Additional Information

Received 05/01/2020

From: Montgomery, Kelley A
To: Goetze, Phillip, EMNRD
Subject: [EXT] RE: Hobbs Guzzler SWD No. 1 - Additional Information Requirement
Date: Friday, May 1, 2020 10:25:29 AM
Attachments: C-108 04-23-2020.docx
Reference Support to summary under section VIII of C-108.pdf
SHU #229 12-12-08.pdf
SHU #238 2-22-23-08.pdf

Hi Phil,

I hope you are doing well during these crazy times. We have finally pulled together answers to your questions below in a few attachments:

- The revised C108 with highlighted changes
- The 'Reference Support to summary under Section VII' which answers each question below
- Two step rate tests on nearby wells to support our injection pressure request

I appreciate your help! Take care and stay safe.

Regards,

Kelley Montgomery, PE
Regulatory Director
Occidental Oil and Gas
Office - 713.366.5716
Cell: 832.454.8137
kelley_montgomery@oxy.com

From: Goetze, Phillip, EMNRD <Phillip.Goetze@state.nm.us>
Sent: Tuesday, August 13, 2019 11:27 AM
To: Montgomery, Kelley A <Kelley_Montgomery@oxy.com>
Cc: McMillan, Michael, EMNRD <Michael.McMillan@state.nm.us>; Hood, April <April_Hood@oxy.com>; Jones, William V, EMNRD <WilliamV.Jones@state.nm.us>
Subject: [EXTERNAL] Hobbs Guzzler SWD No. 1 - Additional Information Requirement

RE: Hobbs Guzzler SWD No. 1; 30-025-43702; Appl. no. pMAM1903249035; application to plugback and dispose in San Andres Fm

Kelley:

Per our conversation yesterday regarding this application, I have reviewed the content and find that additional geologic information will be required. It seems my memory of this application was incorrect and that a supplemental effort will be required. Mike first identified an issue with the submittal of the application in January and I concur that the information contained in the application does not satisfy the unique situation for this well (see attachment). Since the well is within a statutory unit established by Commission Order R-6198 with a defined "unitized interval" and Oxy has proposed to utilize the lower San Andres formation for disposal, the supporting documentation should be more comprehensive as to ensure that the injection will not impact the North Hobbs ER project. A few lines on page one of the C-108 application would not stand at Commission and the Division does not have access to the data used to assess these findings. Therefore, Division is

requesting an expanded effort to support the summary found under Section VIII of the C-108 application. Please provide a geological and engineering summary by a qualified person that includes, at a minimum:

1. Correlation of the type log to logs in the immediate area of the Hobbs Guzzler (or if there is a log for the Guzzler that is shallower than the log submitted to the Division) summarized in a cross-section showing the injection zone is not within the "unitized interval";
2. That a confining layer, or other means of vertically isolating the migration of injection fluids, is present;
3. More detail of the content of the reservoir analysis referenced in the application; and
4. Examples of the IP tests used for the assessment.

Additionally, Oxy needs to address the conflict in the application for the proposed lower limit of the injection interval. The re-completion well diagram shows seven plugs with the shallowest being 5898 feet deep, also the depth of the deepest perforation. It references the plug location as isolation for the Glorieta Formation. Yet, the mud log provided in the Division well record has a formation top for the Glorieta as 5486 feet (TVD). If the lower limit of the San Andres is 5486 feet, then the order can only be issued for the San Andres interval with a total depth 5486 feet and not the application's proposed depth of 5900 feet. This would also require a modification of the well design to include a CIBP with cement cap that is no deeper than 100 feet from 5486 feet (or less than or equal to 5586 feet).

Other items are noted about the application:

- Section X of the C-108 states that logs will be filed after the well has been drilled and completed. Is this a fact or an oversight?
- The proposed MSIP is 2000 psi. The method to determine the MSIP for administrative orders is 0.2 psi/ft, thus making the MSIP 956 psi (0.2 psi x 4780 ft).
- The well construction shows the 9 5/8-inch casing set at 5020 feet and the 7-inch production casing set to 10650 feet. Is Oxy proposing perforating the shoe of the 9 5/8-inch casing as well as the location of the DV tool at 5098 feet in the 7-inch casing?

Take some time and review this request. Please contact me with any questions you may have concerning the content of this e-mail. PRG

Phillip Goetze, PG
Engineering Bureau, Oil Conservation Division
New Mexico Energy, Minerals and Natural Resources Department
1220 South St. Francis Drive, Santa Fe, NM 87505
Direct: 505.476.3466
E-mail: phillip.goetze@state.nm.us

STATE OF NEW MEXICO
ENERGY, MINERALS AND NATURAL RESOURCES DEPARTMENT

Oil Conservation Division
1220 South St. Francis Dr.
Santa Fe, New Mexico 87505

FORM C-108
Revised June 10, 2003

APPLICATION FOR AUTHORIZATION TO INJECT

I. PURPOSE: _____Secondary Recovery _____Pressure Maintenance ____X____Disposal _____Storage
Application qualifies for administrative approval? ____X____Yes _____No

II. OPERATOR: Occidental Permian LTD

ADDRESS: PO Box 4294 Houston, TX 77210

CONTACT PARTY: Kelley Montgomery PHONE: 713-366-5716

III. WELL DATA: Complete the data required on the reverse side of this form for each well proposed for injection. Additional sheets may be attached if necessary.

IV. Is this an expansion of an existing project? _____Yes ____X____No
If yes, give the Division order number authorizing the project: _____

V. Attach a map that identifies all wells and leases within two miles of any proposed injection well with a one-half mile radius circle drawn around each proposed injection well. This circle identifies the well's area of review. **Attached**

VI. Attach a tabulation of data on all wells of public record within the area of review which penetrate the proposed injection zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of completion, and a schematic of any plugged well illustrating all plugging detail. **Attached**

VII. Attach data on the proposed operation, including:

1. Proposed average and maximum daily rate and volume of fluids to be injected; **Avg – 10,000 BWPD Max – 20,000 BWPD**
2. Whether the system is open or closed; **Closed**
3. Proposed average and maximum injection pressure;
   2400 psi – Average, 2700 psi – Maximum (Bottom Hole Pressure)
   1000 psi – Average, 1200 psi – Maximum (Surface Pressure after accounting for friction losses)
   Step Rate Test for wells completed in the San Andres Reservoir (SHU 229 and SHU 238) attached for reference.
4. Sources and an appropriate analysis of injection fluid and compatibility with the receiving formation if other than reinjected produced water; and, **Grayburg / San Andres from the North Hobbs Unit, Attached**
5. If injection is for disposal purposes into a zone not productive of oil or gas at or within one mile of the proposed well, attach a chemical analysis of the disposal zone formation water (may be measured or inferred from existing literature, studies, nearby wells, etc.). **Attached**

*VIII. Attach appropriate geologic data on the injection zone including appropriate lithologic detail, geologic name, thickness, and depth. Give the geologic name, and depth to bottom of all underground sources of drinking water (aquifers containing waters with total dissolved solids concentrations of 10,000 mg/l or less) overlying the proposed injection zone as well as any such sources known to be immediately underlying the injection interval.

Injection Zone:
Lithologic Description: San Andres formation.
Porosity: 9-19%
Sw: 50% to 100%
Injection Interval: 4,780' – 5,900'

Reservoir analysis is based on petrophysical data collected in the Hobbs wells. From the review of the offset geological data (logs and core) and IP tests below 4780' TVD, it is concluded that there are likely no producible hydrocarbons from the propose interval. Additional review of offset geological and historic seismic data suggests no evidence of open or active faults near the proposed location.

Additional information "Reference: Support to summary under section VIII of C-108" as requested by the Division (email send by "Goetze, Phillip, EMNRD" Phillip.Goetze@state.nm.us) can be found attached to this application

IX. Describe the proposed stimulation program, if any. **Acid Stimulation**

*X. Attach appropriate logging and test data on the well. (If well logs have been filed with the Division, they need not be resubmitted).
Logs have been filed to the division as part of the original completion

*XI. Attach a chemical analysis of fresh water from two or more fresh water wells (if available and producing) within one mile of any injection or disposal well showing location of wells and dates samples were taken. **Attached**

XII. Applicants for disposal wells must make an affirmative statement that they have examined available geologic and engineering data and find no evidence of open faults or any other hydrologic connection between the disposal zone and any underground sources of drinking water.

I have examined the available geologic and engineering data for Hobbs Guzzler #1 SWD well and find no evidence of open faults or any other hydrologic connection between the disposal zone and any underground sources of drinking water

Dmitri Pistoun

XIII. Applicants must complete the "Proof of Notice" section on the reverse side of this form. **Attached**

XIV. Certification: I hereby certify that the information submitted with this application is true and correct to the best of my knowledge and belief.

NAME: Kelley Montgomery TITLE: Director - Regulatory

SIGNATURE: Kelley Montgomery DATE: 04/23/2020

E-MAIL ADDRESS: Kelley_montgomery@oxy.com

* If the information required under Sections VI, VIII, X, and XI above has been previously submitted, it need not be resubmitted. Please show the date and circumstances of the earlier submittal: _____

DISTRIBUTION: Original and one copy to Santa Fe with one copy to the appropriate District Office

Side 2

III. WELL DATA

A. The following well data must be submitted for each injection well covered by this application. The data must be both in tabular and schematic form and shall include:

(1) Lease name; Well No.; Location by Section, Township and Range; and footage location within the section.

(2) Each casing string used with its size, setting depth, sacks of cement used, hole size, top of cement, and how such top was determined.

(3) A description of the tubing to be used including its size, lining material, and setting depth.

(4) The name, model, and setting depth of the packer used or a description of any other seal system or assembly used.

Division District Offices have supplies of Well Data Sheets which may be used or which may be used as models for this purpose. Applicants for several identical wells may submit a "typical data sheet" rather than submitting the data for each well.

B. The following must be submitted for each injection well covered by this application. All items must be addressed for the initial well. Responses for additional wells need be shown only when different. Information shown on schematics need not be repeated.

(1) The name of the injection formation and, if applicable, the field or pool name.

(2) The injection interval and whether it is perforated or open-hole.

(3) State if the well was drilled for injection or, if not, the original purpose of the well.

(4) Give the depths of any other perforated intervals and detail on the sacks of cement or bridge plugs used to seal off such perforations.

(5) Give the depth to and the name of the next higher and next lower oil or gas zone in the area of the well, if any.

XIV. PROOF OF NOTICE

All applicants must furnish proof that a copy of the application has been furnished, by certified or registered mail, to the owner of the surface of the land on which the well is to be located and to each leasehold operator within one-half mile of the well location.

Where an application is subject to administrative approval, a proof of publication must be submitted. Such proof shall consist of a copy of the legal advertisement which was published in the county in which the well is located. The contents of such advertisement must include:

(1) The name, address, phone number, and contact party for the applicant;

(2) The intended purpose of the injection well; with the exact location of single wells or the Section, Township, and Range location of multiple wells;

(3) The formation name and depth with expected maximum injection rates and pressures; and,

(4) A notation that interested parties must file objections or requests for hearing with the Oil Conservation Division, 1220 South St. Francis Dr., Santa Fe, New Mexico 87505, within 15 days.

NO ACTION WILL BE TAKEN ON THE APPLICATION UNTIL PROPER PROOF OF NOTICE HAS BEEN SUBMITTED.

NOTICE: Surface owners or offset operators must file any objections or requests for hearing of administrative applications within 15 days from the date this application was mailed to them.

Side 1

INJECTION WELL DATA SHEET

OPERATOR: Occidental Permian LTD

WELL NAME & NUMBER: Hobbs Guzzler SWD #1

WELL LOCATION: 440 FSL & 435 FWL | M | 23 | 18S | 37E

FOOTAGE LOCATION | UNIT LETTER | SECTION | TOWNSHIP | RANGE

WELLBORE SCHEMATIC

WELL CONSTRUCTION DATA

Surface Casing

Hole Size: 17 1/2" Casing Size: 13 3/8"

Cemented with: 1,430 sx. *or* _____ ft³

Top of Cement: 0 Method Determined: Circulation

Intermediate Casing

Hole Size: 12 1/4" Casing Size: 9 5/8"

Cemented with: 1,510 sx. *or* _____ ft³

Top of Cement: 0 Method Determined: Circulation

Production Casing

Hole Size: 8 3/4" Casing Size: 7"

Cemented with: 750 sx. *or* _____ ft³

Top of Cement: 0 Method Determined: Circulation

Total Depth: 10,650'

Injection Interval

4,780' feet to 5,900" (Perforated – Gross interval, csg shoes and DV-tool will be avoided)

(Perforated or Open Hole; indicate which)

Side 2

INJECTION WELL DATA SHEET

Tubing Size: 4 1/2 " Lining Material: Duoline

Type of Packer: 7" (Retrievable) AS1-X Arrowset Packer

Packer Setting Depth: +/- 4,750'

Other Type of Tubing/Casing Seal (if applicable): _____

Additional Data

1. Is this a new well drilled for injection? _____Yes X No

   If no, for what purpose was the well originally drilled? _____

   Well was drilled as SWD into Silurian / Devonian Formation. Well Drilled in May, 2017

2. Name of the Injection Formation: San Andres

3. Name of Field or Pool (if applicable): San Andres

4. Has the well ever been perforated in any other zone(s)? List all such perforated intervals and give plugging detail, i.e. sacks of cement or plug(s) used. Yes (OH in the Siluran / Devonian)

   7 plugs at following depths will be set: Woodford Plug @ 10603', Barnett Plug @ 8687', Abo Plug @ 7684',

   DRKD Plug @ 7204', TUBB Plug @ 7064, BLBR Plug @ 6266' and GLRT Plug @ 5898'

   Plugs will be set per NMOCD guidance

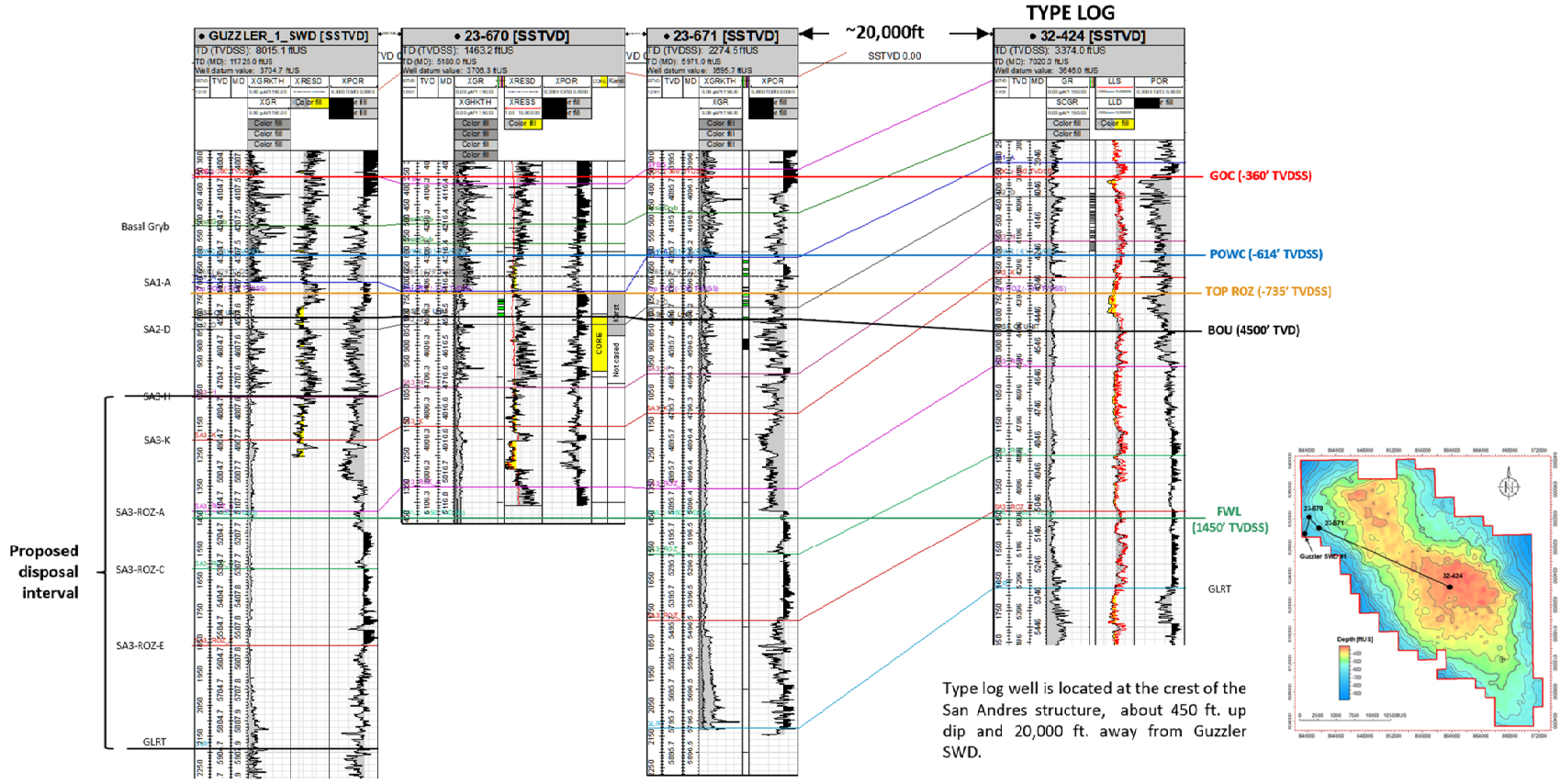
5. Give the name and depths of any oil or gas zones underlying or overlying the proposed Injection zone in this area: No known producing zones at this interval seen at this time

   Additional information "Reference: Support to summary under section VIII of C-108"

Reference: Support to summary under section VIII of C-108

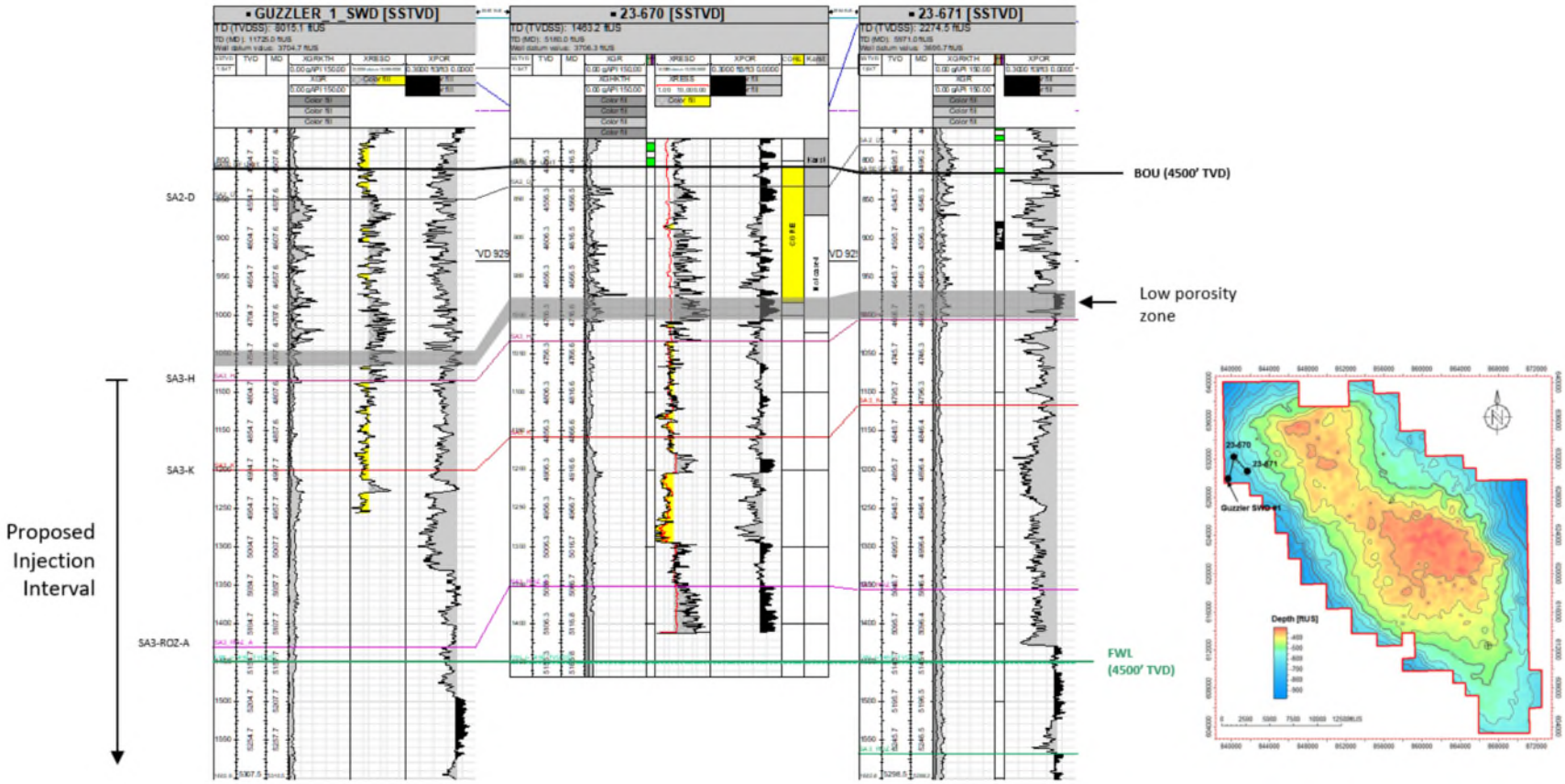
1. Correlation of the type log to logs in the immediate area of the Hobbs Guzzler. **Response:** The North Hobbs Unit unitized interval ends at a depth of 4500 ft. and the proposed disposal interval begins at 4780 ft., 280 ft. below the unitized interval. The type log well shown in Appendix I is located at the crest of the San Andres structure, about 450 ft. up dip and 20,000 ft. away from the Guzzler SWD. See Appendix I.
2. That a confining layer, or other means of vertically isolating the migration of injection fluids, is present; **Response:** The targeted injection zone SA-3 (zone 3) has a distinct signature showing high porosity and low resistivity, capped within a low porosity layer that acts as a seal. OXY conducted an extensive study of the proposed injection interval and concluded that the zone is biodegraded. Biodegradation occurred millions of years ago, where there was an influx of water and bacteria. The fact that bacteria could not migrate out of the zone supports our isolation statement. For additional details about the biodegraded interval refer to Appendix II and III.
3. More details of the content of the reservoir analysis referenced in the application. **Response** See Appendix III.
4. Example of IP test used for the assessment. **Response** See Appendix IV for details.
5. The Glorieta top marked on the mudlog is incorrect. The correct Glorieta top is shown on well log in Appendix V.
6. The well logs were previously filed with the NMOCD as part of the original completion.
7. The proposed MSIP has been modified to 1200 psi. Two attached step rate tests from SHU 229 and SHU 238 were used to determine the MBHP of 2700 psi and MSHP of 1200 psi. In addition, a Petroleum Expert Prosper ® Model was used to calculate/verify surface pressure with tubing ID ranging from 2-3/8" to 3-1/2", reservoir depth of 5850', injection water properties and the BHP limit (~2700 psi) shown in the step rate test. Prosper Model is industrial standard nodal analysis software for pressure calculation includes phase behavior change, friction loss.
8. When we perforate the casing, the casing shoes and the DV-Tool will be avoided.

APPENDIX I



Appendix I. Guzzler SWD #1 correlation to the type log.

APPENDIX II



Appendix II. Confining layer.

APPENDIX III

Hobbs Biodegraded Zone

Production data from biodegraded zone shows nearly ~100% water cut even under CO_2 flooding (Appendix II). Historic production and injection into the SA-3 (zone 3) suggests the presence of a fast "thief" water-bearing zone. This zone corresponds to the SA3-K interval in the Hobbs field. The SA-3K interval is characterized by high porosity and low resistivity (figure 1) bounded by a low porosity interval that acts as a seal. Currently, there is no production or injection in this interval.

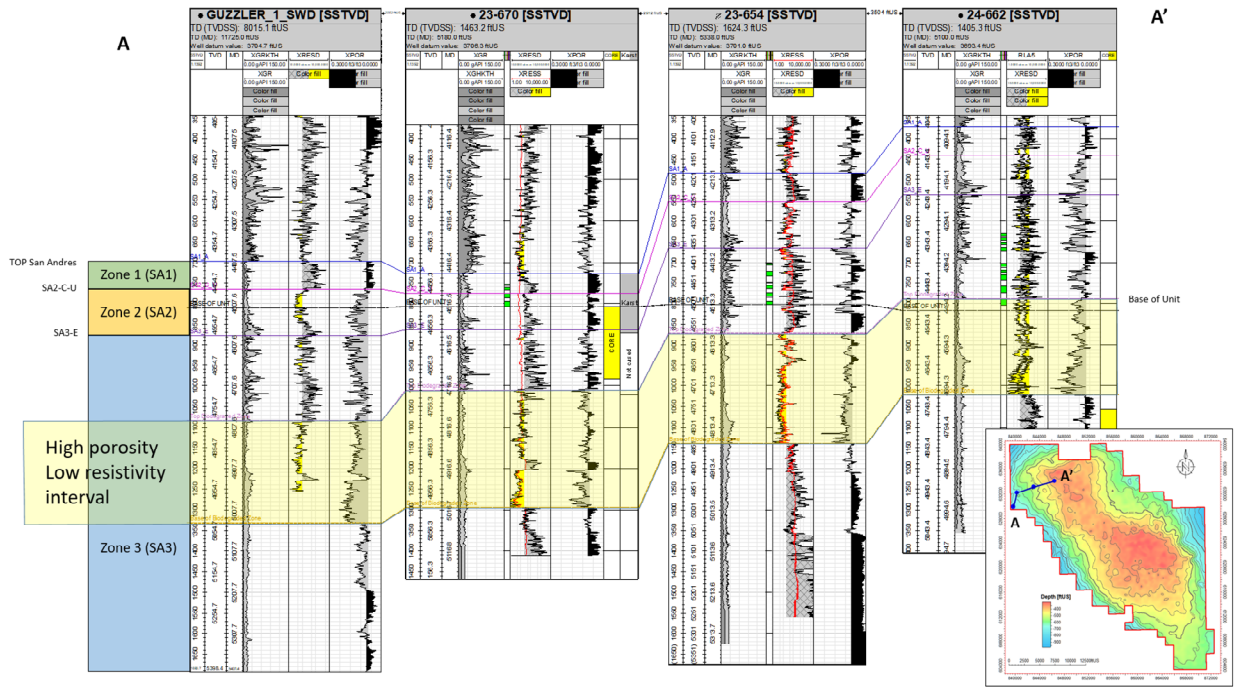


Figure 1. A-A' well section showing presence of high porosity, low resistivity zone within San Andres reservoir.

Recent studies based on core and log data for this zone identified the presence of biodegraded oil in SA3-K. SHU-294 (see Figure 2) is a good example of log response to the biodegraded zone. Figure 2 shows high, up to 25% porosity and less than 30 Om·m resistivity. The biodegraded zone is highlighted by light brown color. Additionally to log response, core observations show that the biodegraded zone is associated with open vugs with calcite and sulfur lightning, gypsum, blochy oil stain and the occurrence of tar and bitumen (see Figure 3).

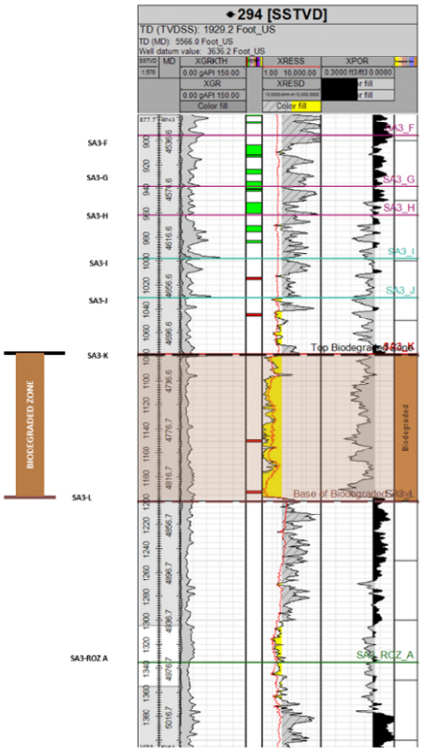


Figure 2. SHU 294 well logs showing log signature of biodegraded zone.

Figure 3. Full and slab core photos from SHU 262.

Figure 3 shows images core collected in SHU 262 across the biodegraded zone and slab photos for the same zone. One can clearly see large, golf ball size vugs caused by dissolution of anhydrite. The slab photos clearly show that vugs are lined by calcite and sulfur. The dark black stain in the vugs represent tar/bitumen.

The origin of the biodegraded zone can be explained by the influx of freshwater into San Andres, which brought microbes and under saturated water with respect to evaporates. This process can be described by the following biogenic reaction:

$$CaSO_4 + CH_4 \rightarrow CaCO_3 + H_2O + H_2S$$

Dissolution of anhydrite, biodegradation of oil — *Deposition of calcite and sulfur*

Available log data was calibrated with existing core data (figure 4). The biodegraded zone is represented by high porosity and low resistivity values on the logs, correlating to the vuggy zones with heavy oil staining without fluorescence and the presence of calcite and sulfur. Using log data signatures, the biodegraded zone was mapped across the entire Hobbs field. Results of mapping, suggest that the biodegraded zone is thinner on the structural crest, thickens in the off-structure direction and is commonly associated with SA3-K and SA3-I layers. Thickness of the biodegraded zone ranges from 50 ft. to 300 ft.

The occurrence of vertically discrete biodegraded zone in the Hobbs field demonstrate that fresh water with hydrocarbon-eating bacteria was preferentially traveling through the high porosity flow units, following the path of least resistance. The fact that we do not observed bugs in

the shallower reservoirs is a proof that the water influx did not penetrate into overlaying, lower porosity zones, preventing biodegradation of the shallower reservoir.

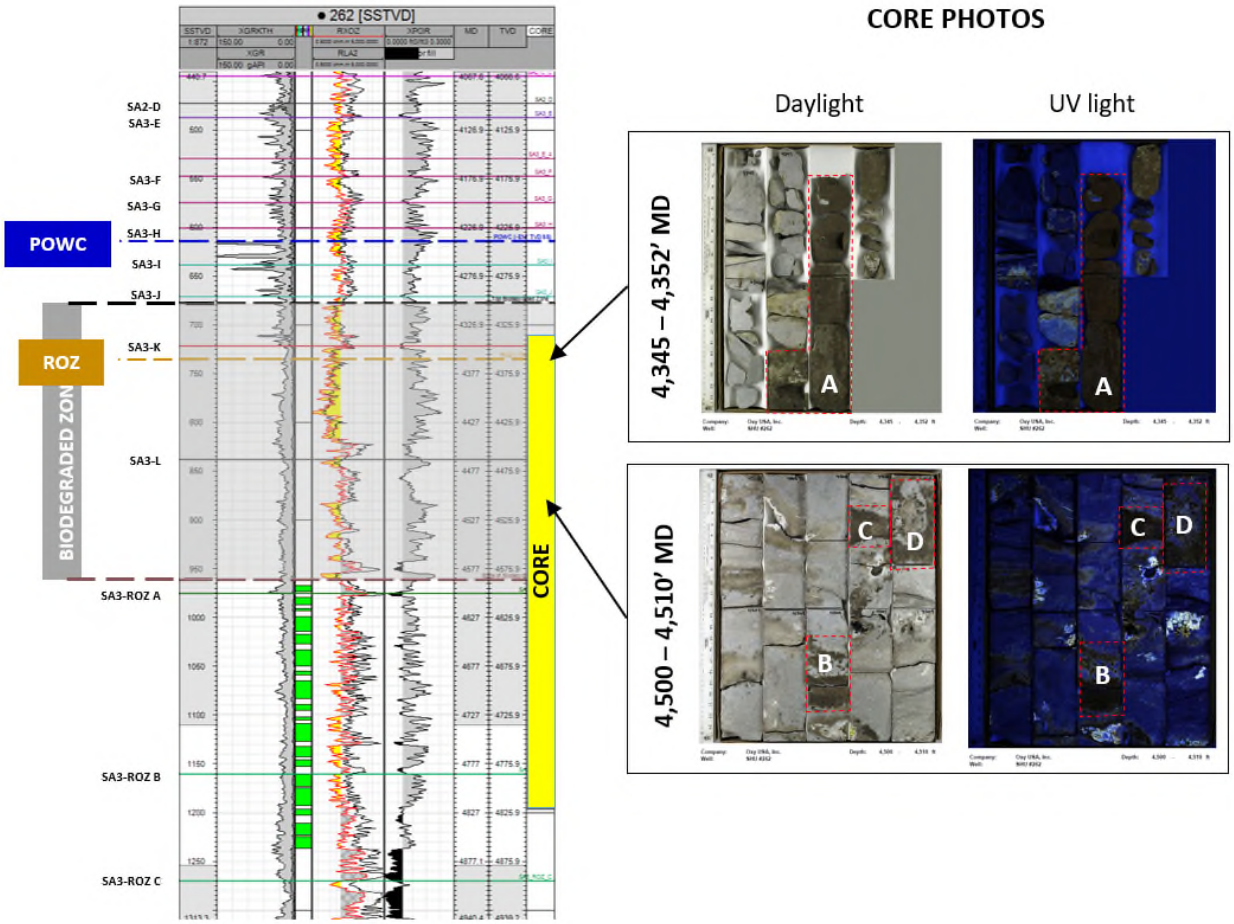


Figure 4. Figure 4. Example of correlation between well logs and core data within biodegraded zone. Well logs (low resistivity and high porosity) demonstrate excellent correlation with indicators of biodegraded zone (vuggy zones with heavy oil staining without fluorescence, presence of calcite and sulfur)

Saltwater Disposal into Biodegraded Zone

Well test and production data shows that biodegraded zone (SA3-J and SA3-K) is a water-bearing interval. We believe that disposing additional volumes of water will not damage overlaying producing zones, and disposed water will flow within the high porosity layer similarly to the water that caused biodegradation within SA3-J and SA-3K layers.

Evidence of Historical Water Disposal into SA3-K.

After a detailed study of the historical water disposal in the Hobbs field, we came across two wells that were disposing produced water into the San Andres reservoir, particularly the SA3-K zone. Both wells, Rice SWD P 025 (30-025-05493) and Rice SWD F 029 (30-025-12802) were operated by Rice Operating Company. This is the same zone SA3-K we are proposing for Guzzler disposal.

Rise SWD P 025 was operational from 1957 through 2004, disposing water into zones SA3-H, SA3-I, SA3-J, and SA3-K, between 4517 ft. and 4735 ft. MD. These zones appear to be biodegraded in the offset wells (Figure 5). Later, the well was purchased by Occidental Permian LTD and converted to a producer by setting a CIBP @ 4407 and perforating from 4187 to 4376 in the North Hobbs Unit Unitized interval.

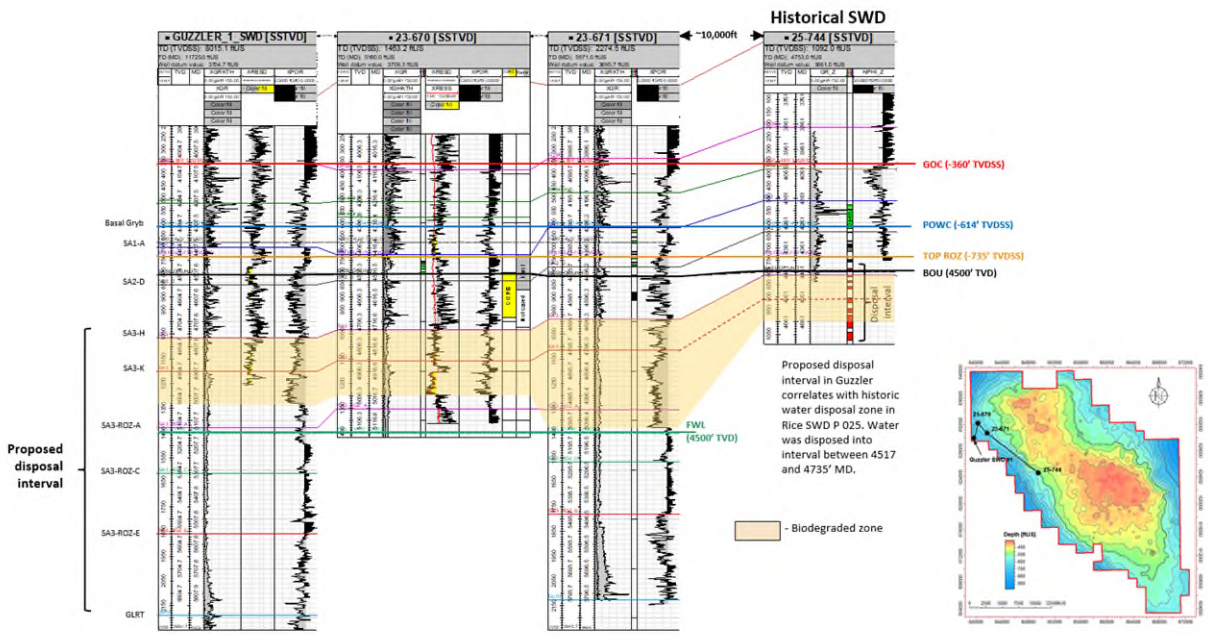


Figure 5. Well correlation between Guzzler SWD #1, historical SWD 24-744, and the type log well. The well section shows that former Rise SWD P 025 (currently NHU 25-744) was disposing produced water into zones SA3-H, SA3-I, SA3-J, and SA3-K. Biodegraded zone is highlighted by beige color.

Rice SWD F 029 was operational from 1960 through 2013. The well was disposing produced water into SA3-K, SA3-ROZ-A, SA3-ROZ-B, and SA3-ROZ-C (figure 6). Based on the nearest offset well, NHU 30-412 the SA3-K zone is interpreted to be biodegraded.

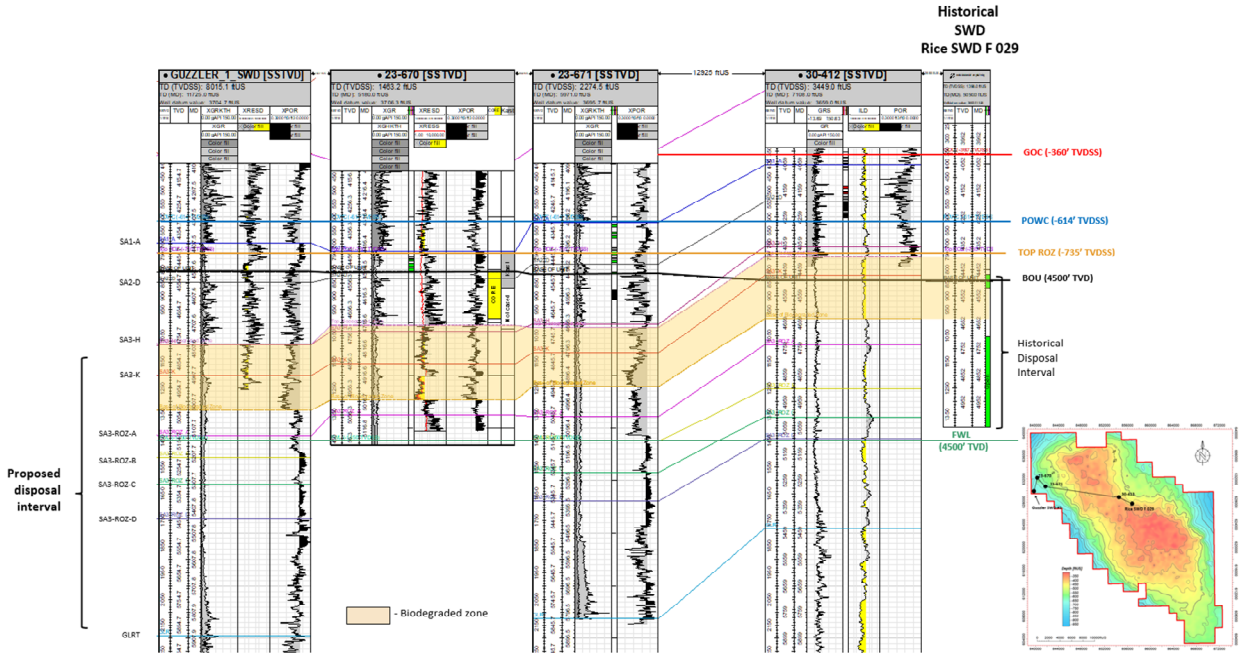
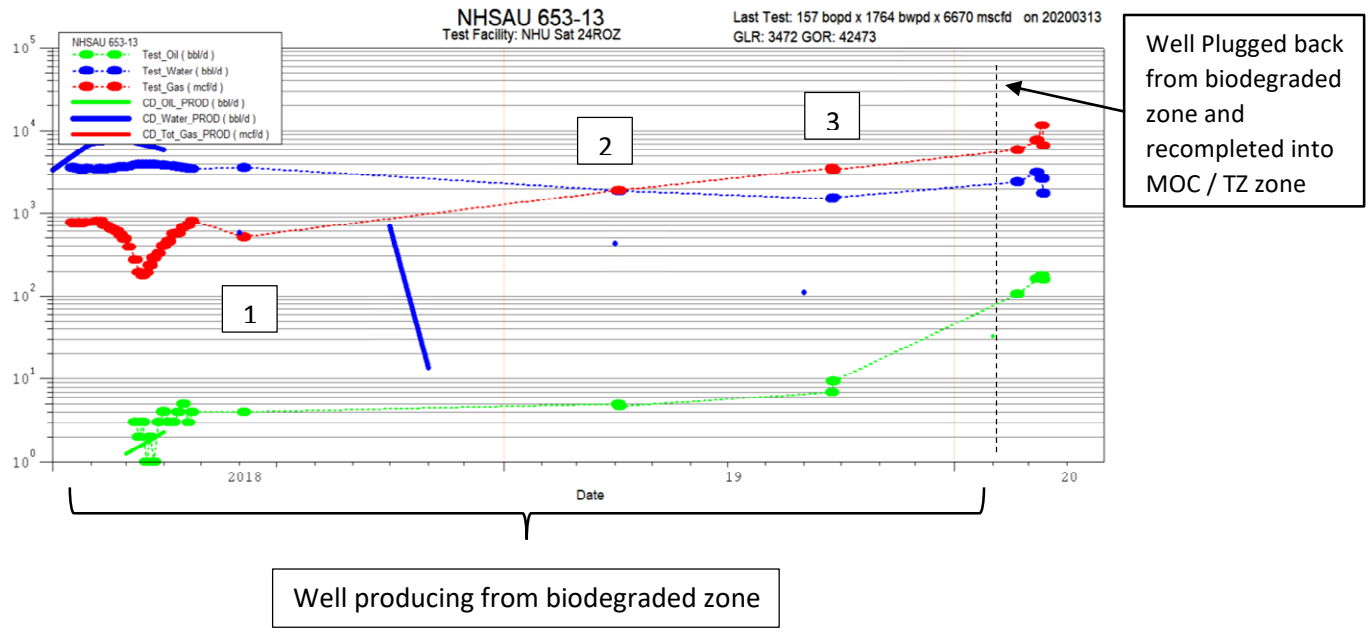


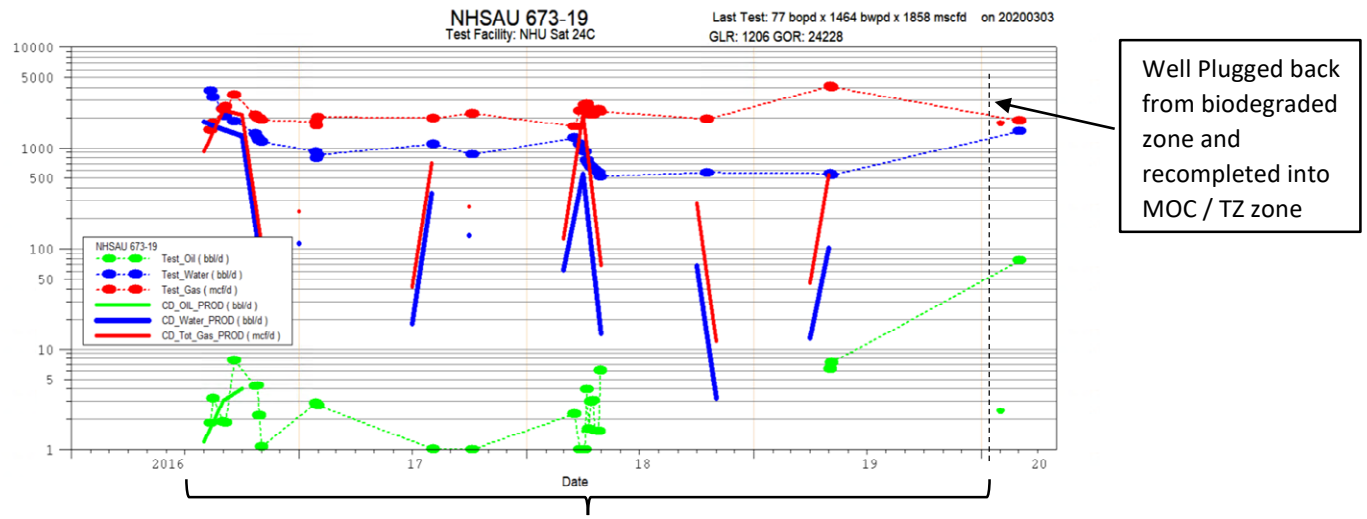
Figure 6. Well correlation between Guzzler SWD #1, historical Rice SWD F 029, and the type log well. The well section shows that former Rise SWD F 0 29 was disposing produced water into zones SA3-K, SA3-ROZ-A, SA3-ROZ-B, and SA3-ROZ-C.

APPENDIX IV



The NHSAU 13-653 showed in the production plot above was drilled in early 2018 and completed in what is today's known as the Biodegraded zone. The initial production was ~3 BOPD x 3589 BWPD x 455 MSCFPD. The well keep that level of production for the first 6 months of production (until 06/05/2018) and at that point it was decided to shut in due to its water cut and gas oil ratio. Additional attempts to produce the well (point 1, 2 and 3 in the production plot) show not oil response even under heavy CO2 support, GAS (Mainly CO2 ~ 90%) production at those times increased from ~500 MSCFPD to ~ 2000 MSCFPD and ~3400 MSCFPD respectably.

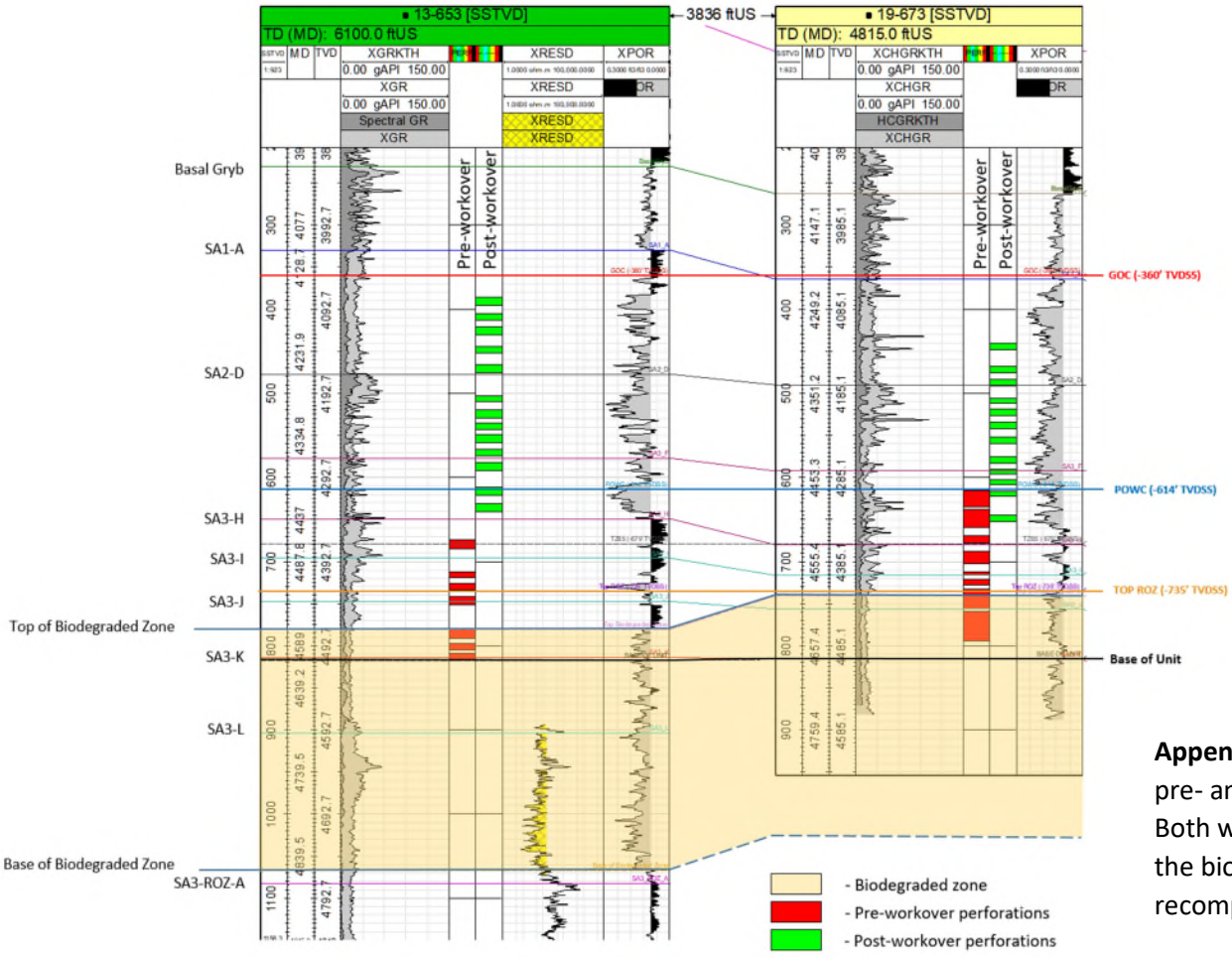
After several attempts to produce the well it was decided to plug back the biodegraded zone and re-complete the well into Main Oil Column (MOC) and Transition Zone (TZ). As it can be seen, the well is now producing ~ 160 BOPD x 1764 BWPD x 6670 MSCFPD

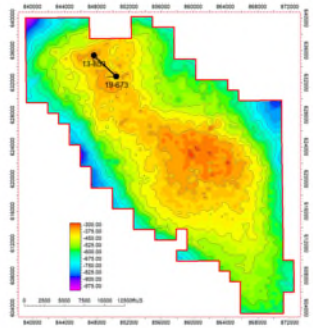


The NHSAU 19-673 showed in the production plot above, was drilled in early 2016 and completed in the Biodegraded zone. As was the case of the NHSAU 13-653, the NHSAU 19-673 the initial production was ~1 BOPD x 3685 BWPD x 1510 MSCFPD. The well keep that level of production until early 2019 when it was also decided to shut in due to its water cut and gas oil ratio (at that point the well was producing 6 BOPD x 500 BWPD x 4000 MSCFPD).

In early 2020 it was decided to plug back the biodegraded zone and re-complete into Main Oil Column (MOC) and Transition Zone (TZ). As it can be seen, the well is now producing ~ 77 BOPD x 1464 BWPD x 1858 MSCFPD.

below Well section showing pre- and post-workover perforations for both wells can be seen below.



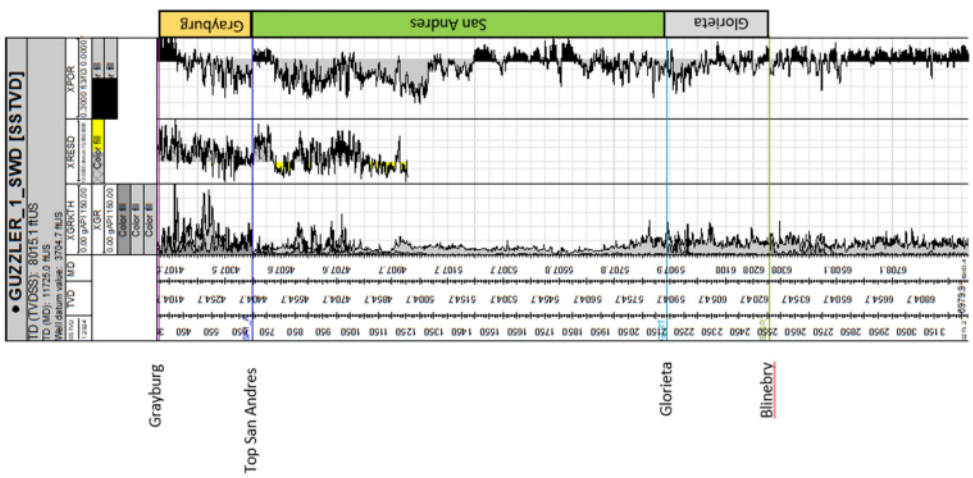


Appendix IV. Well section is showing pre- and post-workover perforations. Both wells were plugged back from the biodegraded zone and recompleted into MOC / TZ zone.

APPENDIX V

Formation	MD (ft)
Grayburg	4070
San Andres	4405
Glorieta	5898

Appendix V. Guzzler SWD #1 reservoir tops.



OXY PERMIAN

SHU #229
LEA COUNTY, NEW MEXICO

TEST DATE
12/12/2008

STEP RATE TEST

Ran step rate test with electric surface readout unit, 1 electronic pressure instrument @ run depth of 4,150' and surface pressure transducer.

STEP RATE TEST

OXY PERMIAN
SHU #229
TEST DATE 12/12/2008

Injection Rate (BWPD)	Psurface (psig)	B.H.P. (psia)	Psurface W/O FRICTION
0	11.60	846.40	11.60
1500	8.30	1439.80	8.30
3000	528.60	2184.90	409.60
3500	796.10	2386.50	638.10
4000	1019.40	2559.20	817.40
4500	1258.20	2735.30	1008.30
5000	1493.30	2885.70	1189.30
5500	1695.70	3023.30	1332.70
6000	1904.30	3159.60	1464.30
6500	2131.60	3295.10	1628.60

Run Depth: 4150 Perforations: 4068-4233

Formation: San Andres Total Depth:

Tubing Depth: Pkr. Depth:

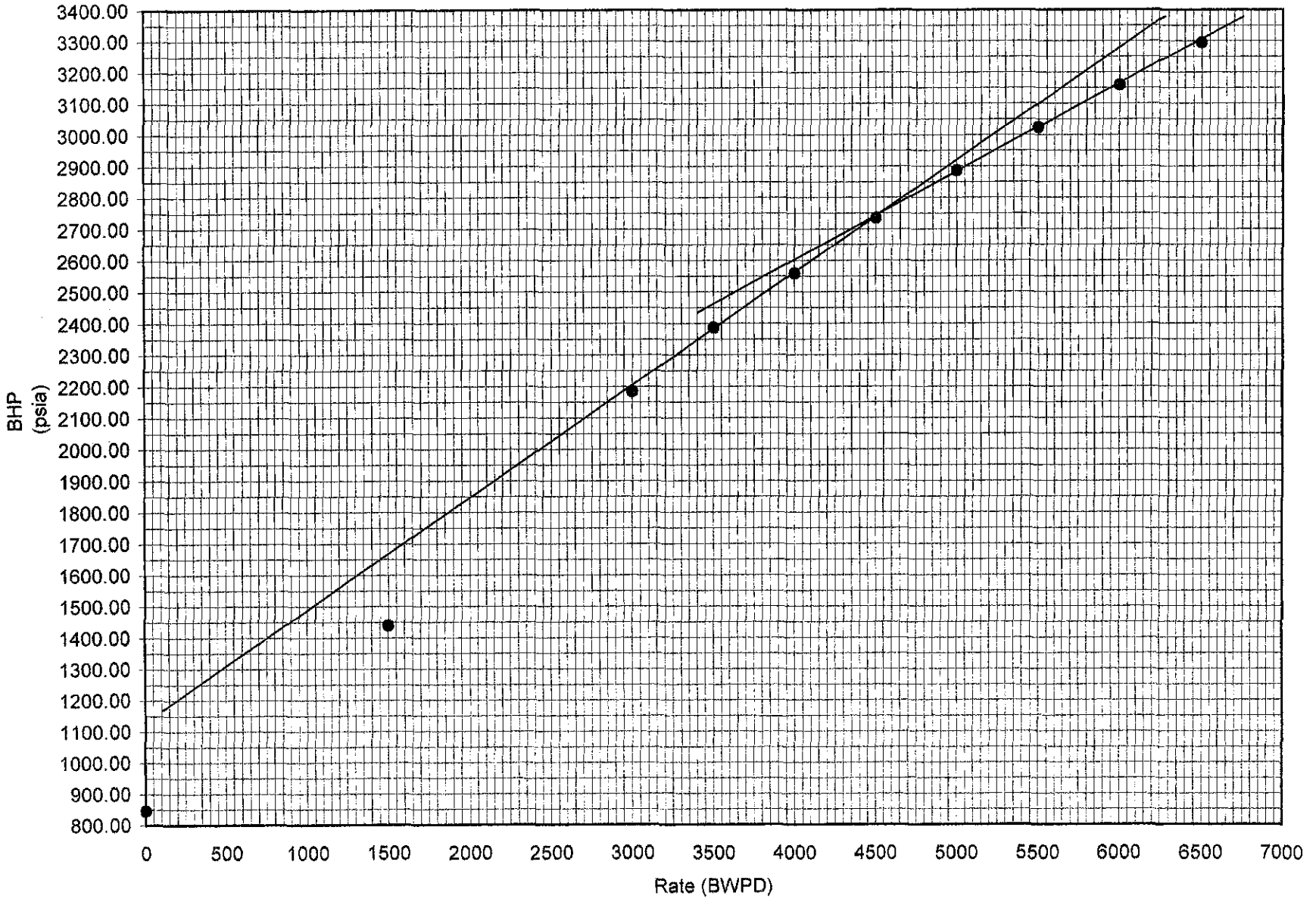
Tested By: J. Chesshir Instrument #: 78298

TEST RESULTS

Parting Pressure @ 2740 BHP (psia) @ 4500 BWPD

STEP RATE TEST
OXY PERMIAN
SHU #229
12/12/2008

PRECISION PRESSURE DATA, INC.



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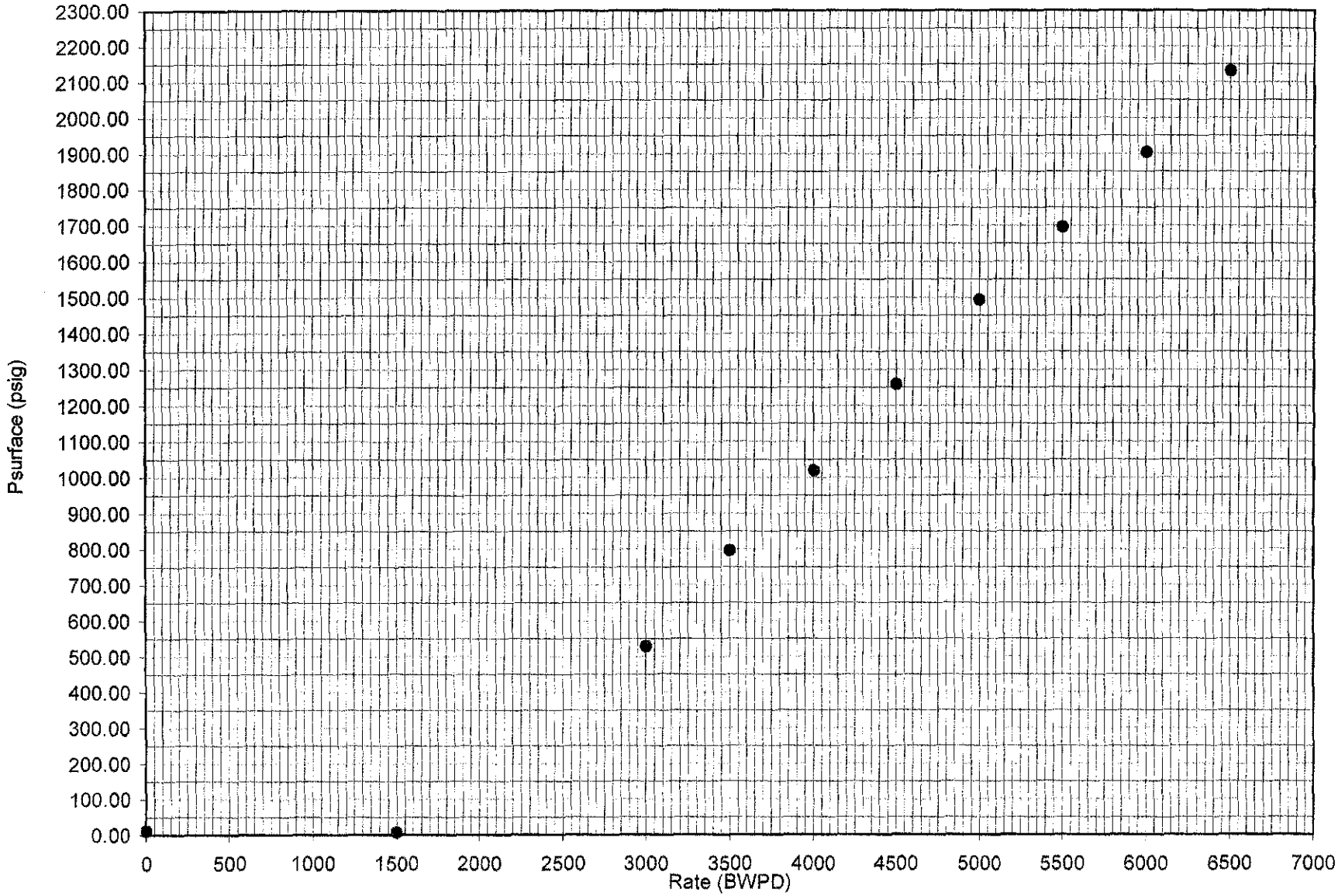
PRECISION PRESSURE DATA, INC.

STEP RATE TEST
OXY PERMIAN
SHU #229
12/12/2008



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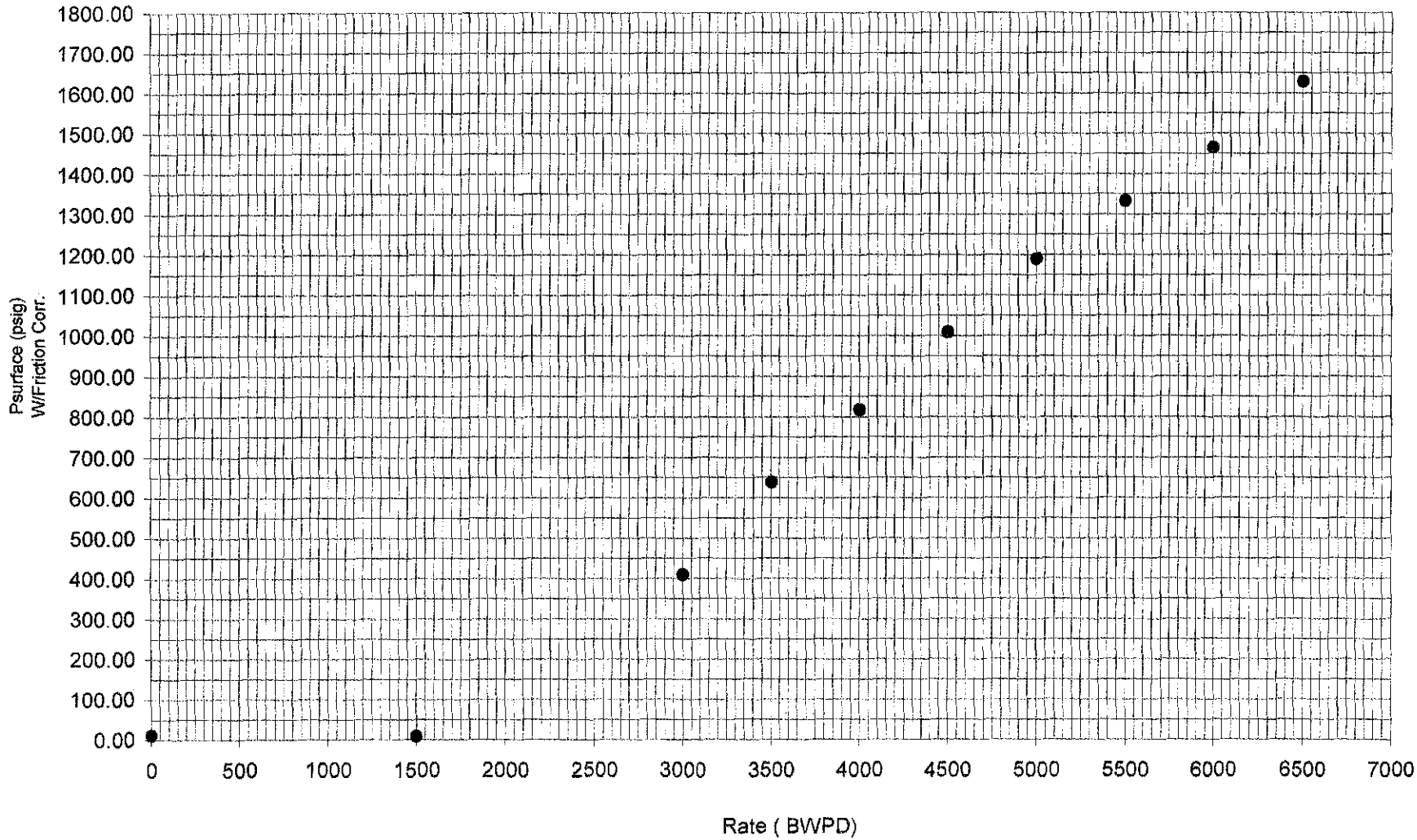
STEP RATE TEST
OXY PERMIAN
SHU #229
12/12/2008

PRECISION PRESSURE DATA, INC.



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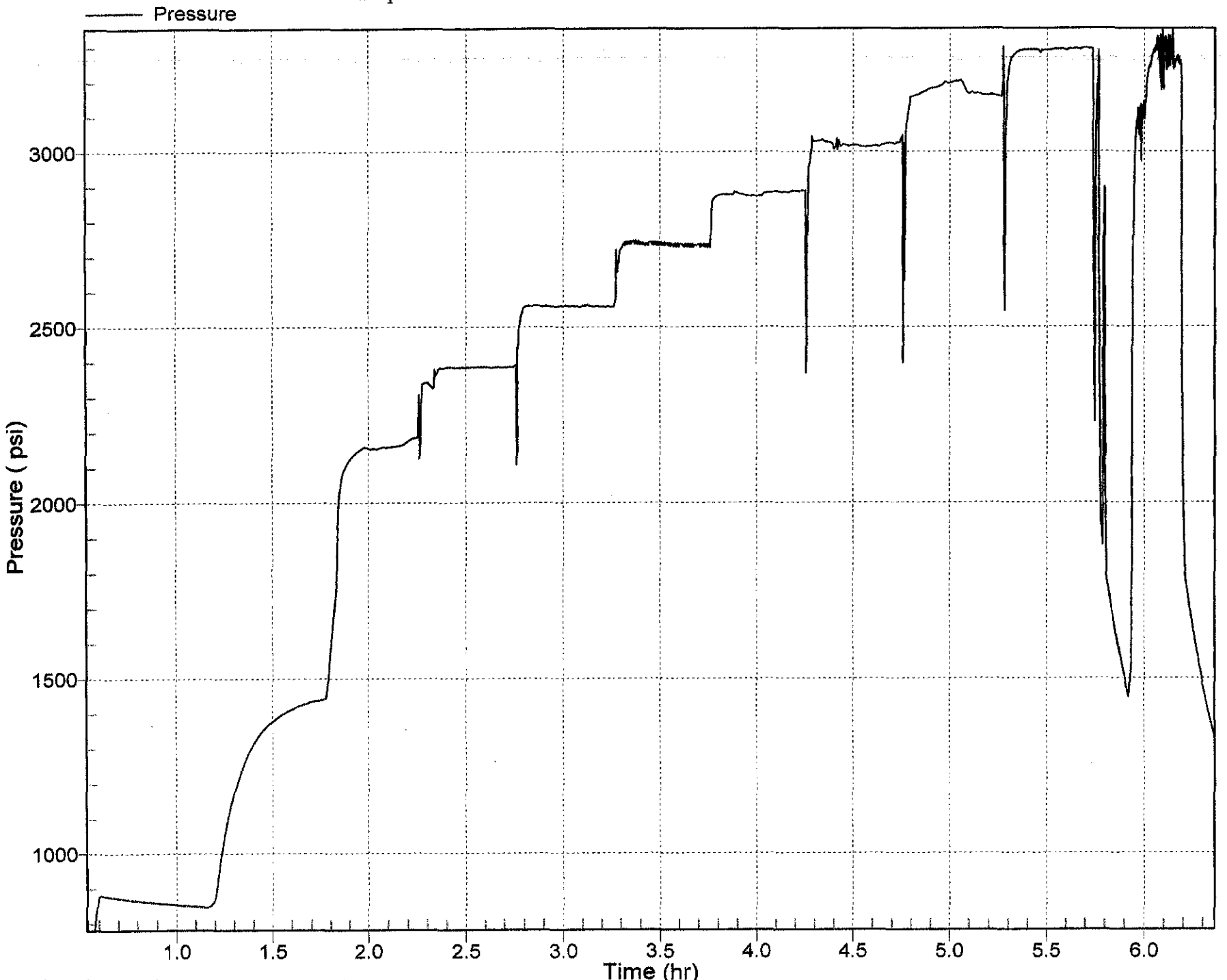
OXY PERMIAN - SHU #229

Step Rate Test 12/12/2008 Bottom Hole Pressure Data



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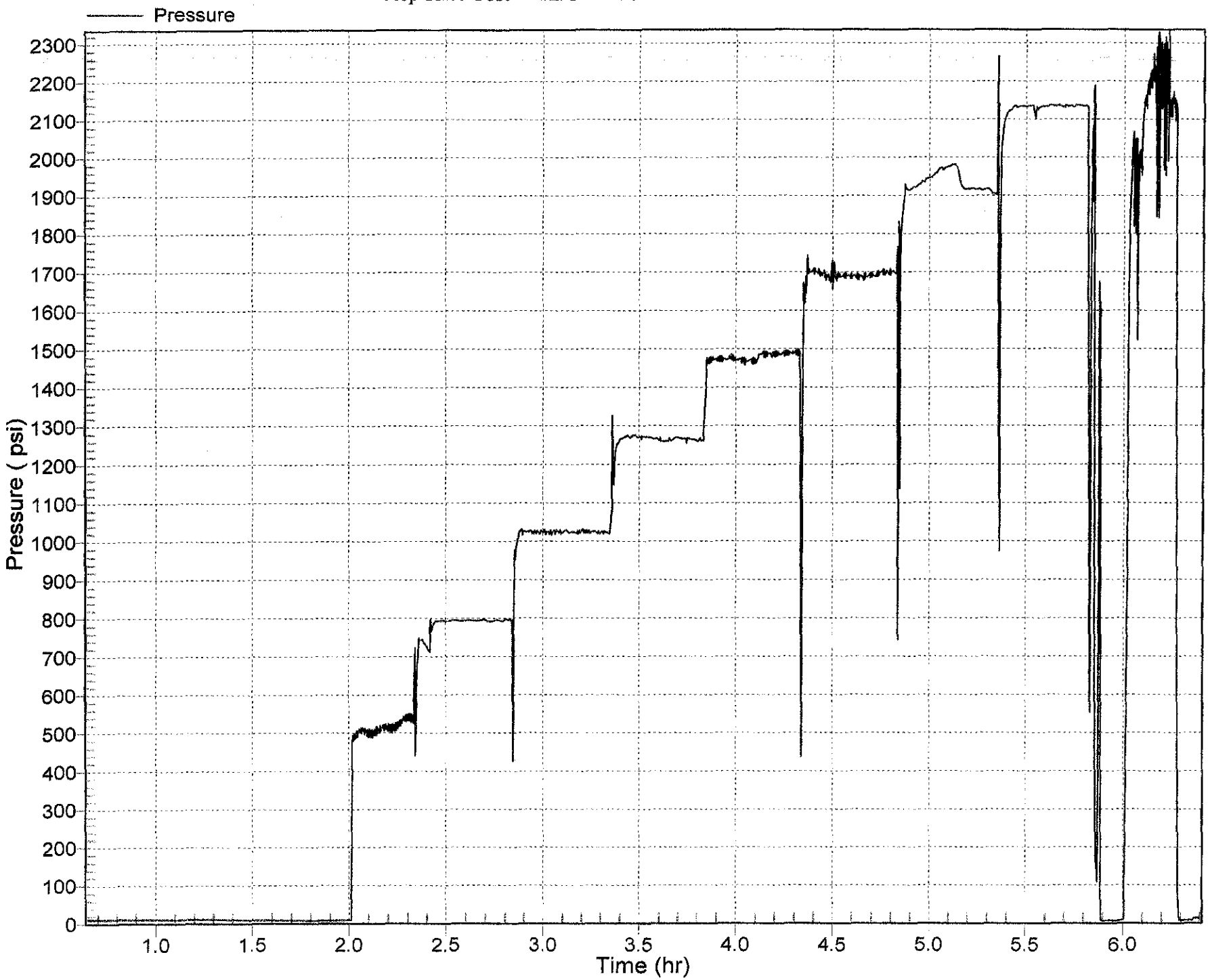
OXY PERMIAN - SHU #229

Step Rate Test 12/12/2008 Surface Pressure Data



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OXY PERMIAN

SOUTH HOBBS UNIT #238

LEA COUNTY, NEW MEXICO

TEST DATE
2/22/2008

STEP RATE TEST

Ran step rate test with electric surface readout unit, 1 electronic pressure instrument @ run depth of 4,160' and surface pressure transducer.

STEP RATE TEST

OXY PERMIAN
SOUTH HOBBS UNIT #238
TEST DATE 2/22/2008

Injection Rate (BWPD)	Psurface (psig)	B.H.P. (psia)	Psurface W/O FRICTION
0	13.20	1391.90	13.20
300	226.00	2006.90	222.00
400	362.60	2145.80	356.60
500	502.90	2282.80	492.90
600	678.10	2451.90	664.10
700	856.50	2626.20	838.50
800	1023.10	2788.10	999.10
900	1157.90	2916.40	1127.90
1000	1281.50	3032.50	1245.50
1100	1401.30	3148.50	1358.30
1200	1555.70	3276.60	1504.70
1300	1647.40	3385.30	1588.40
1400	1732.60	3466.50	1663.60
1500	1849.20	3568.40	1771.20

Run Depth: 4160 Perforations: 4136-4254

Formation: San Andres Total Depth: 4294

Tubing Depth: 4086 Pkr. Depth: 4086

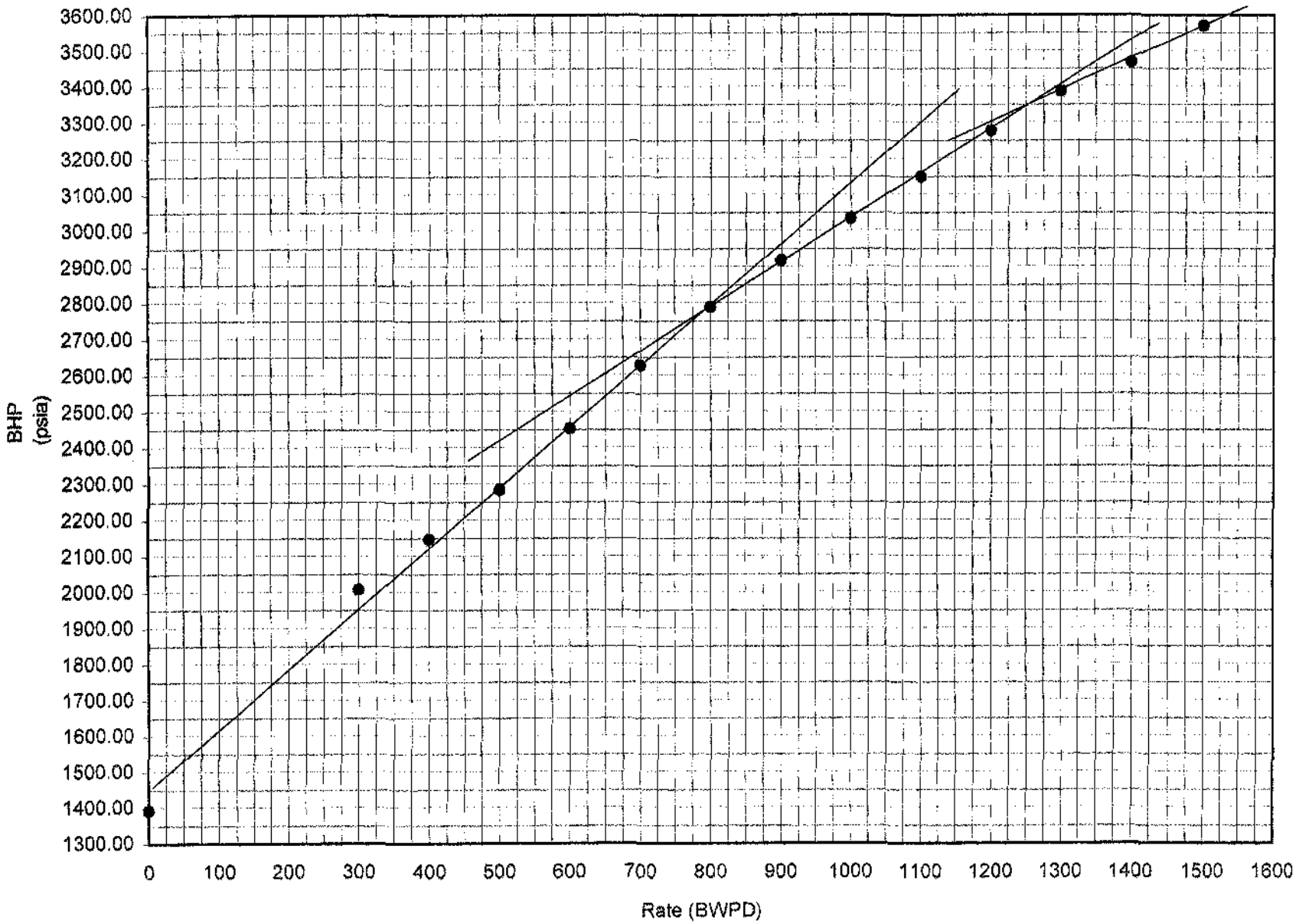
Tested By: J. Chesshir Instrument #: 78302

TEST RESULTS

Parting Pressures @ 2772 BHP (psia) @ 797 BWPD & @ 3348 BHP (psia) @ 1249 BWPD

STEP RATE TEST
OXY PERMIAN
SOUTH HOBBS UNIT #238
2/22/2008

PRECISION PRESSURE DATA INC.



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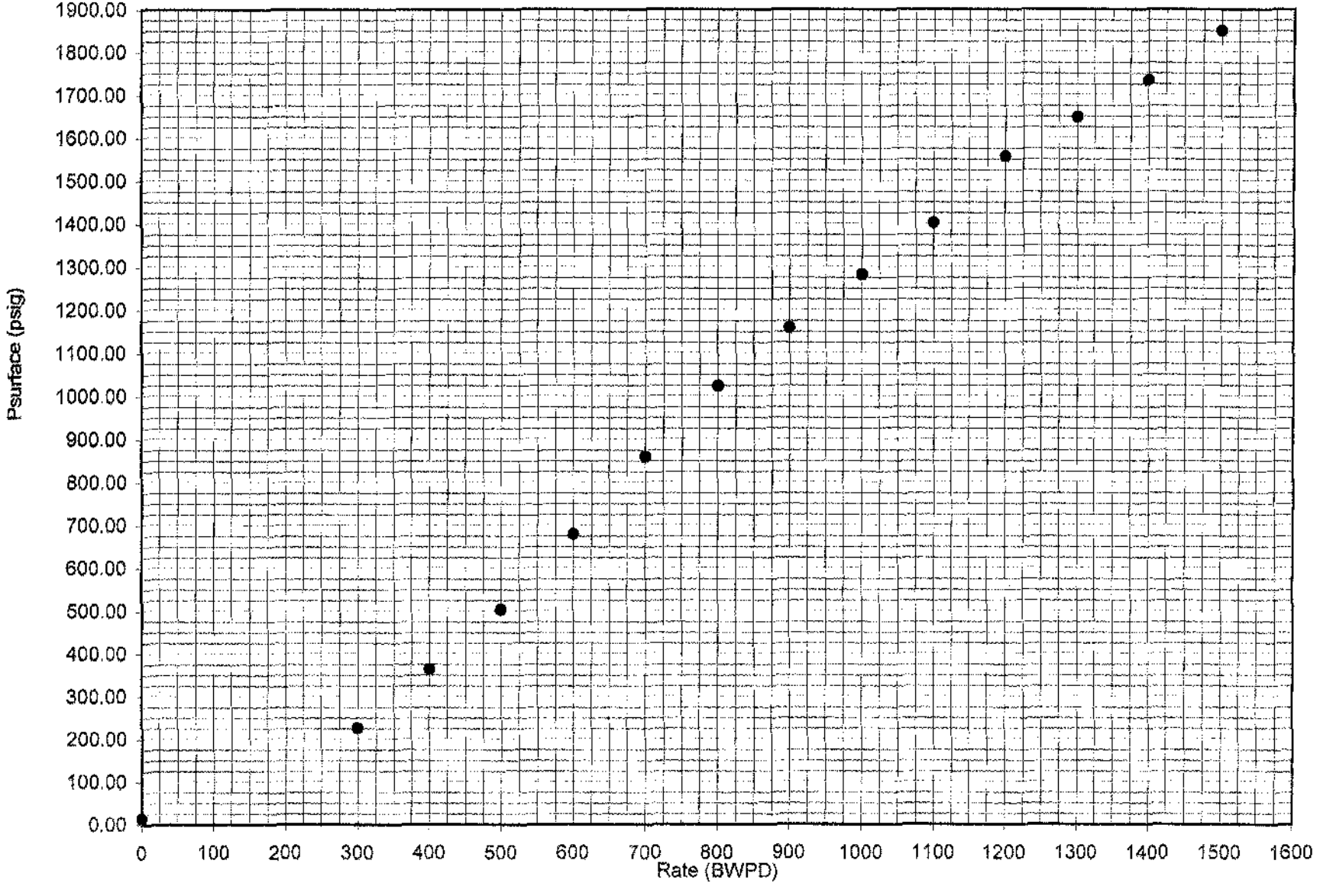
STEP RATE TEST
OXY PERMIAN
SOUTH HOBBS UNIT #238
2/22/2008

PRECISION PRESSURE DATA, INC.



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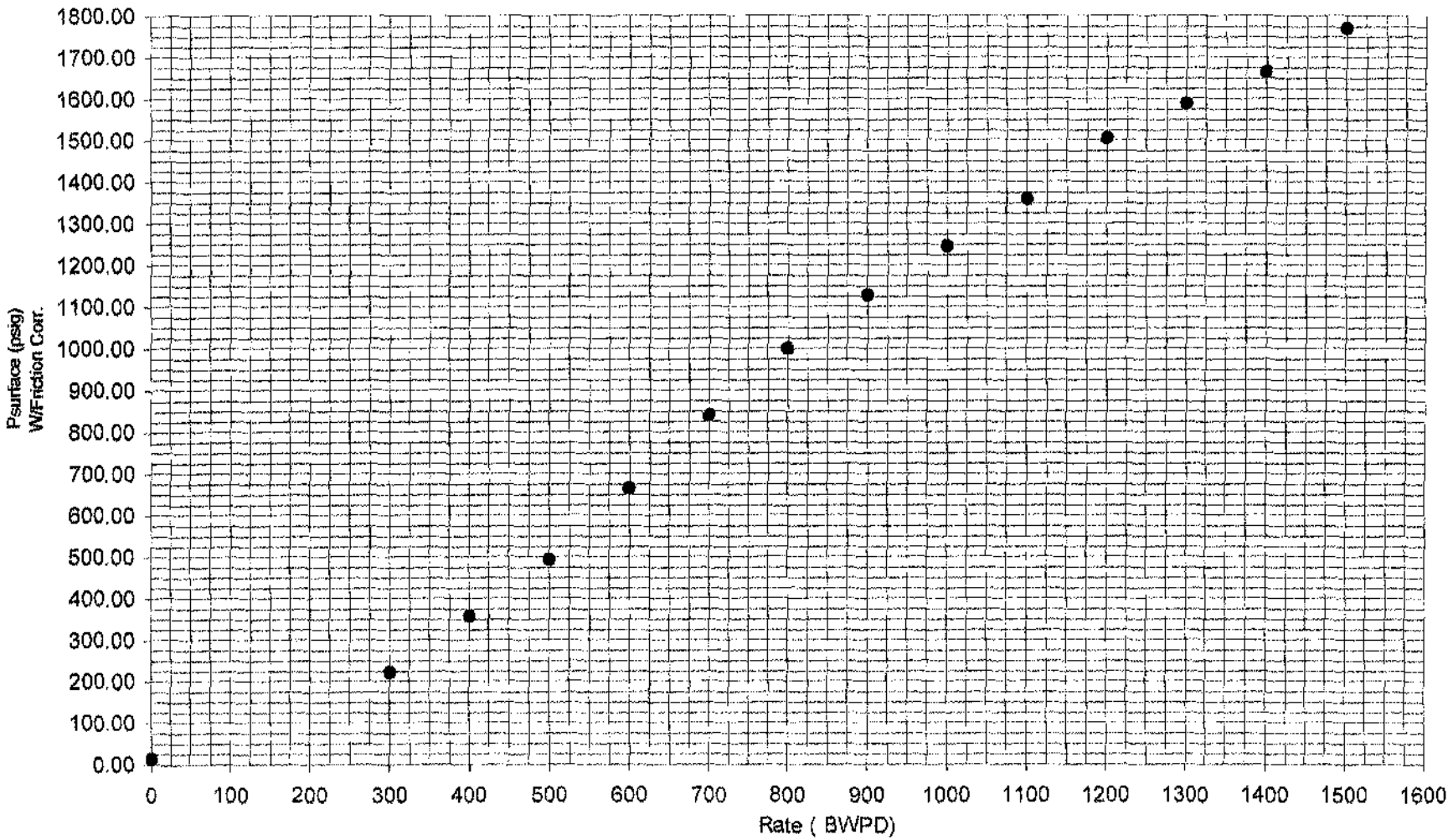
STEP RATE TEST
OXY PERMIAN
SOUTH HOBBS UNIT #238
2/22/2008

PRECISION PRESSURE DATA, INC.



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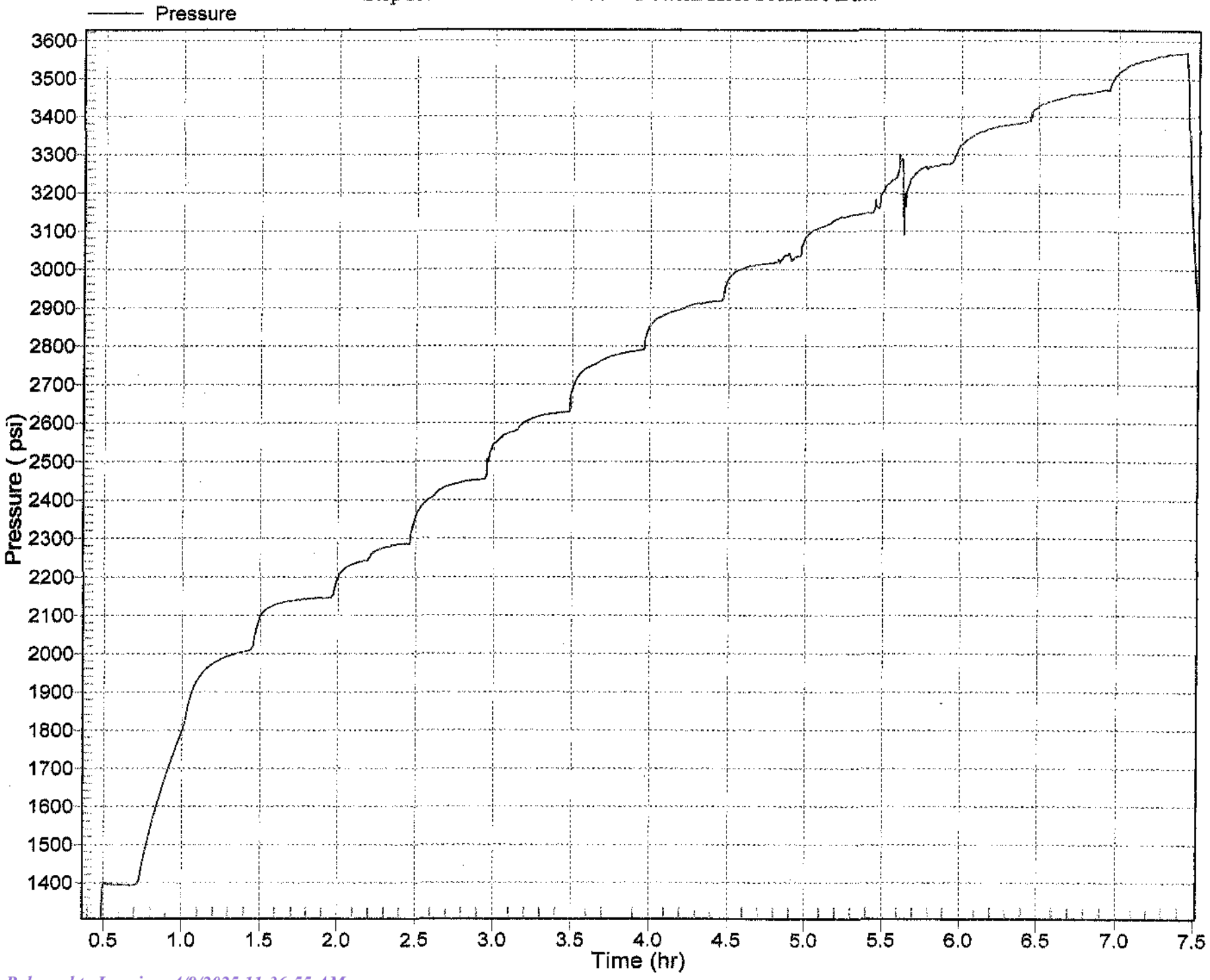
OXY PERMIAN - SOUTH HOBBS UNIT #238

Step Rate Test 2/22/2008 Bottom Hole Pressure Data



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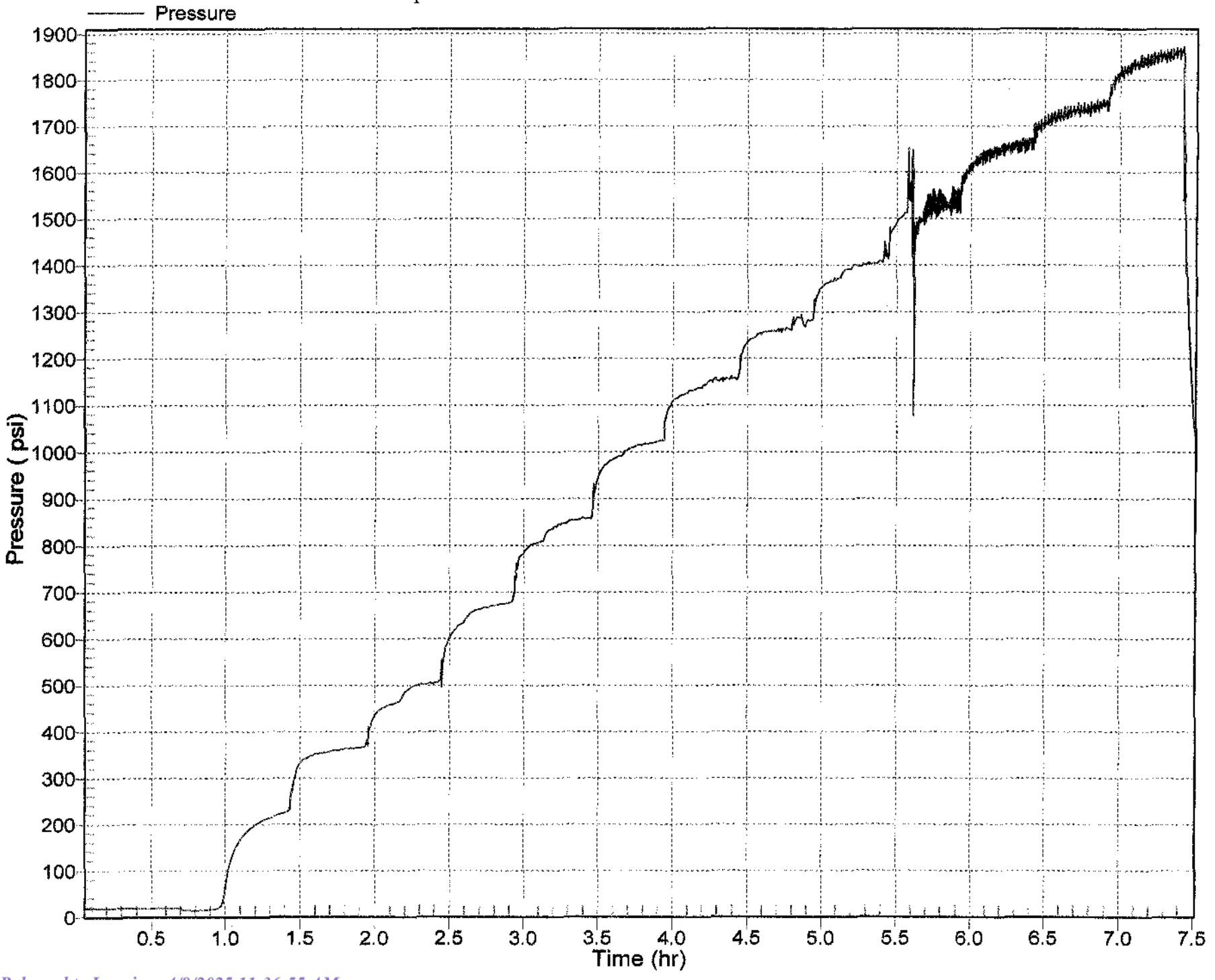
OXY PERMIAN - SOUTH HOBBS UNIT #238

Step Rate Test 2/22/2008 Surface Pressure Data



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OXY PERMIAN

SOUTH HOBBS UNIT #238

LEA COUNTY, NEW MEXICO

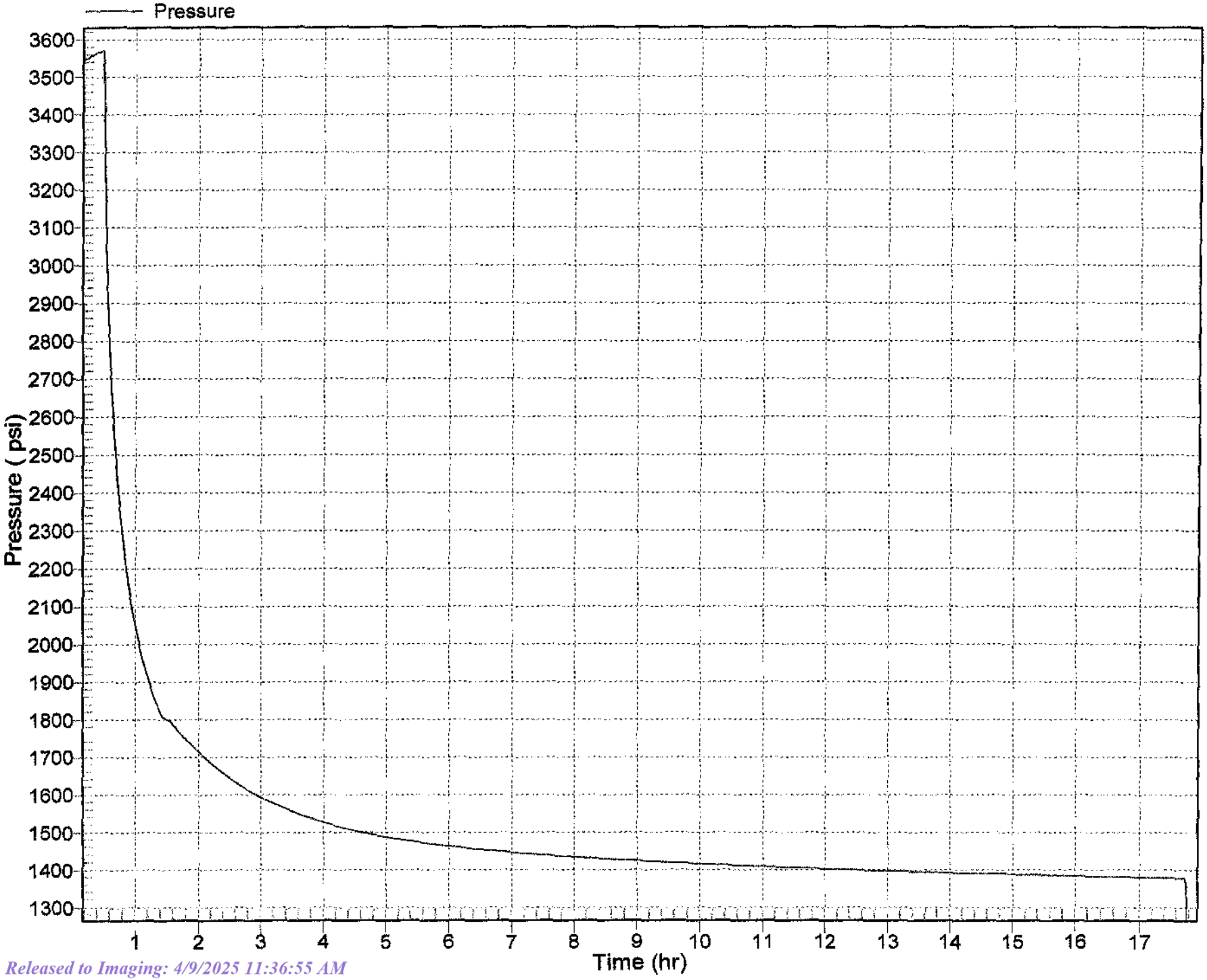
TEST DATES
2/22/2008 – 2/23/2008

18 HOUR FALL OFF TEST

Ran 18 hour fall off test with electric surface readout unit, 1 electronic pressure instrument @ run depth of 4,160' and surface pressure transducer.

OXY PERMIAN - SOUTH HOBBS UNIT #238

18 Hour BHP Fall Off 2/22/2008 - 2/23/2008



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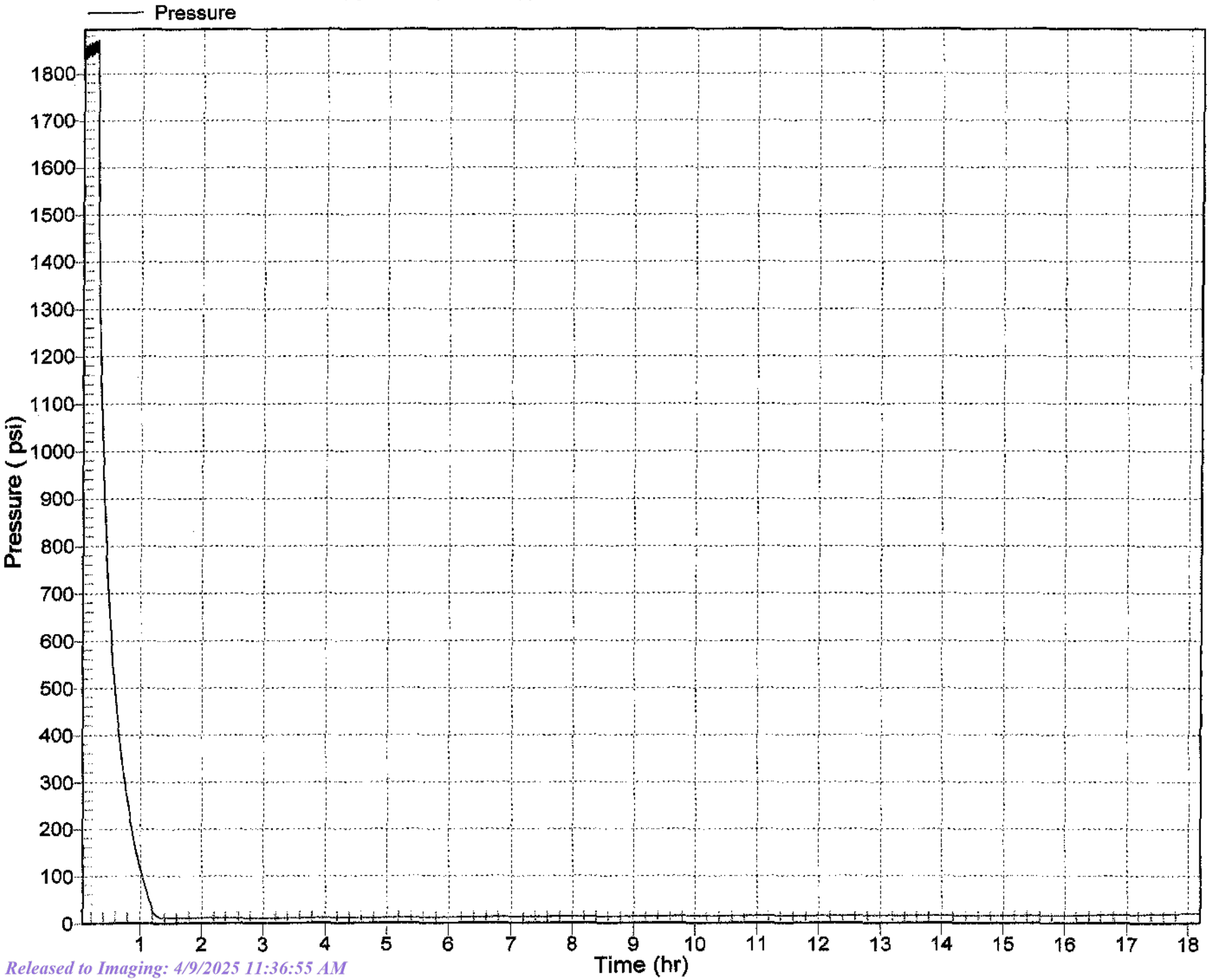
OXY PERMIAN - SOUTH HOBBS UNIT #238

18 Hour Surface Pressure Fall Off 2/22/2008 - 2/23/2008



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Sante Fe Main Office
Phone: (505) 476-3441

General Information
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Online Phone Directory
https://www.emnrd.nm.gov/ocd/contact-us

State of New Mexico
Energy, Minerals and Natural Resources
Oil Conservation Division
1220 S. St Francis Dr.
Santa Fe, NM 87505

CONDITIONS

Operator: NEW MEXICO ENERGY MINERALS & NATURAL RESOURCE 1220 S St Francis Dr Santa Fe , NM 87504	OGRID: 264235
	Action Number: 450308
	Action Type: [IM-SD] Admin Order Support Doc (ENG) (IM-AAO)

CONDITIONS

Created By	Condition	Condition Date
pgoetze	None	4/9/2025