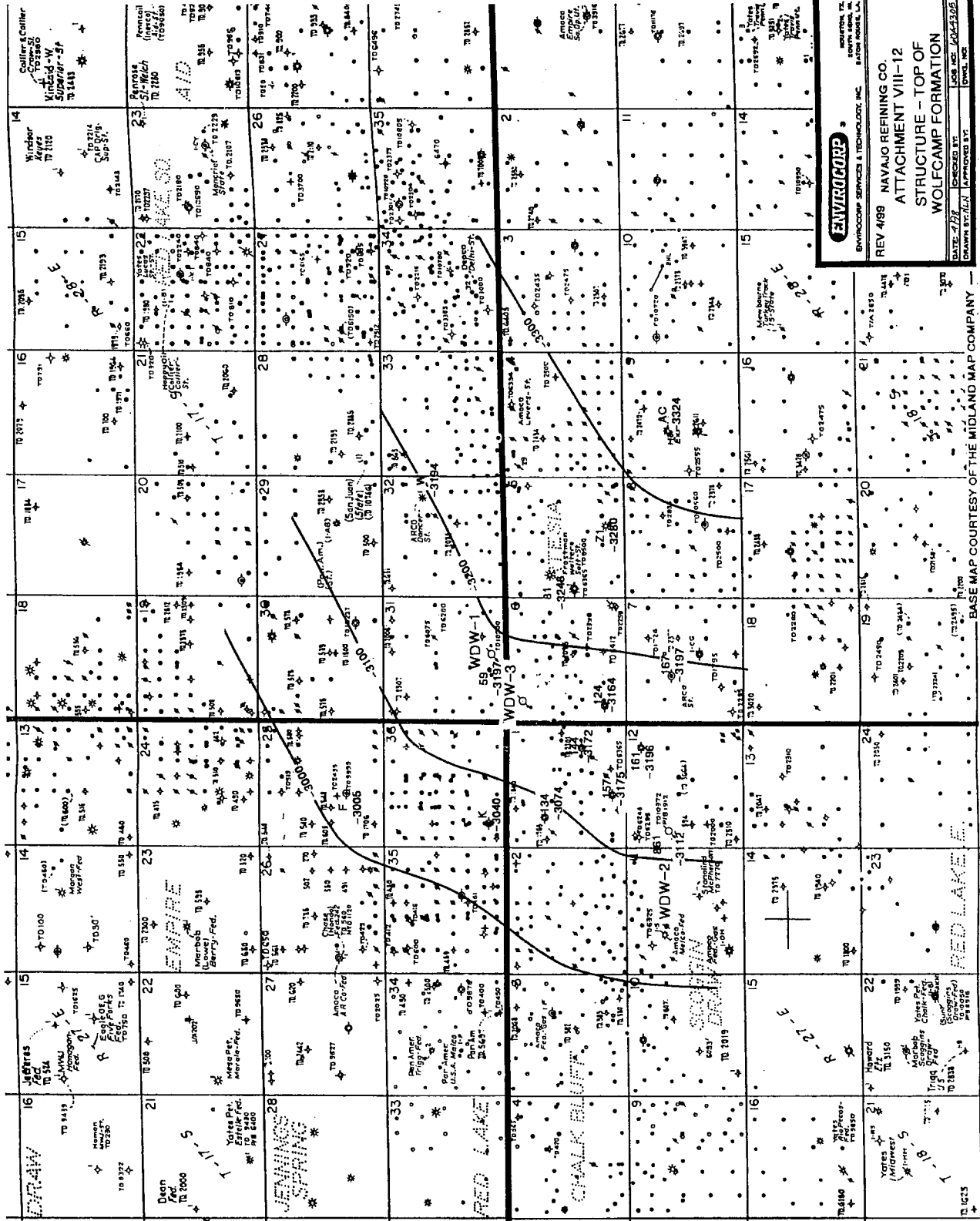
STRAWN STRUCTURE MAPS



ENVIRONMENTAL
ENVIRONMENTAL SERVICES & TECHNOLOGY, INC.
NAVAJO REFINING CO.
ATTACHMENT VIII-11
STRUCTURE MAP OF THE
STRAW FORMATION
DATE: 4/95
DRAWN BY: [Name]
APPROVED BY: [Name]

STRUCTURE MAP COURTESY OF THE GEOMAP COMPANY
Poster July 1997

APPENDIX J
WOLFCAMP STRUCTURE MAPS



157 ID NO.
-4025 SUBSEA DEPTH

APPENDIX J

ENVIRONMENTAL SERVICES & TECHNOLOGY, INC.
 10000 W. 10th Ave., Suite 100
 Denver, CO 80231
 (303) 751-1000

NAVJO REFINING CO.
 ATTACHMENT VIII-12
 STRUCTURE - TOP OF
 WOLF CAMP FORMATION

DATE: 1/19/64
 DRAWN BY: J. L. HARRIS
 CHECKED BY: J. L. HARRIS
 APPROVED BY: J. L. HARRIS

APPENDIX K
CISCO STRUCTURE MAPS

APPENDIX L

CHRONOLOGY OF FIELD ACTIVITIES

APPENDIX L
CHRONOLOGY OF FIELD ACTIVITIES

OCTOBER 29, 2012

Tim Jones:

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

Subsurface personnel obtained safe work permit and held safety meeting with Pro-Well Testing personnel at WDW-2. Bottomhole pressure (BHP) gauges were run in WDW-2 and set at 7570 feet relative to ground level (GL) at 1315 hours. A surface gauge was installed at WDW-2. A BHP gauge was run into WDW-3 and set at 7660 feet GL at 1430 hours. BHP gauge was run into WDW-1 and set at 7924 feet GL at 1525 hours. Subsurface personnel and Pro-Well Testing left the well location. Subsurface personnel Larry McDonald traveled to Artesia for meeting with Navajo tomorrow.

OCTOBER 30, 2012

Subsurface personnel (Tim Jones, Larry McDonald, and Steve King) held technical meeting with Navajo personnel regarding reservoir pressure buildup model, booster pumping system, increasing scope of area of review beyond one mile, and the feasibility of fourth disposal well. Note: The pressure falloff testing for WDW-2 will continue with the offset wells, WDW-1 and WDW-3 to be shut-in at 3:30 p.m. on 10-31-12.

OCTOBER 31, 2012

Subsurface personnel (Tim Jones) traveled back to Houston, Texas.

APPENDIX L

CHRONOLOGY OF FIELD ACTIVITIES (CONTINUED)

NOVEMBER 3, 2012

Ted Jose:

At 0700 hours, Subsurface personnel traveled from Houston, Texas to Artesia, New Mexico. At 1415 hours, Subsurface personnel obtained safe work permit and held safety meeting with Pro-Well Testing (Pro-Well) personnel at 501 East Main St. At 1450 hours, Subsurface and Pro-Well arrived at WDW-2. At 1530 hours, Pro-Well began pulling bottom hole pressure (BHP) gauges out of WDW-2 and made seven (7) minute gradient stops at 7000 feet, 6000 feet, 5000 feet, 4000 feet, 3000 feet, 2000 feet, 1000 feet, and at the surface. Depths are relative to ground level (GL).

At 1655 hours, left WDW-2 and traveled to WDW-1. At 1715 hours, Subsurface and Pro-Well arrived at WDW-1. Pro-Well's truck did not start. At 1750 hours, Pro-Well began pulling out of WDW-1. At 1920 hours, Pro-Well rigged down and turned well over to Navajo. At 1940 hours, Subsurface and Pro-Well arrived at WDW-3. At 2010 hours, Pro-Well began to pull out of WDW-3. At 2045 hours, Pro-Well rigged down and turned over WDW-3 to Navajo. At 2150 hours, Subsurface and Pro-Well arrived at WDW-2 and rigged down BHP gauges and Surface Gauge. At 2240 hours, Pro-Well rigged up sinker bar to tag bottom and began to run in hole to tag bottom. At 2305 hours, Pro-Well tagged bottom at 8773 feet GL and began to pull out of WDW-2. At 2345 hours, Pro-Well rigged down and turned WDW-2 to Navajo. At 2400 hours, Subsurface and Pro-Well secured location and left the plant. Subsurface personnel traveled from Artesia, New Mexico to Midland, Texas.

NOVEMBER 4, 2012

Subsurface personnel traveled back to Houston, Texas.

APPENDIX M

PANSYSTEM© ANALYSIS OUTPUT

Production Optimization Systems	Report File:	2012 WDW-2.pan
PanSystem Version 3.5	Analysis Date:	12/13/2012
Well Test Analysis Report		APPENDIX M
Company	Navajo Refining (Holly Corporation)	
Location	Artesia, NM	
Well	Chukka Well No. 2	
Test Date	10/31/12 to 11/3/12	
Test Type	Buildup/Falloff Test	
Gauge Type/Serial Number	Spartek Systems/76077	
Gauge Depth	7570 feet	
Injection Interval	7570 feet to 8399 feet	
Completion Type	Perforated 2 SPF on 120 deg Phasing	
Top of Fill	8773 feet GL	
Analyst	TJJ	
Subsurface Project No.	70D6835	
Remarks:		

Well Test Analysis Report

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	0.000000 psia
Temperature	0.000000 deg F

Well Parameters Data

	Well 1
Well radius	0.3281 ft
Distance from observation to active well	0.000000 ft
Wellbore storage coefficient	0.0000 bbl/psi
Storage Amplitude	0.000000 psi
Storage Time Constant	0.000000 hr
Second Wellbore Storage	0.000000 bbl/psi
Time Change for Second Storage	0.000000 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	0.590 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

Well Test Analysis Report

Layer 1 Correlations

Not Used

Layer Boundaries Data

Layer 1 Boundary Type : Infinitely acting

	Layer 1
L1	0.000000 ft
L2	0.000000 ft
L3	0.000000 ft
L4	0.000000 ft
Drainage area	0.000000 acres
Dietz shape factor	0.000000

Layer 1 Model Data

Layer 1 Model Type : Radial homogeneous

	Layer 1
Permeability	0.0000 md
Skin factor (Well 1)	0.0000

Rate Change Data

Time Hours	Pressure psia	Rate STB/day
-9102.500000	0.000000	-5875.603257
-9078.500000	0.000000	-6030.089286
-9054.500000	0.000000	-3423.428571
-9030.500000	0.000000	-4350.218254
-9006.500000	0.000000	-5724.309524
-8982.500000	0.000000	-5650.851108
-8958.500000	0.000000	-5800.268023
-8934.500000	0.000000	-5662.694279
-8910.500000	0.000000	-5774.367146
-8886.500000	0.000000	-5627.262814
-8862.500000	0.000000	-5721.080523
-8838.500000	0.000000	-5626.751901
-8814.500000	0.000000	-5784.849206
-8790.500000	0.000000	-5684.746114
-8766.500000	0.000000	-5773.854993
-8742.500000	0.000000	-5697.136987
-8718.500000	0.000000	-5687.378224
-8694.500000	0.000000	-5808.256779
-8671.500000	0.000000	-5677.206267
-8647.500000	0.000000	-5791.847222
-8623.500000	0.000000	-5425.666667
-8599.500000	0.000000	-5254.702381
-8575.500000	0.000000	-4417.779679
-8551.500000	0.000000	-3369.438575
-8527.500000	0.000000	-3398.611111
-8503.500000	0.000000	-5390.454365
-8479.500000	0.000000	-5784.466270
-8455.500000	0.000000	-5731.948495
-8431.500000	0.000000	-5637.704365
-8407.500000	0.000000	-5529.908647
-8383.500000	0.000000	-5866.676587
-8359.500000	0.000000	-5965.734127

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-8335.500000	0.000000	-5863.061425
-8311.500000	0.000000	-5962.904845
-8287.500000	0.000000	-5786.928571
-8263.500000	0.000000	-5807.609127
-8239.500000	0.000000	-5533.809524
-8215.500000	0.000000	-5522.085317
-8191.500000	0.000000	-5652.761987
-8167.500000	0.000000	-5398.418485
-8143.500000	0.000000	-5709.412781
-8119.500000	0.000000	-5843.753968
-8095.500000	0.000000	-5863.748099
-8071.500000	0.000000	-5727.516981
-8047.500000	0.000000	-5453.914683
-8023.500000	0.000000	-5469.386907
-7999.500000	0.000000	-5579.055556
-7975.500000	0.000000	-5463.418651
-7951.500000	0.000000	-3836.807540
-7927.500000	0.000000	-4051.267774
-7903.500000	0.000000	-5624.373099
-7879.500000	0.000000	-5448.017940
-7855.500000	0.000000	-4873.454282
-7831.500000	0.000000	-5512.186425
-7807.500000	0.000000	-5547.031829
-7783.500000	0.000000	-5689.422619
-7759.500000	0.000000	-5569.662698
-7735.500000	0.000000	-5647.833416
-7711.500000	0.000000	-5671.841104
-7687.500000	0.000000	-5495.291749
-7663.500000	0.000000	-5603.440476
-7639.500000	0.000000	-5880.857143
-7615.500000	0.000000	-5907.196429
-7591.500000	0.000000	-4405.065393

Well Test Analysis Report

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-7567.500000	0.000000	-4968.881035
-7543.500000	0.000000	-4504.432622
-7519.500000	0.000000	-5027.835235
-7495.500000	0.000000	-5462.033730
-7471.500000	0.000000	-5475.388294
-7447.500000	0.000000	-5322.293651
-7423.500000	0.000000	-5756.357143
-7399.500000	0.000000	-5823.321429
-7375.500000	0.000000	-5801.067460
-7351.500000	0.000000	-5697.696429
-7327.500000	0.000000	-5730.859127
-7303.500000	0.000000	-5484.045635
-7279.500000	0.000000	-5892.333333
-7255.500000	0.000000	-5606.242063
-7231.500000	0.000000	-5900.771825
-7207.500000	0.000000	-5602.829365
-7183.500000	0.000000	-5458.507937
-7159.500000	0.000000	-5268.896825
-7135.500000	0.000000	-5009.230076
-7111.500000	0.000000	-5150.103340
-7087.500000	0.000000	-5192.220238
-7063.500000	0.000000	-5071.049521
-7039.500000	0.000000	-5282.053489
-7015.500000	0.000000	-5116.581432
-6991.500000	0.000000	-5200.400794
-6967.500000	0.000000	-5045.728175
-6943.500000	0.000000	-4860.948413
-6919.500000	0.000000	-5147.757937
-6895.500000	0.000000	-5022.660632
-6871.500000	0.000000	-5216.777860
-6847.500000	0.000000	-4625.255870
-6823.500000	0.000000	-4208.773892
-6799.500000	0.000000	-4548.428571
-6775.500000	0.000000	-4159.343254
-6751.500000	0.000000	-3235.775794
-6727.500000	0.000000	-3239.319444
-6703.500000	0.000000	-4481.603257
-6679.500000	0.000000	-5143.710400
-6655.500000	0.000000	-5434.898644
-6631.500000	0.000000	-5444.331432
-6607.500000	0.000000	-5425.404679
-6583.500000	0.000000	-5081.035714
-6559.500000	0.000000	-5208.813492
-6535.500000	0.000000	-5107.644841
-6511.500000	0.000000	-5308.234127
-6487.500000	0.000000	-5423.656746
-6463.500000	0.000000	-5328.761905
-6439.500000	0.000000	-4986.142857
-6415.500000	0.000000	-5377.047619

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-6391.500000	0.000000	-5375.500000
-6367.500000	0.000000	-5356.428571
-6343.500000	0.000000	-5393.418651
-6319.500000	0.000000	-5352.666667
-6295.500000	0.000000	-5356.976190
-6271.500000	0.000000	-5124.898727
-6247.500000	0.000000	-5002.896908
-6223.500000	0.000000	-5073.755952
-6199.500000	0.000000	-4978.642857
-6175.500000	0.000000	-5230.924520
-6151.500000	0.000000	-5180.968419
-6127.500000	0.000000	-4842.309441
-6103.500000	0.000000	-4872.728340
-6079.500000	0.000000	-5121.944874
-6055.500000	0.000000	-5175.015790
-6031.500000	0.000000	-5274.748099
-6007.500000	0.000000	-5252.309524
-5983.500000	0.000000	-5270.003968
-5959.500000	0.000000	-5195.720238
-5935.500000	0.000000	-5099.513889
-5911.500000	0.000000	-5267.287698
-5887.500000	0.000000	-5292.456432
-5863.500000	0.000000	-5161.797619
-5839.500000	0.000000	-5211.531581
-5815.500000	0.000000	-5243.890873
-5791.500000	0.000000	-5211.166667
-5767.500000	0.000000	-5313.327381
-5743.500000	0.000000	-5109.890873
-5719.500000	0.000000	-5201.149057
-5695.500000	0.000000	-5292.531498
-5671.500000	0.000000	-5281.855075
-5646.500000	0.000000	-5461.035962
-5622.500000	0.000000	-5471.908647
-5598.500000	0.000000	-5513.354993
-5574.500000	0.000000	-5576.317791
-5550.500000	0.000000	-5615.802662
-5526.500000	0.000000	-5643.248925
-5502.500000	0.000000	-5557.787285
-5478.500000	0.000000	-5553.494296
-5454.500000	0.000000	-5308.511905
-5430.500000	0.000000	-5288.591270
-5406.500000	0.000000	-5120.228175
-5382.500000	0.000000	-4918.049603
-5358.500000	0.000000	-4474.198413
-5334.500000	0.000000	-4915.482143
-5310.500000	0.000000	-5370.579563
-5286.500000	0.000000	-4937.466270
-5262.500000	0.000000	-5263.998099
-5238.500000	0.000000	-4807.974124

Well Test Analysis Report

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-5214.500000	0.000000	-4648.109127
-5190.500000	0.000000	-4963.666171
-5166.500000	0.000000	-5254.954861
-5142.500000	0.000000	-5157.507937
-5118.500000	0.000000	-5116.511905
-5094.500000	0.000000	-5109.373016
-5070.500000	0.000000	-5307.047619
-5046.500000	0.000000	-4983.347222
-5022.500000	0.000000	-5219.027778
-4998.500000	0.000000	-5273.377067
-4974.500000	0.000000	-5413.696429
-4950.500000	0.000000	-5301.585235
-4926.500000	0.000000	-5382.785714
-4902.500000	0.000000	-5206.047702
-4878.500000	0.000000	-4791.043568
-4854.500000	0.000000	-4723.553571
-4830.500000	0.000000	-4723.535714
-4806.500000	0.000000	-4466.732143
-4782.500000	0.000000	-4707.446429
-4758.500000	0.000000	-4655.420635
-4734.500000	0.000000	-4961.341270
-4710.500000	0.000000	-4535.131035
-4686.500000	0.000000	-5266.043568
-4662.500000	0.000000	-5278.238095
-4638.500000	0.000000	-4736.126901
-4614.500000	0.000000	-4885.819527
-4590.500000	0.000000	-5185.841270
-4566.500000	0.000000	-4939.059441
-4542.500000	0.000000	-5276.438575
-4518.500000	0.000000	-5410.490079
-4494.500000	0.000000	-5408.617394
-4470.500000	0.000000	-5420.715939
-4446.500000	0.000000	-5275.525876
-4422.500000	0.000000	-5387.440228
-4398.500000	0.000000	-5308.196677
-4374.500000	0.000000	-5319.251901
-4350.500000	0.000000	-5410.003968
-4326.500000	0.000000	-5440.771825
-4302.500000	0.000000	-5438.962219
-4278.500000	0.000000	-5433.633019
-4254.500000	0.000000	-5387.785714
-4230.500000	0.000000	-5379.390956
-4206.500000	0.000000	-5305.466270
-4182.500000	0.000000	-5394.453602
-4158.500000	0.000000	-5627.867229
-4134.500000	0.000000	-5572.978886
-4110.500000	0.000000	-5671.688657
-4086.500000	0.000000	-5734.816964
-4062.500000	0.000000	-5500.480985

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-4038.500000	0.000000	-5646.392295
-4014.500000	0.000000	-5604.357970
-3990.500000	0.000000	-5756.819692
-3966.500000	0.000000	-5631.102844
-3942.500000	0.000000	-5810.422123
-3918.500000	0.000000	-5620.153191
-3894.500000	0.000000	-5464.986111
-3870.500000	0.000000	-3979.785714
-3846.500000	0.000000	-3647.972139
-3822.500000	0.000000	-5612.120866
-3798.500000	0.000000	-5567.663539
-3774.500000	0.000000	-5552.705755
-3750.500000	0.000000	-5449.464286
-3726.500000	0.000000	-5387.960317
-3702.500000	0.000000	-5120.144841
-3678.500000	0.000000	-5439.128968
-3654.500000	0.000000	-5454.543651
-3630.500000	0.000000	-5337.279762
-3606.500000	0.000000	-5393.414600
-3582.500000	0.000000	-5287.357226
-3558.500000	0.000000	-5319.476190
-3534.500000	0.000000	-5471.023810
-3510.500000	0.000000	-5391.466270
-3486.500000	0.000000	-5328.716270
-3462.500000	0.000000	-5353.736111
-3438.500000	0.000000	-5332.049686
-3414.500000	0.000000	-5342.741898
-3390.500000	0.000000	-5396.285714
-3366.500000	0.000000	-5414.809606
-3342.500000	0.000000	-5106.428571
-3318.500000	0.000000	-5394.799520
-3294.500000	0.000000	-5461.917146
-3270.500000	0.000000	-5425.597139
-3246.500000	0.000000	-5416.103257
-3222.500000	0.000000	-5472.190559
-3198.500000	0.000000	-5404.904679
-3174.500000	0.000000	-5398.085317
-3150.500000	0.000000	-5464.452381
-3126.500000	0.000000	-5469.523810
-3102.500000	0.000000	-5396.952381
-3078.500000	0.000000	-5459.000000
-3054.500000	0.000000	-5417.023810
-3030.500000	0.000000	-5446.248016
-3006.500000	0.000000	-5405.755952
-2982.500000	0.000000	-5381.509921
-2958.500000	0.000000	-5376.857143
-2934.500000	0.000000	-5375.023810
-2910.500000	0.000000	-5407.714286
-2886.500000	0.000000	-5396.184524

Well Test Analysis Report

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-2862.500000	0.000000	-5374.057044
-2838.500000	0.000000	-5263.690559
-2814.500000	0.000000	-5315.248429
-2790.500000	0.000000	-5378.357341
-2766.500000	0.000000	-5371.632854
-2742.500000	0.000000	-5398.714286
-2718.500000	0.000000	-5262.105241
-2694.500000	0.000000	-5261.648810
-2670.500000	0.000000	-4517.773810
-2646.500000	0.000000	-5449.708333
-2622.500000	0.000000	-5349.363095
-2598.500000	0.000000	-5222.359127
-2574.500000	0.000000	-5311.795718
-2550.500000	0.000000	-4839.567378
-2526.500000	0.000000	-5290.152778
-2502.500000	0.000000	-5215.523810
-2478.500000	0.000000	-5349.277778
-2454.500000	0.000000	-5278.172702
-2430.500000	0.000000	-5171.833251
-2406.500000	0.000000	-5136.680556
-2382.500000	0.000000	-5341.190393
-2358.500000	0.000000	-5183.373099
-2334.500000	0.000000	-5239.365162
-2310.500000	0.000000	-5159.299521
-2286.500000	0.000000	-5204.595238
-2262.500000	0.000000	-5148.724289
-2238.500000	0.000000	-5363.517774
-2214.500000	0.000000	-5328.648810
-2190.500000	0.000000	-5338.551422
-2166.500000	0.000000	-5210.383267
-2142.500000	0.000000	-4783.470073
-2118.500000	0.000000	-5287.023727
-2094.500000	0.000000	-4148.656829
-2070.500000	0.000000	-4779.027778
-2046.500000	0.000000	-5269.180556
-2022.500000	0.000000	-5127.081349
-1998.500000	0.000000	-5171.948611
-1974.500000	0.000000	-5209.335400
-1950.500000	0.000000	-5172.952381
-1926.500000	0.000000	-5074.791667
-1902.500000	0.000000	-5205.228092
-1878.500000	0.000000	-5093.952381
-1854.500000	0.000000	-5272.595238
-1830.500000	0.000000	-5127.990079
-1806.500000	0.000000	-5275.132854
-1782.500000	0.000000	-5010.258019
-1758.500000	0.000000	-5229.023810
-1734.500000	0.000000	-5189.375000
-1710.500000	0.000000	-5201.565873

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-1686.500000	0.000000	-5182.240278
-1662.500000	0.000000	-4905.202133
-1638.500000	0.000000	-5304.591518
-1614.500000	0.000000	-5146.228175
-1590.500000	0.000000	-5223.238095
-1566.500000	0.000000	-5149.642940
-1542.500000	0.000000	-5322.214203
-1518.500000	0.000000	-5176.809524
-1494.500000	0.000000	-5279.942378
-1470.500000	0.000000	-5297.972702
-1446.500000	0.000000	-5293.942460
-1422.500000	0.000000	-5263.684524
-1398.500000	0.000000	-5350.811508
-1374.500000	0.000000	-5320.926587
-1350.500000	0.000000	-5436.882937
-1326.500000	0.000000	-5396.271825
-1302.500000	0.000000	-5379.496032
-1278.500000	0.000000	-5238.918568
-1254.500000	0.000000	-5155.811508
-1230.500000	0.000000	-5041.095403
-1206.500000	0.000000	-4900.517774
-1182.500000	0.000000	-4931.000000
-1158.500000	0.000000	-4841.069444
-1134.500000	0.000000	-4468.428571
-1110.500000	0.000000	-5093.833333
-1086.500000	0.000000	-4650.595238
-1062.500000	0.000000	-5032.619048
-1038.500000	0.000000	-4942.809805
-1014.500000	0.000000	-4315.426422
-990.500000	0.000000	-3389.595321
-966.500000	0.000000	-3391.857143
-942.500000	0.000000	-3948.841353
-918.500000	0.000000	-5277.190476
-894.500000	0.000000	-5238.857060
-870.500000	0.000000	-5265.061425
-846.500000	0.000000	-5192.317543
-822.500000	0.000000	-5247.706266
-798.500000	0.000000	-5290.877067
-774.500000	0.000000	-5301.926670
-750.500000	0.000000	-5241.946346
-726.500000	0.000000	-5153.694527
-702.500000	0.000000	-5266.805473
-678.500000	0.000000	-5193.607143
-654.500000	0.000000	-5245.142857
-630.500000	0.000000	-5238.347222
-606.500000	0.000000	-5238.295635
-582.500000	0.000000	-4806.694444
-558.500000	0.000000	-5161.950314
-534.500000	0.000000	-5243.714368

Well Test Analysis Report

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-510.500000	0.000000	-5221.652778
-486.500000	0.000000	-5232.345238
-462.500000	0.000000	-5206.632854
-438.500000	0.000000	-5153.067543
-414.500000	0.000000	-5192.632937
-390.500000	0.000000	-5091.051587
-366.500000	0.000000	-5159.940079
-342.500000	0.000000	-5112.609127
-318.500000	0.000000	-4968.152778
-294.500000	0.000000	-4867.694527
-270.500000	0.000000	-4995.910632
-246.500000	0.000000	-4857.269841
-222.500000	0.000000	-4669.623181
-198.500000	0.000000	-4824.243882
-174.500000	0.000000	-4906.841353
-150.500000	0.000000	-4765.345155
-126.500000	0.000000	-4764.329365
-102.500000	0.000000	-4943.396825
-78.500000	0.000000	-4896.704365
-54.500000	0.000000	-4914.831432
-30.500000	0.000000	-5396.001984
-29.500000	0.000000	-5385.714286
-28.500000	0.000000	-5385.142857
-27.500000	0.000000	-5392.240081
-26.500000	0.000000	-5396.902778
-25.500000	0.000000	-5385.714286
-24.500000	0.000000	-5384.571429
-23.500000	0.000000	-5384.571429
-22.500000	0.000000	-5385.714286
-21.500000	0.000000	-5404.809524
-20.500000	0.000000	-5422.523810
-19.500000	0.000000	-5440.571429
-18.500000	0.000000	-5465.140872
-17.500000	0.000000	-5480.811508
-16.500000	0.000000	-5491.426586
-15.500000	0.000000	-5510.525794
-14.500000	0.000000	-5499.523810
-13.500000	0.000000	-5488.478176
-12.500000	0.000000	-5474.950397
-11.500000	0.000000	-5445.474205
-10.500000	0.000000	-5428.571427
-9.500000	0.000000	-5431.430555
-8.500000	0.000000	-5419.430557
-7.500000	0.000000	-5415.998016
-6.500000	0.000000	-5416.000000
-5.500000	0.000000	-5416.569443
-4.500000	0.000000	-5416.001984
-3.500000	0.000000	-5415.188491
-2.500000	0.000000	-5414.287698

Rate Change Data (cont)

Time Hours	Pressure psia	Rate STB/day
-1.500000	0.000000	-5413.380952
-0.000293	3952.678533	-5411.190476
33.090092	3900.508486	0.000000

Well Test Analysis Report

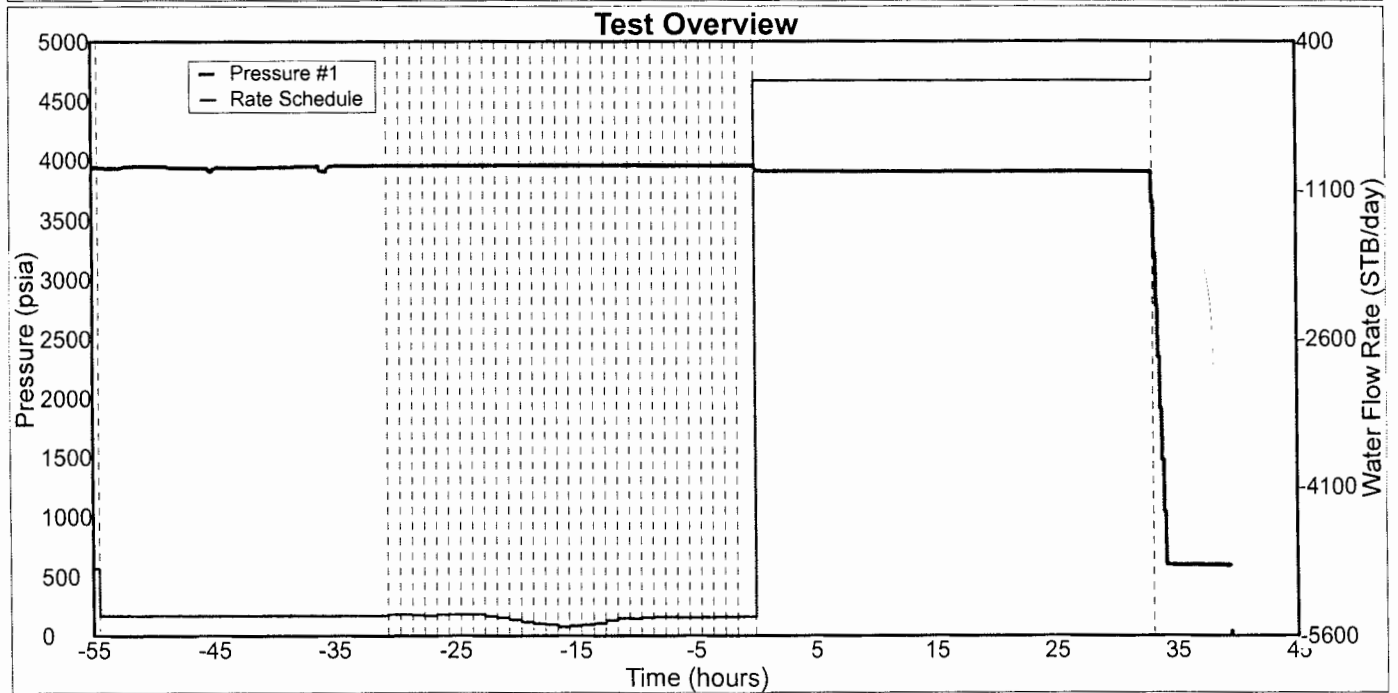
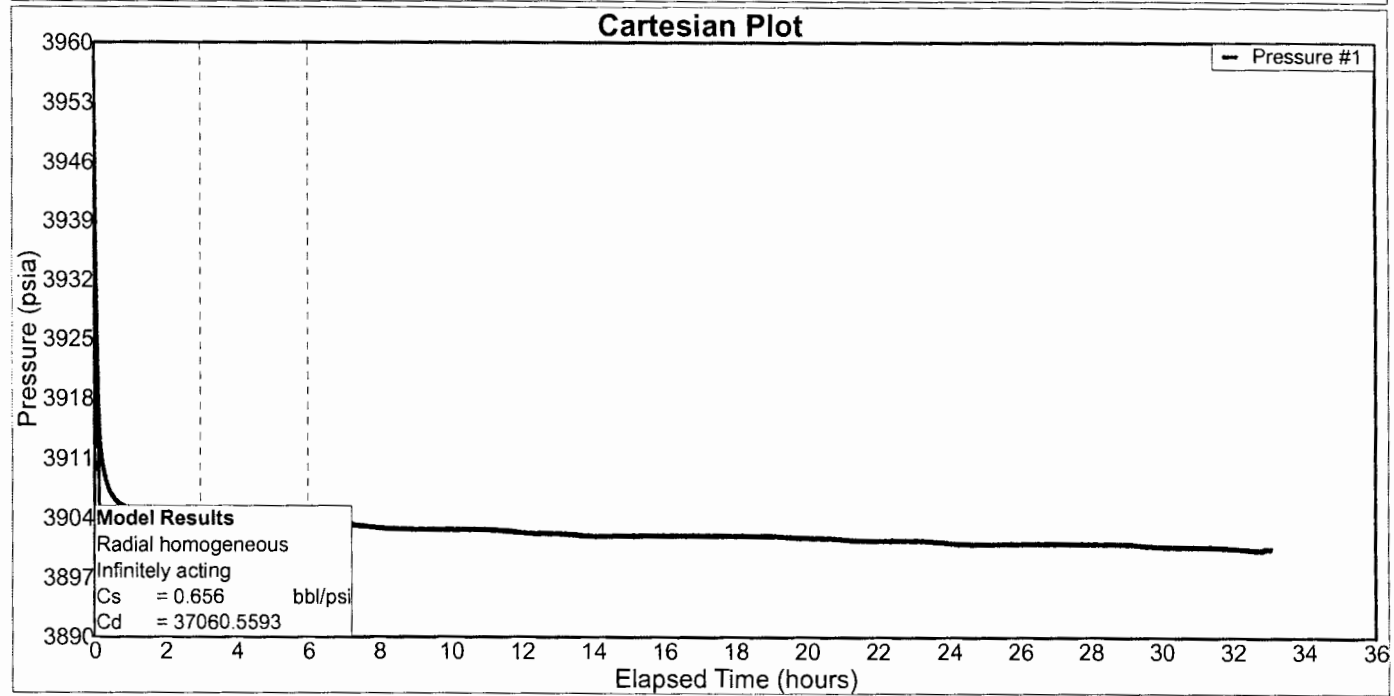


FIGURE 9



Cartesian Plot Model Results
 Radial homogeneous - Infinitely acting

Classic Wellbore Storage

	Value
Wellbore storage coefficient	0.656001 bbl/psi
Dimensionless wellbore storage	3.7061e4

Cartesian Plot Line Details
 Line type : Wellbore storage
 Slope : -343.698
 Intercept : 3953.14
 Coefficient of Determination : 0.978285
 Number of Intersections = 0

Well Test Analysis Report

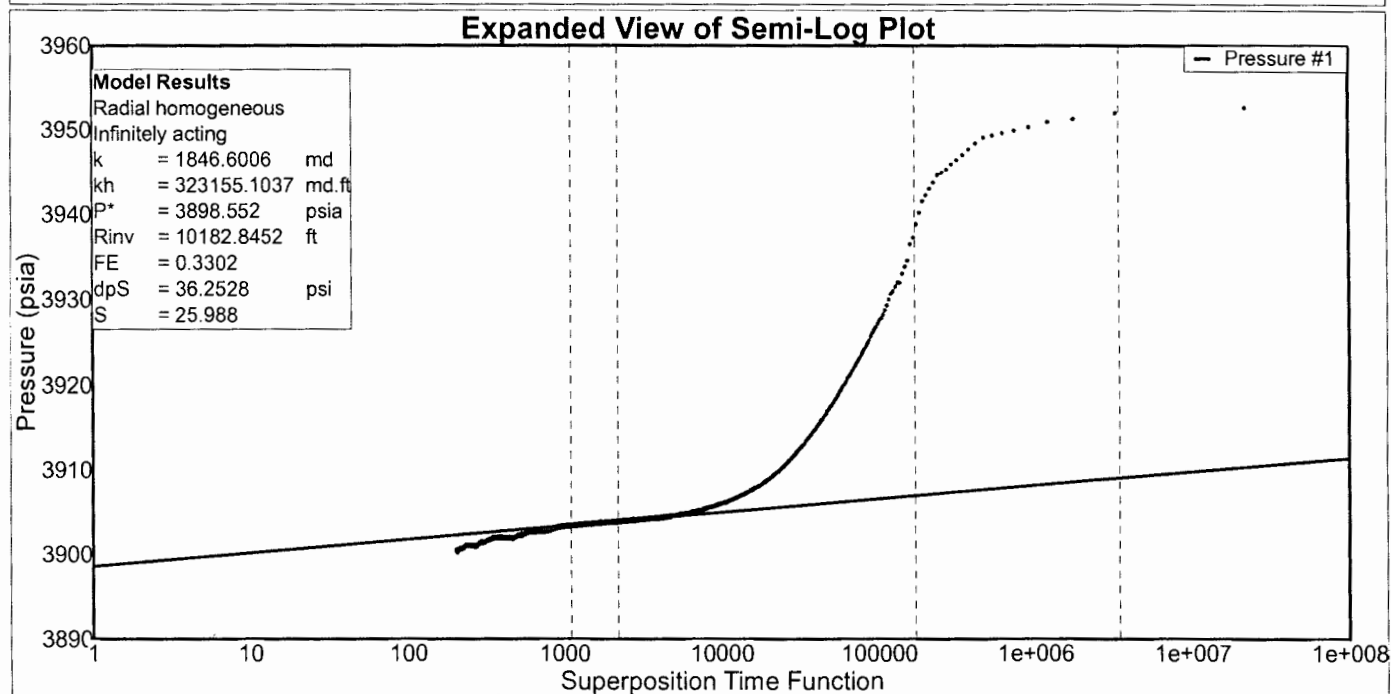


FIGURE 16

Expanded View of Semi-Log Plot Model Results

Radial homogeneous - Infinitely acting

Classic Wellbore Storage

	Value
Permeability	1846.600592 md
Permeability-thickness	3.2316e5 md.ft
Extrapolated pressure	3898.552011 psia
Radius of investigation	1.0183e4 ft
Flow efficiency	0.330221
dP skin (constant rate)	36.252795 psi
Skin factor	25.988007

Expanded View of Semi-Log Plot Line Details

Line type : Radial flow

Slope : 1.60603

Intercept : 3898.55

Coefficient of Determination : 0.908753

	Radial flow
Extrapolated pressure	3898.552011 psia
Pressure at dt = 1 hour	3904.683069 psia

Number of Intersections = 0

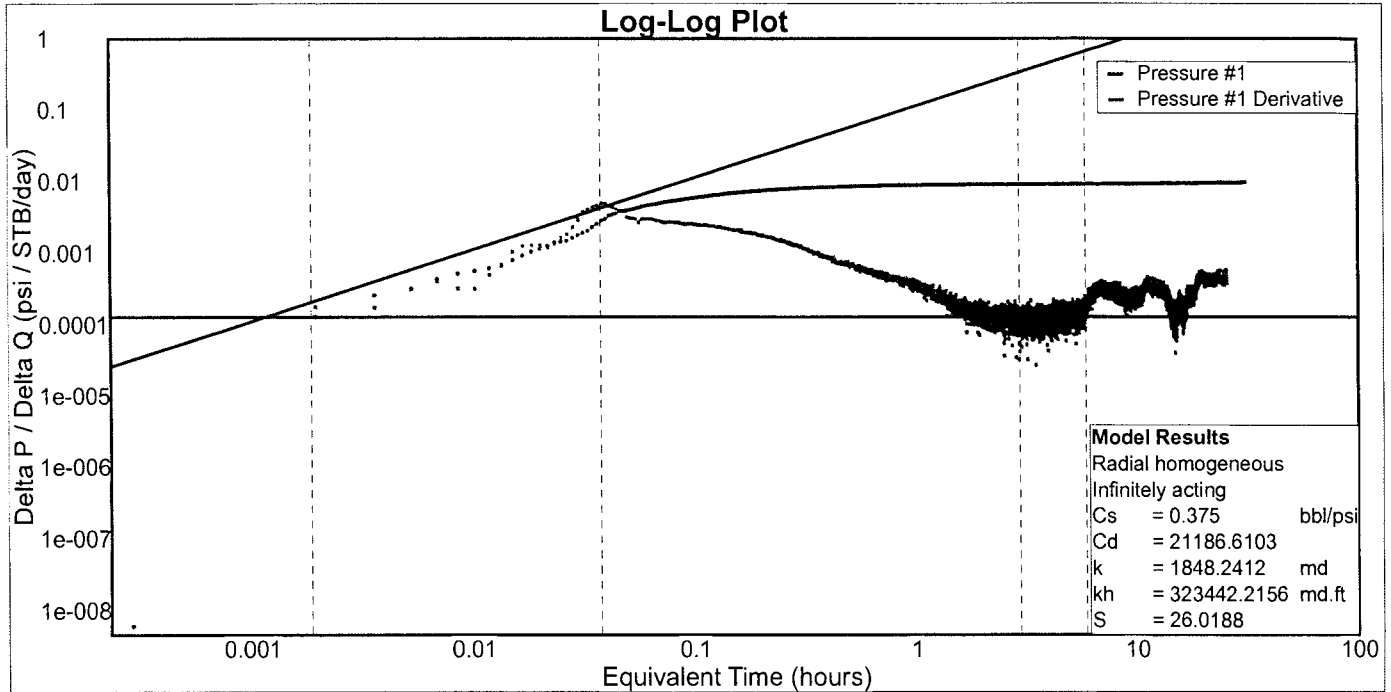


FIGURE 14

Log-Log Plot Model Results

Radial homogeneous - Infinitely acting

Classic Wellbore Storage

	Value
Wellbore storage coefficient	0.375019 bbl/psi
Dimensionless wellbore storage	2.1187e4
Permeability	1848.241232 md
Permeability-thickness	3.2344e5 md.ft
Skin factor	26.018834

Log-Log Plot Line Details

Line type : Radial flow

Slope : 0

Intercept : 0.000128783

Coefficient of Determination : Not Used

Line type : Wellbore storage

Slope : 1

Intercept : 0.111105

Coefficient of Determination : Not Used

Number of Intersections = 0