Pryor Chemical Company
Pryor Facility
Pryor, Oklahoma

Permit Renewal Application
for
Class I Non-Hazardous Underground Injection Control Well

Permit No. IW-NH-49022-RI

Submitted
to
Oklahoma Department of Environmental Quality

VOLUME 2

Attachments A— U

October 2017

GEOSTOCK SANDIA
ENTREPOSE
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ATTACHMENT A

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Area of Review Methods

Pryor Chemical Company (PCC) is submitting this permit renewal application to continue operation of one Class I non-hazardous injection well (Permit No. IW-NH-49022-R1) in Mayes County, Oklahoma. The well is located at the PCC Facility in Pryor, Oklahoma. (See Figure B-2).

Under U.S. Environmental Protection Agency (EPA) Code of Federal Regulations (CFR) Title 40 §146.6, the Area of Review (AOR) for a Class I injection well is defined as the area in which the owner or operator of a Class I injection well must identify all artificial penetrations into the confining and/or injection zone and determine whether they have been completed or plugged so that they do not provide conduits for fluid movement. Artificial penetrations pose a possible threat to human health or the environment because of their potential to convey injected effluent and formation fluid out of the injection zone and/or convey fluid (injected effluent or formation fluid) into an underground source of drinking water (USDW) (non-endangerment standard).

EPA regulations state that the AOR for a Class I non-hazardous injection well corresponds to the area within a fixed 0.25-mile radius of the injection well or an area based on the calculated "Cone of Influence" of the injection well, whichever is greater. The "Cone of Influence" is defined as the potentiometric surface area around the injection well in which increased injection zone pressures caused by injection of wastes would be sufficient to drive fluids upward into a USDW or freshwater aquifer.

At the PCC Pryor Facility, the injection interval exhibits artesian characteristics with the natural formation pressure being sufficient to cause flow at the surface when the well is full of injectate. The original U.S. EPA UIC regulations acknowledged the possibility of artesian characteristics for injection zones as evidenced in its discussion of AOR calculations. In the final rule preamble, the U.S. EPA addressed comments that suggested a standard calculation methodology could result in a calculated infinite area of review. As part of its response to these comments, the U.S. EPA noted that no single calculation nor set of calculations describes the universe of acceptable methods for determining an AOR. Further the U.S. EPA noted

> "***The Agency also recognizes that calculations may result in an asymptote, or that in some physical settings the formation pressure will contribute to an AOR that extends over great distances.*** Under current State and Federally implemented rules, the problem of infinite asymptotes has been addressed by setting the cut off points when the slope of the pressure curve flattens. ***It is not the EPA's intent that operators "chase infinite asymptotes" when no real potential endangerment resulting from the well exists***. ***The physical settings which might result in calculated AORs in excess of 2 miles involve highly overpressurized formations. As noted in the proposal, overpressurization can be evidence that the formation is effectively a closed system***." (emphasis added)

The U.S. EPA further notes:

> "Moreover, such systems are more likely to be static, resulting in very little or no flow over time. Accordingly, EPA still believes the appropriate AOR is described by the pressure from the well injection, and further believes that in the vast majority of cases, that this area is best described by the 2 mile area of review."

In PCC's case, utilization of the provided "Cone of Influence" calculation methodology will result in an infinite radius due to nominal formation pressure. This situation is precisely what the U.S. EPA addressed in its comments. Based on the regulatory preamble, PCC has set the AOR at a 2.0-mile radius. We note that ODEQ reviewed and approved the 2.0-mile radius AOR for its preceding permit application.

The 2.0-mile radius AOR is conservative, as the annual formation injection/falloff tests show that the static bottomhole pressure has not increased significantly, and plume calculations have shown a distance to the waste front of less than 6,000 feet (well within the 2.0-mile AOR) at Year-End 2016. See Attachment 5 of the Reservoir Mechanics portion of the permit renewal application. See Attachment B, Figure B-2 for a map of the Area of Review.

Calculation of the Cone of Influence

The "Cone of Influence" is defined as the potentiometric surface area around the injection well in which increased injection zone pressures caused by injection would be sufficient to drive fluids upward into a USDW or freshwater aquifer. Methodologies for calculating the Cone of Influence of an injection well are generally based on the assumption that absent of naturally-occurring, vertically-transmissive conduits (i.e., faults, fractures) between the injection zone and USDW, the only potential pathway between the injection zone and USDW is through artificial penetrations (i.e., drilled wells).

Per the previous section, at the PCC Pryor Facility, the injection interval exhibits artesian characteristics with the natural formation pressure sufficient to cause flow at the surface. Therefore, any calculation of "Cone of Influence" using the standard formula will result in an infinite radius. Therefore, a Cone of Influence calculation is not presented here. PCC has conservatively set a 2.0-mile AOR. A detailed review of the wells within the AOR will be conducted following the evaluation method described in the following section.

Evaluation Methodology for Artificial Penetrations

In general, evaluation of an artificial penetration consists of two steps. 1) Evaluate the well's construction to determine if it is appropriately constructed to prevent movement of fluids into USDWs (i.e., satisfy the non-endangerment standard). 2) For those wells determined to not be appropriately constructed in Step 1, perform a well-specific calculation of allowable pressure buildup.

In the case of PCC, there are no USDWs present in the AOR (see Appendix D-1). However, there are some groundwater wells completed in perched aquifers. Therefore, well records were reviewed and well construction documented.

Table A-1 shows information on the three wells located within the PCC No. 1 injection well's 2.0-mile AOR that are considered artificial penetrations (i.e., penetrate the top of the Confining Zone and/or Injection Zone).

1. Kaiser Aluminum & Chemical Corp. No. 1 was an industrial injection well drilled in the mid-1950s and plugged in 2008. The well is cased to the Arbuckle Group and also has cement plugs from total depth to surface. This construction satisfies the non-endangerment standard and the well does not require further evaluation.
2. Kaiser Aluminum & Chemical Corp. No. 2 was an industrial injection well drilled in the mid-1950s and plugged in 2008. The well has casing cemented to the Arbuckle Group and also has cement plugs from total depth to surface. This construction satisfies the non-endangerment standard, and the well does not require further evaluation.
3. Oklahoma Ordnance Works Authority No. 2 was abandoned in 1985. It was plugged from total depth to the surface with a bentonite plug in the lower half of the borehole and a cement plug in the upper half of the borehole. The plugs satisfy the non-endangerment standard and this well requires no further evaluation.

No other wells are present within the 2-mile radius AOR that penetrate the top of the Confining Zone (Woodford Shale). The information available demonstrates that pressure buildup at the wells within the 2-mile AOR will not endanger any USDW as none are present, nor will it lead to endangerment of any groundwater zone.

TABLES

TABLE A-1
Artificial Penetrations Within 2.0-Mile Area of Review

Operator	Lease and Well #	Distance from PCC No. 1 (feet)	Year Drilled	Status	Date Plugged	Well Total Depth (feet)	Depth Top of Confining Zone (KB)	Depth Top of Injection Interval (KB)	Depth CMT Plugs (feet)	Depth Surface Casing (feet)	Protection Casing Size (inch)	Depth Protection Casing Cutoff (feet)	Hole Size (inch)	Model Build Up Pressure (psi)	Screening Status
Kaiser (Deere & Co.) Aluminum & Chemical Corp	Kaiser Injection Well (Johm Deere) #1	7,075	1955	P&A	06/17/08	820	305	249	0 - 820	50	8 5/8	0	7 1/2	42	Surface casing cemented from 0 - 358'. Cement plug from 0 - 820'.
Kaiser Aluminum & Chemical Corp	Kaiser Injection Well #2	6,725	1956	P&A	06/17/08	789	312	254	0 - 789	--	8 5/8	0	6 1/4	43	Surface casing cemented from 0 - 397'. Cement plug from 0 - 789'.
Oklahoma Ordnance Works Authority	OOWA #2	1,950	--	P&A	03/27/85	938	350	278	0 - 473 473 - 938	--	--	--	9	55	Cement plug from 0 - 473'. Bentonite plug from 473 - 938'

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Maps of Wells/Area and Area of Review

The PCC injection well site is located on the PCC Facility in Section 3, Township 20 North, Range 19 East of Indian Meridian in Mayes County, Oklahoma. The site is located within the Mid America Industrial Park. A copy of the deed for the property is included as Figure B-1. The well site is shown on the topographic map of the area (Figure B-2). The 2.0-mile radius Area of Review (AOR) contains three injection-related wells (all plugged), six domestic groundwater wells, and six monitor wells. The injection and monitoring wells are discussed in Attachment C, and the water wells are discussed in Attachment D.

Table B-1 contains a list of the landowners for property adjacent to the PCC facility. Figure B-3 shows the location of these tracts.

TABLE B-1
Adjacent Landowner Information

Map Key No. (Tax Property ID No.)	Landowner	Address
1 (0000-04-20N-19E-1-022-00)	GAP ROOFING	4444 HUNT STREET PRYOR OK 74361
2 (0000-04-20N-19E-1-001-00)	GAP ROOFING	4444 HUNT STREET PRYOR OK 74361
3 (0000-04-20N-19E-1-007-00)	GAP ROOFING	4444 HUNT STREET PRYOR OK 74361
4 (0000-04-20N-19E-1-018-00)	MAYFIELD, FREDERICK REVO TRUST	PO 1102 PRYOR OK 74362-0000
5 (0000-04-20N-19E-1-004-00)	RAE CORPORATION	C/O BOYDSTON CO 616 S MAIN ST SUITE 302 TULSA OK 74119-1261
6 (0000-04-20N-19E-4-001-00)	ORCHIDS PAPER PRODUCTS	4826 HUNT STREET PRYOR OK 74361
7 (0000-03-20N-19E-3-006-00)	ORCHIDS PAPER PRODUCTS	4826 HUNT STREET PRYOR OK 74361
8 (0000-03-20N-19E-2-005-00)	SALINA DRILLERS	PO BOX 255 SALINA OK 74365-0000
9 (0000-03-20N-19E-3-007-00)	LSB	PO BOX 754 OKLAHOMA CITY OK 73101-0000
10 (0000-03-20N-19E-3-004-00)	PCC	PO BOX 754 OKLAHOMA CITY OK 73101-0000

TABLE B-1
Adjacent Landowner Information

Map Key No. (Tax Property ID No.)	Landowner	Address
11 (0000-03-20N-19E-1-001-00)	OOWA	PO BOX 945 PRYOR OK 74361
12 (0000-03-20N-19E-2-001-00)	NGC INDUSTRIES INC (NAT'L GP)	2001 REXFORD RD CHARLOTTE NC 28211-0000
13 (0000-04-20N-19E-4-004-00)	EVANS ELECTRIC INC	PO BOX 1316 TULSA OK 74101-0000
14 (0000-04-20N-19E-1-005-00)	HARRIS HOLDING LLC	PO BOX 1148 PRYOR OK 74362-0000

FIGURES

Figure B-1 General Warranty Deed
Transfer of Property from Willard Grain & Feed, INC. (dba Wil-Gro Fertilizer)
Transfer of Property from Salina-Drillers L.L.C.

Figure B-1 General Warranty Deed
Transfer of Property from Willard Grain & Feed, INC. (dba Wil-Gro Fertilizer)

STATE OF OKLAHOMA } SS
COUNTY OF MAYES
This Instrument was Filed for Record
at 1:50 o'clock ____ PM

Return original to: #44513

Betty J. Cummins
First American Title & Trust Co.
P.O. Box 1234
Oklahoma City, OK 73102

530127 FEB - 8 2001

LAUREL RAMON, County Clerk
Deputy

This Space Reserved for Filing Stamp

SPECIAL WARRANTY DEED

KNOW ALL MEN BY THESE PRESENTS:

THAT **WILLARD GRAIN & FEED, INC. d/b/a WIL-GRO FERTILIZER, INC.**, a Texas corporation ("Grantor"), having a mailing address of Route 2, Box 1444, Celina, Texas 75009, in consideration of the sum of Ten and No/100 Dollars ($10.00) and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, does hereby grant, bargain, sell and convey to **PRYOR PLANT CHEMICAL COMPANY**, an Oklahoma corporation ("Grantee"), having a mailing address of 16 South Pennsylvania Avenue, Oklahoma City, Oklahoma 73107, all of Grantor's right, title and interest in and to the real property and premises situated in Mayes County, Oklahoma, and more particularly described on Exhibit "A" attached hereto and incorporated herein, together with all the improvements thereon and the appurtenances thereunto belonging (collectively, the "Property"), and warrants title to the same to be free, clear and discharged of and from all former grants, charges, taxes, judgments, mortgages and other liens and encumbrances of whatsoever nature made by Grantor, but not otherwise, except for the matters listed on Exhibit "B" attached hereto.

TO HAVE AND TO HOLD said described premises unto Grantee, its successors and assigns forever, free, clear and discharged of and from all former grants, charges, taxes, judgments, mortgages and other liens and encumbrances of whatsoever nature made by Grantor, but not otherwise, except for the matters listed on Exhibit "B" attached hereto.

IN WITNESS WHEREOF, Grantor has executed this Special Warranty Deed this 29th day of December, 2000.

"Grantor": WILLARD GRAIN & FEED, INC. d/b/a WIL-GRO FERTILIZER, INC., a Texas corporation

By Brenda W. Goodell
Printed Name: Brenda W. Goodell
~~President~~
SECRETARY - TREASURER AND DIRECTOR

mail tax statements to:

Pryor Plant Chemical Company
16 South Pennsylvania Avenue
Oklahoma City, OK 73107

COUNTY CLERK SEAL MAYES COUNTY OKLAHOMA

DEIRDRE P. HARRIS
MY COMMISSION EXPIRES
November 17, 2001

CONSIDERATION LESS THAN $101.00 - NO DOC. STAMPS

G:\DOCS\JCE\LSB\Pryor-SWD.wpd

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Figure B-1 General Warranty Deed
Transfer of Property from Willard Grain & Feed, INC. (dba Wil-Gro Fertilizer)

TRUST CO.

STATE OF Texas)
) ss.
COUNTY OF Dallas)

This instrument was acknowledged before me on December 29, 2000, by Brenda Woodell, as Sec-Treas ~~President~~ Director of Willard Grain & Feed, Inc. d/b/a Wil-Gro Fertilizer, Inc., a Texas corporation.

Notary Public

My Commission Expires:

11/17/01
(SEAL)

DEIRDRE P. HARRIS
MY COMMISSION EXPIRES
November 17, 2001

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Figure B-1 General Warranty Deed
Transfer of Property from Willard Grain & Feed, INC. (dba Wil-Gro Fertilizer)

EXHIBIT "A"

TRACT 1

A tract of land situated in the South Half (S/2) of the Northwest Quarter (NW/4) and the Southwest Quarter (SW/4) of Section 3, Township 20 North, Range 19 East of the Indian Base and Meridian, Mayes County, Oklahoma, and more particularly described as follows, to-wit:

Beginning at a point 1656.25 feet South and 76.235 feet East of the Northwest corner of said Section 3;

Thence South 89°48'24" East a distance of 1590.0 feet;

Thence South 0°02'34" East a distance of 736.0 feet;

Thence North 89°48'24" West a distance of 50.0 feet;

Thence South 0°02'34" East a distance of 65.0 feet;

Thence North 89°48'24" West a distance of 612.48 feet;

Thence South 0°02'34" East a distance of 249.5 feet;

Thence South 89°48'24" East a distance of 124.16 feet;

Thence South 0°02'34" East a distance of 249.5 feet;

Thence North 89°48'24" West a distance of 686.72 feet;

Thence South 0°02'34" East a distance of 1137.0 feet;

Thence North 89°48'24" West a distance of 400.0 feet;

Thence North 0°02'34" West and parallel to the West line of said Section 3 a distance of 1636.0 feet;

Thence South 89°48'24" East a distance of 35.0 feet;

Thence North 0°02'34" West a distance of 801.0 feet to the point of beginning.

CONTINUED ON NEXT PAGE

Figure B-1 General Warranty Deed
Transfer of Property from Willard Grain & Feed, INC. (dba Wil-Gro Fertilizer)

EXHIBIT "A" CONTINUED

TRACT 2

A tract of land situated in the Northwest Quarter (NW/4) and the Southwest Quarter (SW/4) of Section 3, Township 20 North, Range 19 East of the Indian Base and Meridian, Mayes County, Oklahoma, and more particularly described as follows, to-wit:

Beginning at a point 2640.38 feet South and 1004.348 feet East of the Northwest corner of said Section 3;

Thence South 0°02'34" East and parallel to the West line of said Section 3 a distance of 249.5 feet;

Thence South 89°48'24" East a distance of 124.16 feet;

Thence South o°02'34" East a distance of 230.50 feet;

Thence South 89°48'24" East a distance of 538.32 feet;

Thence North 0°02'34" West a distance of 480.0 feet;

Thence North 89°48'24" West a distance of 662.48 feet to the point of beginning.

TRACT 2A

A tract of land situated in the Southwest Quarter (SW/4) of Section 3, Township 20 North, Range 19 East of the Indian Base and Meridian in Mayes County, Oklahoma, and more particularly described as follows, to-wit:

Beginning at a point 2940.801 feet South and 1128.866 feet East of the Northwest corner of said Section 3;

Thence South 0°02'34" East and parallel to the West line of said Section 3 a distance of 19.0 feet;

Thence South 89°48'24" East a distance of 538.32 feet;

Thence North 0°02'34" West a distance of 19.0 feet;

Thence North 89°48'24" West a distance of 538.32 feet to the point of beginning.

Figure B-1 General Warranty Deed
Transfer of Property from Willard Grain & Feed, INC. (dba Wil-Gro Fertilizer)

EXHIBIT "B"

Exceptions to Special Warranty of Title

1. 1999 Business Personal Taxes in the amount of $146,258.32 against Will-Gro Fertilizer, Inc. % Willard Grain & Feed. Account No. 127474.

2. 1999 Business personal Taxes in the amount of $108,370.84 against Wil-Gro Fertilizer. Account No. 127473.

3. Real estate taxes for 2000 and subsequent years.

4. All interests in and to all oil, gas, coal and other minerals and all rights pertaining thereto, which have been previously reserved or conveyed of record.

5. Statutory right-of-way along all section lines.

6. Easements for public road granted to Board of County Commissioners of Mayes County dated September 20, 1939, filed October 6, 1939, recorded in Book 199, page 159.

7. Easements of varying widths granted to Grand River Dam Authority as set out in that certain Quit Claim Deed dated October 19, 1948, filed May 19, 1949, recorded in Book 253, page 180, together with the right of ingress and/or egress as set out therein; partially released and recorded June 7, 1989 in Book 701, page 832.

8. Rights of Missouri-Kansas-Texas Railroad Company as established by Agreement dated September 29, 1961, filed October 18, 1961, recorded in Book 326, page 151.

9. Easement for Transmission Line to Grand River Dam Authority dated August 27, 1963, filed August 27, 1963, recorded in Bo9k 345, page 290.

10. Right-of-way Agreement to Oklahoma Natural Gas Company dated July 19, 1965, filed July 30, 1965, recorded in Book 358, page 351.

11. Right-of-way Agreement to Oklahoma Natural Gas Company dated December 1, 1965, filed December 29, 1965, recorded in Book 362, page 278.

12. Easement to the Carborundum Company dated May 18, 1978, filed August 8, 1978, recorded in Book 560, page 464; and Corrective Easement dated June 13, 1990, filed August 14, 1990, recorded in Book 718, page 44, in favor of Atochem North America, Inc., successor-in-interest to the Carborundum Company.

13. Railroad Joint Use Agreement dated August 31, 1978, filed September 21, 1978, recorded in Book 561, page 962, entered into by the Grand River Dam Authority and the Oklahoma Ordinance Work Authority.

14. Easement to Mann Engineering dated January 27, 1981, filed September 18, 1981, recorded in Book 593, page 214; and Assignment dated October 22, 1982, filed December 3, 1982, recorded in Book 605, page 804; and Assignment dated September 6,

Figure B-1 General Warranty Deed
Transfer of Property from Willard Grain & Feed, INC. (dba Wil-Gro Fertilizer)

1983, filed January 3, 1986, recorded in Book 653, page 63; and Notice of Claim dated May 27, 1983, filed May 31, 1983, recorded in Book 611, page 738; and Journal Entry of Stipulated Settlement filed January 3, 1986, recorded in Book 653, page 60.

15. Reservations of Easements and Restrictive Covenants and Terms and Conditions of Unrecorded Real Estate, Plant and Equipment Purchase and Sale Agreement, Indemnity Agreement and Cancellation, Release and Termination of (1) Lease and Agreement dated February 1, 1967, and of (2) Lease and Agreement dated June 1, 1980, contained in Quit Claim Deed in favor of Willard Grain and Feed, Inc., a Texas corporation, dated April 25, 1989, filed April 25, 1989, recorded in Book 700, page 227.

16. Easement in favor of Oklahoma Ordinance Works Authority dated April 20, 1989, filed April 25, 1989, recorded in Book 700, page 235.

17. Corrective Easements in favor of Mid-Continent Power company, Inc. with original Easement to Epic Mid-America Corp., filed September 26, 1984, recorded in Book 633, page 617, such corrective easements filed November 7, 190, recorded in Book 721, page 270; Book 721, page 279; Book 721, page 288 and Book 721, page 297.

18. Easement in favor of Mid-Continent Power Company, Inc. dated June 13, 1990, filed July 9, 1990, recorded in Book 716, page 506, partially re-conveyed to Willard Grain and Feed, Inc., by Quit Claim Deed dated June 1, 1990, filed November 7, 1990, recorded in Book 721, page 269, and corrected Quit Claim Deed dated June 1, 1990, filed November 8, 1990, recorded in Book 721, page 391.

19. Right-of-Way in favor of Oklahoma Natural Gas Company, recorded in Book 811, page 690.

20. Right-of-Way in favor of Oklahoma Natural Gas Company, recorded in Book 811, page 693.

21. Right-of-Way in favor of TransOK, Inc., recorded in Book 845, page 754.

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Figure B-1 General Warranty Deed
Transfer of Property from Willard Grain & Feed, INC. (dba Wil-Gro Fertilizer)

Figure B-1 General Warranty Deed
Transfer of Property from Salina-Drillers L.L.C.

I-1996-646165 10/10/2012 3:46 pm
Book 1227 Page(s) 0176-0178
Fee: $ 17.00 Doc: $ 900.00
Rita Littlefield - Mayes County Clerk
State of Oklahoma

STATE OF OKLAHOMA
MAYES COUNTY
Documentary Stamps: $ 900.00

Special Warranty Deed

KNOW ALL MEN BY THESE PRESENTS:

THAT **Salina-Drillers L.L.C.**, an Oklahoma limited liability company with an address of P.O. Box 255, Salina, Oklahoma 74365 ("Grantor"), in consideration of the sum of Ten Dollars ($10.00) and other valuable considerations in hand paid, the receipt of which is hereby acknowledged, does hereby grant, bargain, sell and convey unto **CHEMICAL PROPERTIES L.L.C.**, an Oklahoma limited liability company with an address of 16 S. Pennsylvania Avenue, Oklahoma City, Oklahoma 73107 ("Grantee") and to Grantee's successors and assigns forever, all of the Grantor's right, title, interest, estate, and every claim and demand, both at law and in equity, in and to all of the real property and premises situated in Oklahoma County, State of Oklahoma more fully described on Exhibit A attached hereto and incorporated by reference together with all the improvements thereon and appurtenances thereunto belonging (the "Property").

TO HAVE AND TO HOLD said described Property unto the said Grantee and Grantee's successors and assigns forever, free, clear and discharged of and from all former grants, charges, taxes, judgments, mortgages, and any other liens or encumbrances of whatsoever nature. Grantor hereby covenants with Grantee and Grantee's successor and assigns that Grantor will warrant and defend the title to said described Property against all claims, liens and encumbrances affecting such Property made or suffered to be made or done by, through or under Grantor.

EXECUTED as of the 10th day of October, 20 12.

Salina-Drillers L.L.C.

By: David Bohannan
Printed Name: David Bohannan
Title: Manager

STATE OF OKLAHOMA,)
MAYES) SS.
COUNTY OF ~~OKLAHOMA~~)

This instrument was acknowledged before me on this 10th day of October, 20 12, by David Bohannan as the Manager of Salina-Drillers L.L.C.

Shirley A. Keith
Notary Public
Commission No. 09002313

SHIRLEY A. KEITH NOTARY # 09002313 EXP. 03/10/13 PUBLIC STATE OF OKLAHOMA

My Commission Expires: 3-10-13
(SEAL)

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Figure B-1 General Warranty Deed
Transfer of Property from Salina-Drillers L.L.C.

EXHIBIT "A"
LEGAL DESCRIPTION OF PROPERTY

A tract of land situated in the SW/4 of Section 3, Township 20 North, Range 19 East of the Indian Base and Meridian in Mayes County, Oklahoma and more particularly described as follows to-wit:

COMMENCING at the Southwest Corner of said SW/4.

THENCE North 00 degrees 00 minutes 00 seconds East for a distance of 1170.23 feet and along the West Line of said SW/4;

THENCE South 89 degrees 38 minutes 27 seconds East for a distance of 440.00 feet and parallel to the South Line of said SW/4 to the point of beginning.

THENCE North 00 degrees 00 minutes 00 seconds West for a distance of 1184.14 feet;

THENCE South 89 degrees 45 minutes 50 seconds East for a distance of 2197.42 feet to a point on the East Line of said SW/4;

THENCE South 00 degrees 01 minutes 44 seconds West for a distance of 1426.68 feet and along said East Line;

THENCE South 89 degrees 57 minutes 32 seconds West for a distance of 503.97 feet;

THENCE North 00 degrees 00 minutes 08 seconds West for a distance of 576.47 feet;

THENCE South 89 degrees 29 minutes 51 seconds West for a distance of 150.00 feet;

THENCE North 00 degrees 00 minutes 08 seconds West for a distance of 514.97 feet;

THENCE South 89 degrees 29 minutes 51 seconds West for a distance of 275.00 feet;

THENCE South 00 degrees 00 minutes 08 seconds East for a distance of 514.97 feet;

THENCE South 89 degrees 29 minutes 51 seconds West for a distance of 711.61 feet;

THENCE South 00 degrees 00 minutes 08 seconds East for a distance of 315.40 feet;

THENCE North 89 degrees 59 minutes 08 seconds West for a distance of 367.80 feet;

THENCE South 00 degrees 00 minutes 00 seconds East for a distance of 0.41 feet;

THENCE North 89 degrees 38 minutes 27 seconds West for a distance of 188.34 feet to the point of beginning.

LESS AND EXCEPT, A tract of land situated in the SW/4 of Section 3, Township 20 North, Range 19 East of the Indian Base and Meridian in Mayes County, Oklahoma and more particularly described as follows to-wit (the "Exception Property"):

COMMENCING at the Southwest Corner of said Section 3.

THENCE North 00 degrees 00 minutes 00 seconds West for a distance of 1185.06 feet and along the West Line of said SW/4;

THENCE North 90 degrees 00 minutes 00 seconds East for a distance of 764.08 feet to the POINT OF BEGINNING.

THENCE North 01 degrees 07 minutes 36 seconds East for a distance of 553.11 feet;

THENCE South 87 degrees 09 minutes 50 seconds East for a distance of 268.41 feet;

THENCE South 00 degrees 00 minutes 33 seconds West for a distance of 242.36 feet;

THENCE South 89 degrees 29 minutes 51 seconds West for a distance of 46.88 feet;

THENCE South 00 degrees 00 minutes 08 seconds East for a distance of 299.78 feet;

THENCE North 88 degrees 17 minutes 09 seconds West for a distance of 111.80 feet;

THENCE North 88 degrees 17 minutes 09 seconds West for a distance of 30.46 feet;

THENCE South 89 degrees 13 minutes 43 seconds West for a distance of 52.67 feet;

THENCE South 88 degrees 53 minutes 45 seconds West for a distance of 37.20 feet to the POINT OF BEGINNING.

RESERVING UNTO THE SELLER, AS CURRENT OWNER OF THE EXCEPTION PROPERTY, AND TO ALL FUTURE OWNERS OF THE EXCEPTION PROPERTY, a permanent, perpetual and nonexclusive easement solely for the purposes allowing them the right to pass and repass along said easement for access to or from the Exception Property described above, said easement being located on, over and across a tract of land that is a part of the property described above and that is situated in the SW/4 of Section 3, Township 20 North, Range 19 East of the Indian Base and Meridian in Mayes County, Oklahoma and more particularly described as follows to-wit:

COMMENCING at the Southwest Corner of said Section 3.

THENCE North 00 degrees 00 minutes 00 seconds East for a distance of 1170.23 feet and along the West Line of said SW/4;

THENCE South 89 degrees 38 minutes 27 seconds East for a distance of 440.00 feet to the point of beginning.

THENCE North 00 degrees 00 minutes 00 seconds West for a distance of 14.88 feet;

THENCE North 89 degrees 31 minutes 16 seconds East for a distance of 324.10 feet;

THENCE North 88 degrees 53 minutes 45 seconds East for a distance of 37.20 feet;

THENCE North 89 degrees 13 minutes 43 seconds East for a distance of 52.67 feet;

THENCE South 88 degrees 17 minutes 09 seconds East for a distance of 30.46 feet;

THENCE South 88 degrees 17 minutes 09 seconds East for a distance of 111.80 feet;

THENCE South 00 degrees 00 minutes 08 seconds East for a distance of 15.62 feet;

THENCE North 89 degrees 59 minutes 08 seconds West for a distance of 367.80 feet;

THENCE South 00 degrees 00 minutes 00 seconds East for a distance of 0.41 feet;

THENCE North 89 degrees 38 minutes 27 seconds West for a distance of 188.34 feet to the point of beginning.

Figure B-1 General Warranty Deed
Transfer of Property from Salina-Drillers L.L.C.

Midwest #2
Midwest #3
Midwest #1
Deere #1
Kaiser #2
Kaiser MW 2-3
Doris McGee
Martin #1
PCC #1
OOWA #2
Dixon #1
Anderson 16-1
Jordan 22-1
2 - Mile Area of Review
20N 19E
North
OKLAHOMA
QUADRANGLE LOCATION

WELL SYMBOLS
- Monitoring Well
- Oil Well
- Gas Well
- Dry Hole
- Injection Well
- Abandoned Location - Permit
- Gas Multiple Producer
- Plugged and Abandoned
- Unknown Status
- Plugged & Abandoned Gas Well
- Plugged & Abandoned Injection Well
- Groundwater Well
- Permitted Location
- Storm Water Outfall

Well Symbol Highlight
Well Name
Formation Top (subsea value)

UTM GRID AND 2016 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET
1° 22′ 24 MILS
2° 29′ 44 MILS

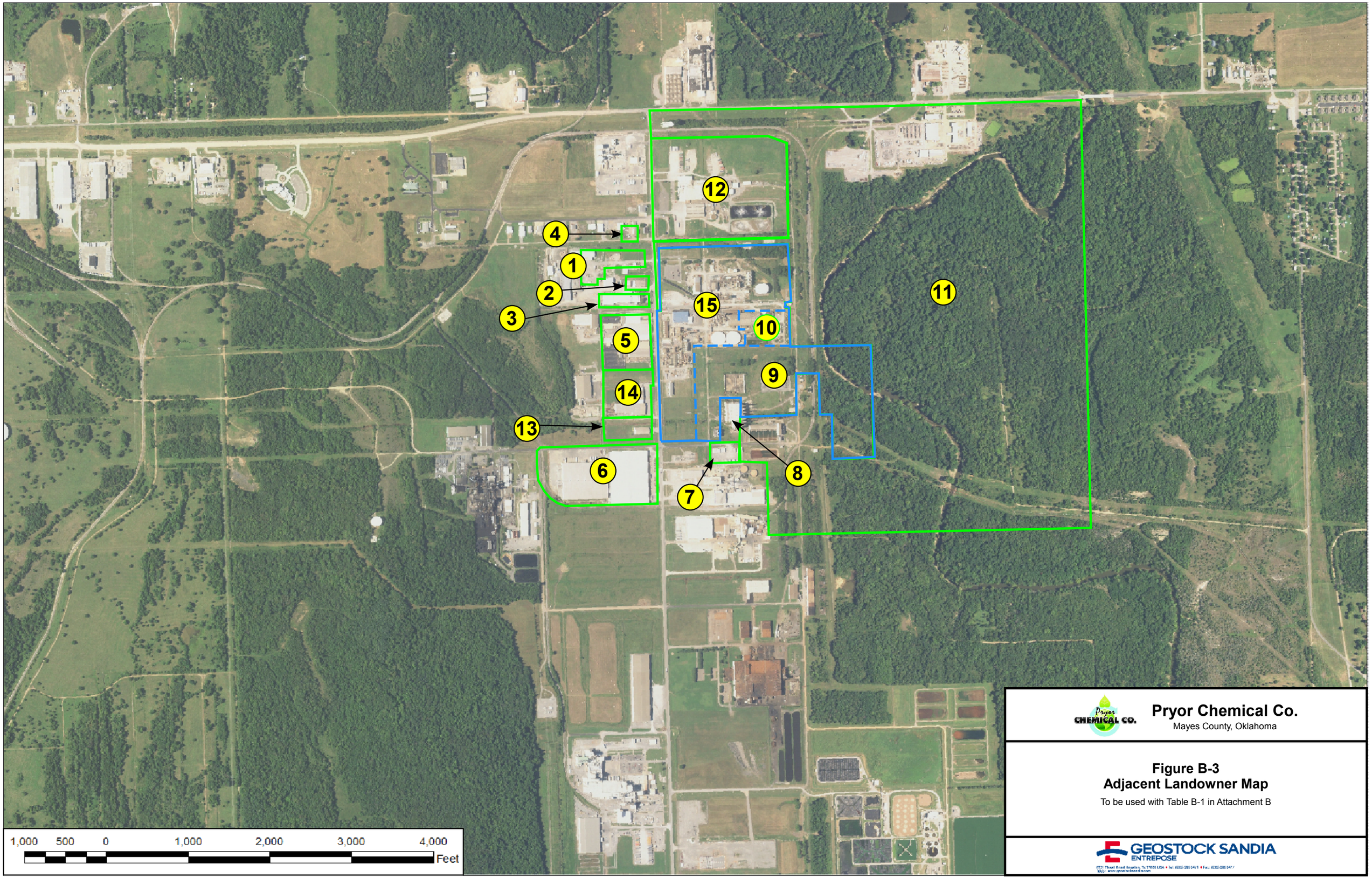
SCALE 1:24 000
1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 1
MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000
FEET

Pryor Chemical Co.
Mayes County, Oklahoma

Figure B-2: Area of Review Topographic Map

Created by: DE | Date: 4/26/2017

GEOSTOCK SANDIA ENTREPOSE



Pryor Chemical Co.
Mayes County, Oklahoma

Figure B-3
Adjacent Landowner Map

To be used with Table B-1 in Attachment B

GEOSTOCK SANDIA ENTREPOSE

ATTACHMENT C

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Corrective Action Plan and Well Data

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ATTACHMENT C

Corrective Action Plan and Well Data

Well Data

There are four injection-related wells, six domestic groundwater wells, and six monitoring wells located within the 2.0-mile Area of Review (AOR). Three of the injection-related wells are considered artificial penetrations, in that they penetrate the confining and/or injection zones. (The fourth well is discussed in Attachment A.) The three artificial penetrations were completed in the Arbuckle Group, and they are all plugged and abandoned. Two of the wells were operated by Amerex Environmental Solutions (formerly Kaiser) to inject storm water runoff from their facility; these wells were plugged in 2008. The remaining well was drilled and operated by the Oklahoma Ordnance Works Authority (OOWA), and it was plugged in 1985. Each artificial penetration was evaluated to determine if its construction and/or plugging required corrective action to protect groundwater from the proposed injection activities.

Records for artificial penetrations were obtained from the Oklahoma Corporation Commission (OCC) office, Oklahoma Water Resources Board, Oklahoma Geological Society, and previously-filed reports. Appendix C-1 contains wellbore diagrams constructed from these records and wireline geophysical logs for each well.

Table C-1 lists the artificial penetrations (penetrating the confining and/or injection zone) within the 2.0-mile AOR. For a map of the 2.0-mile AOR wells, see Attachment B, Figure B-2.

TABLE C-1
Artificial Penetrations

Well Information
Kaiser (Deere & Co.) Injection Well No. 1 Status: Plugged (2008) Owner: Amerex Environmental Solutions Location: NW-NW-NE, Section 33-2IN-19E Completion Year: 1955 Completion: 8-5/8-inch longstring casing cemented from 358 feet to surface. Packer set at 333 feet. Cement plug from 0 – 820 feet.
Kaiser (NIPAK) Injection Well No. 2. Status: Plugged (2008) Owner: Amerex Environmental Solutions Location: NW-SE-NW, Section 33-2IN-19E Completion Year: 1956 Completion: 8-5/8-inch longstring casing cemented from 397 feet to surface. Packer set at 389 feet. Cement plug from 0 – 789 feet.
Oklahoma Ordnance Work Authority #2. Status: Plugged (1985) Owner: Oklahoma Ordnance Works Authority Location: NE-SW-SW, Section 3-20N-19E Completion Date: March 27, 1985 Completion: Bentonite super gel from 473' – 938' and cement from 0'-473'.

Corrective Action Plan

Based on review of the well records and construction of the wells, no corrective action is needed for the three artificial penetrations located within the 2.0-mile AOR.

Appendix C-1
Artificial Penetrations Documentation

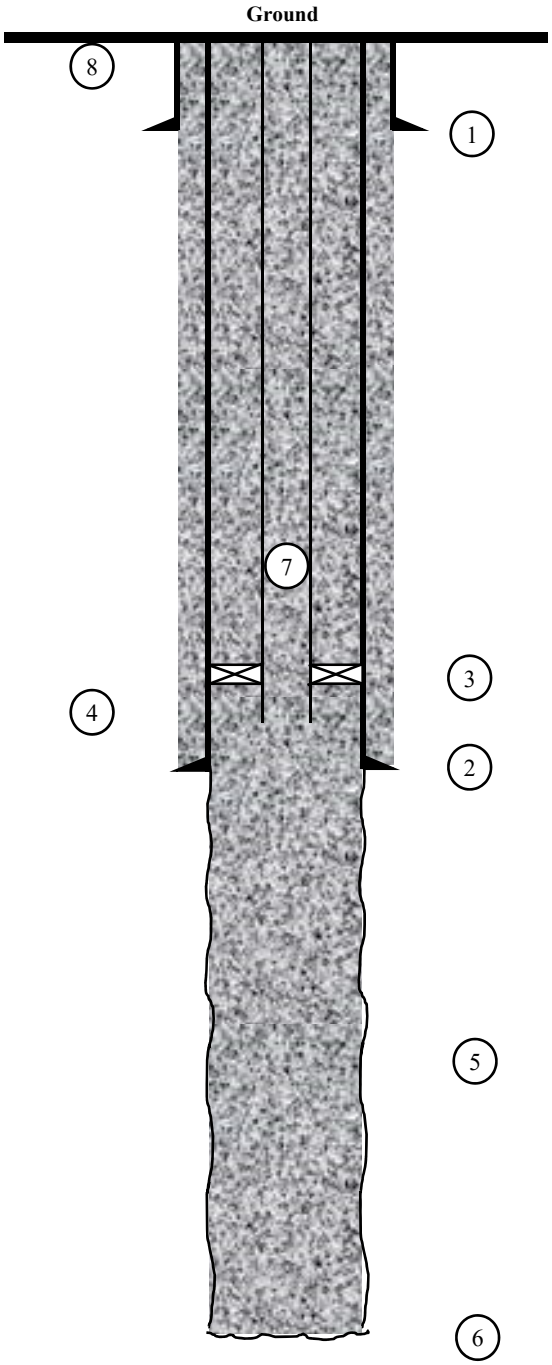
Kaiser

Disposal Well No. 1

Kaiser Aluminum & Chemical Corp (Deere)
No. 1 Disposal Well

STATUS: P&A (06/17/2008)

All depths Log Depth
Ground Elev: 604’



1. **Conductor Pipe**: 13-3/8” set in unknown hole size at unknown depth.
2. **Surface Casing:** 8-5/8” (H40, 32 lb) set in 12-1/4” hole from 0 – 358’; set with Class A Portland cement.
3. **Packer:** Baker “Lok-Set” Packer 8-5/8” x 3-1/2” set in neutral at 333’
4. **Injection Tubing:** 4-1/2” (J55 10.5 lb) 0 – 354’; perforated or removed per P&A form.
5. **Open Hole:** 358’ – 820’ 7-1/2” diameter
6. **Total Depth:** 820’
7. **Cement Plug**: 0 – 820’ (10.5 ppg cement slurry).
8. **Casing Cut Off:** below grade.

Original Source: Golden Strataservices, Inc. Houston, Texas
Modified from QORE Property Sciences (10/21/99)

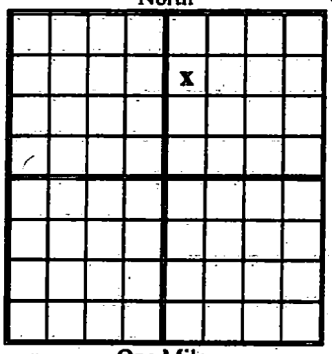
Drawn by: KDS 3/31/2017
Rev:
Note: drawing not to scale

GEOSTOCK SANDIA
ENTREPOSE
8860 Fallbrook Drive Houston, TX 77064 USA Tel: (346) 314-4347 Fax: (832) 478-5172
Info@geostocksandia.com · www.geostocksandia.com

MULTI-PURPOSE WELL COMPLETION & PLUGGING REPORT

Oklahoma Water Resources Board
3800 North Classen Boulevard
Oklahoma City, OK 73118
Telephone (405) 530-8800

Legal Location



Each square is 10-acres

WELL ID NUMBER: 117156

Quarters SW-NW-NE **Section** 33 **Township** 21N **Range** 19EI

Latitude 36.2615167 Longitude -95.28125

Date collected(latitude and longitude), if different from date the well was drilled: 06/10/2008

Method latitude and longitude was collected: Mathematical conversion program

County Mayes Variance Request No. (if applicable) n/a

WELL OWNER - NAME AND ADDRESS

Well Owner Amerex Companies, Inc. Phone (918) 585-1050

Address/City/State 1105 North Peoria Tulsa OK Zip 74106

Finding Location Kaiser Ammonia Plant - from Hwys 69&69A(412B) go E to N4350 Rd, N ~1/2 mi to E0520 Rd, go W ~2 mi to site on S side - Pryor, OK

Well Name D-1 Water Rights #: ___

TYPE OF WORK: Monitoring Well **USE OF WELL:** Site Assessment

NEW WELL CONSTRUCTION DATA

Date Well or Boring Was Completed ___

Number of wells or borings represented by this log 1.

* (Borings are within the same 10 acre-tract and with the same general depths and lithologies)

Hole Diameter 7.5 inches to a depth of 820 ft.

CASING INFORMATION ***Note:** If surface casing is used please indicate that on the appropriate well casing information line.

Surface Pipe Material: ___ Surface Pipe Diameter ___ inches Surface Pipe From ___ ft to ___ ft

SCREEN OR PERFORATION INFORMATION

FILTER PACK INFORMATION

Filter Pack Material: __

WELL SEAL INFORMATION

Type of Surface Seal n/a
Surface Seal Interval: From n/a ft to n/a ft
Type of Annular Seal n/a
Annular Seal Interval: From n/a ft to n/a ft
Filter Pack Seal Material n/a
Filter Pack Seal Interval: From n/a ft to n/a ft

TYPE OF COMPLETION: __

HYDROLOGIC INFORMATION

Depth to water at time of drilling __ ft
Estimated yield of well __ gpm
First water zone __ft

LITHOLOGY DESCRIPTION

MATERIAL	ENCOUNTERED FROM (ft.)	ENCOUNTERED TO (ft.)	SATURATED
Plug In Place	0	820	N

WELL LOCATION TO POTENTIAL SOURCES OF POLLUTION

Has this well been disinfected after completion of work? n/a
Are than any potential sources of pollution or wastewater lagoons within 300 ft. of the well? n/a
Distance of Well is n/a from possible source. Type of possible source: n/a

PLUGGING INFORMATION

Date Well or Boring Was Plugged 06/11/2008
Total Depth of well being plugged 820 ft.
Was the well contaminated or was it plugged as though it was contaminated? Yes
If the well or boring was plugged as if it was contaminated, was the casing removed or perforated? Yes
Was the grout tremied? Yes
Backfilled with Cement Grout
Backfilled from 0 ft. to 820 ft.
Grouted with n/a
Grouted from __ ft. to __ ft.
Grouted with Cement
Grouted from 0 ft. to 820 ft.

Firm Name Associated Environmental Industries, Corp.
D/PC No. DPC-0269
Operator Name DANNY JARMAN
OP No. OP-0253
Date 06/17/2008
Comments: Type of Work: Disposal Injection Wells

WIRELINE SERVICES
GEARHART-OWEN

Gamma-Ray Neutron Log

FIELD PRINT

COMPANY KAISER AGRICULTURAL CHEMS
WELL DISPOSAL WELL #1
FIELD — — —
COUNTY MAYES STATE OKLA.
LOCATION SW-NW-NE
OTHER SERVICES R.A. TRACER
SEC. 33 TWP. 21N RGE. 19E

PERMANENT DATUM GL ELEV. 603.5
LOG MEASURED FROM GL 0 FT. ABOVE PERM. DATUM
DRILLING MEASURED FROM GL

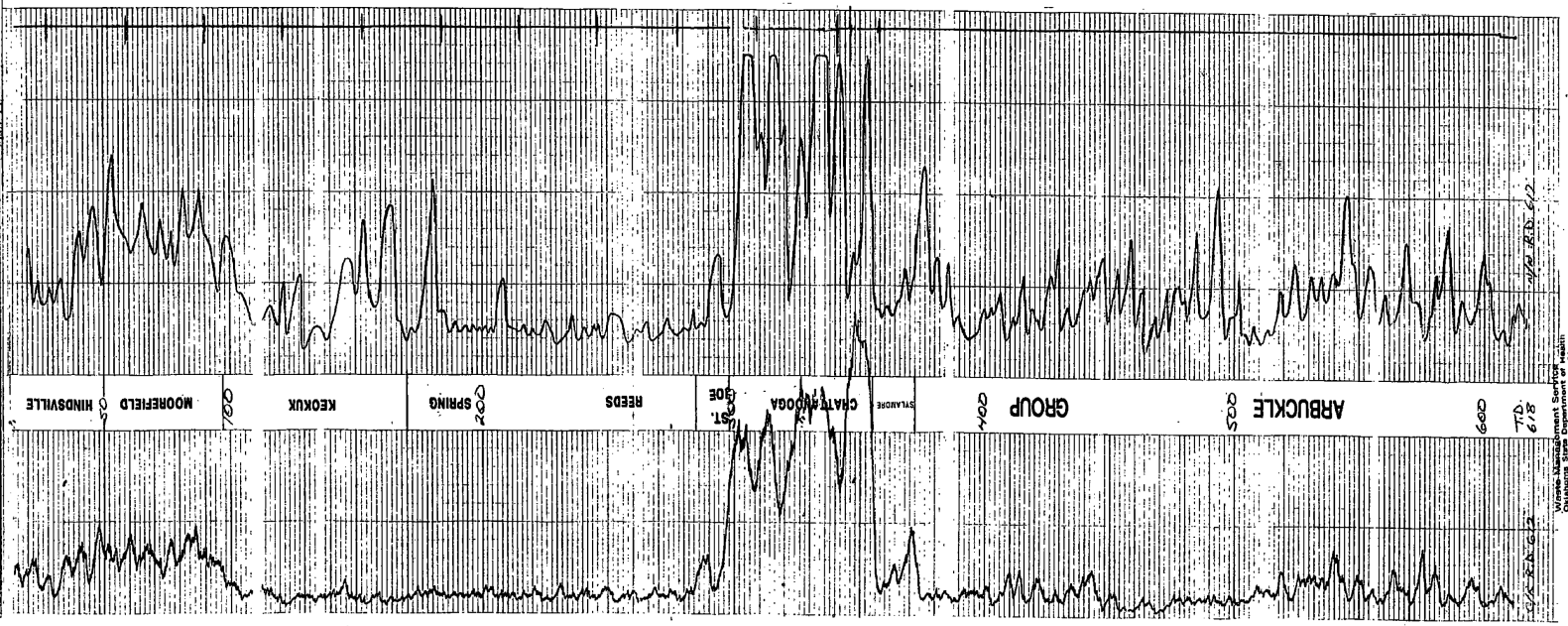
Date	2-7-80		
Run No.	ONE		
Type Log	G/R-NN		
Depth-Driller	620		
Depth-Logger	618		
Bottom logged interval	613		
Top logged interval	-20-		
Type fluid in hole	WATER		
Max. rec. temp., deg. F.	— — —		
Operating rig time	MASTELLE		
Recorded by	D.HAGEN		
Witnessed by	MR. KEEVER		

Tubing-Liner Record

Size	Wgt.	From	To
Tubing			

Casing Record

Size	Wgt.	From	To
8 5/8"		GL	58'
4"		GL	274'



Wireline Service Department of Health
Oklahoma Geological Survey
1000 N. E. 10th, P. O. Box 53991
Oklahoma City, OK 73152

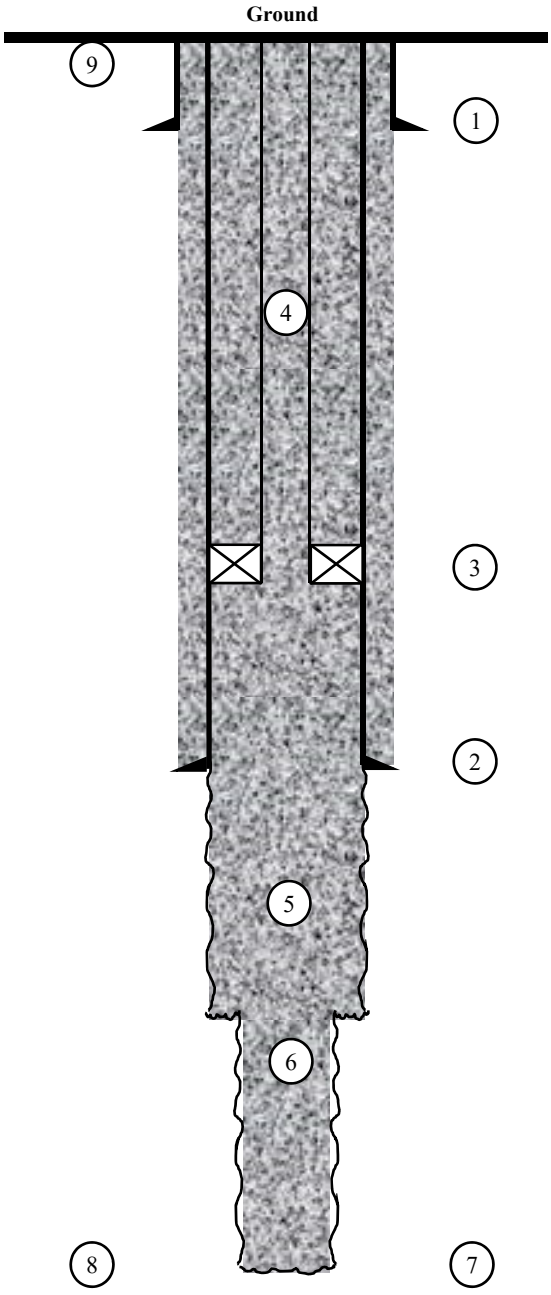
Kaiser

Disposal Well No. 2

Kaiser Aluminum & Chemical Corp
No. 2 Disposal Well

STATUS: P&A (06/17/2008)

All depths Log Depth
Ground Elev.: 599’



1. **Conductor Pipe**: unknown
2. **Surface Casing:** 8-5/8” (J55, 24 lb) set in 12-1/4” hole from 0 – 397’; set with Class A Portland cement.
3. **Packer:** Brown Oil Tool M-1 Husky Packer 8-5/8” x 3-1/2” set in neutral at 389’
4. **Injection Tubing:** 4-1/2” (J55 10.5 lb) 0 – 389’; perforated or removed per P&A form.
5. **Open Hole:** 7-7/8” open hole 389’ – 530’ (10/19/66)
6. **Open Hole:** 6-1/4” open hole 530’ – 789’ (10/14/71)
7. **Total Depth:** 789’ (10/14/71)
8. **Cement Plug**: 0 – 789’ (10.5 ppg cement slurry).
9. **Casing Cut Off:** below grade.

Original Source: Golden Strataservices, Inc. Houston, Texas
Modified from QORE Property Sciences (10/21/99)

Drawn by: Initials mm/dd/yy
Rev. mm/dd/yy Initials
Note: drawing not to scale

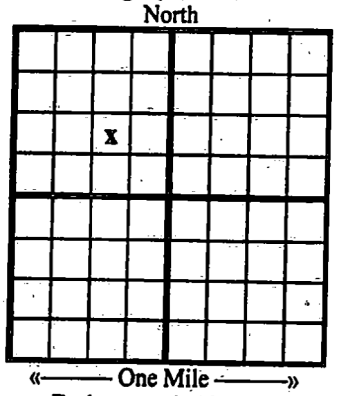
GEOSTOCK SANDIA ENTREPOSE
8860 Fallbrook Drive Houston, TX 77064 USA Tel: (346) 314-4347 Fax: (832) 478-5172
info@geostocksandia.com · www.geostocksandia.com

MULTI-PURPOSE WELL COMPLETION & PLUGGING REPORT

Oklahoma Water Resources Board
3800 North Classen Boulevard
Oklahoma City, OK 73118
Telephone (405) 530-8800

Legal Location

North



Each square is 10-acres

WELL ID NUMBER: 117155

Quarters NW-SE-NW **Section** 33 **Township** 21N **Range** 19EI

Latitude 36.2584833 Longitude -95.2873667

Date collected(latitude and longitude), if different from date the well was drilled: 06/10/2008

Method latitude and longitude was collected: Mathematical conversion program

County Mayes Variance Request No. (if applicable) n/a

WELL OWNER - NAME AND ADDRESS

Well Owner Amerex Companies, Inc. Phone (918) 858-1050

Address/City/State 1105 North Peoria Tulsa OK Zip 74106

Finding Location Kaiser Ammonia Plant - from Hwys 69&69A(412B) go E to N4350 Rd, N ~1/2 mi to E0520 Rd, go W ~2 mi to site on S side - Pryor, OK

Well Name D-2 Water Rights #: ___

TYPE OF WORK: Monitoring Well **USE OF WELL:** Site Assessment

NEW WELL CONSTRUCTION DATA

Date Well or Boring Was Completed ___

Number of wells or borings represented by this log 1

* (Borings are within the same 10 acre-tract and with the same general depths and lithologies)

Hole Diameter 7.5 inches to a depth of 789 ft.

CASING INFORMATION ***Note:** If surface casing is used please indicate that on the appropriate well casing information line.

Surface Pipe Material: ___ Surface Pipe Diameter ___ inches Surface Pipe From ___ ft to ___ ft

SCREEN OR PERFORATION INFORMATION

FILTER PACK INFORMATION

Filter Pack Material: __

WELL SEAL INFORMATION

Type of Surface Seal n/a | Surface Seal Interval: From n/a ft to n/a ft

Type of Annular Seal n/a | Annular Seal Interval: From n/a ft to n/a ft

Filter Pack Seal Material n/a | Filter Pack Seal Interval: From n/a ft to n/a ft

TYPE OF COMPLETION: __

HYDROLOGIC INFORMATION

Depth to water at time of drilling __ ft | Estimated yield of well __ gpm | First water zone __ ft

LITHOLOGY DESCRIPTION

MATERIAL	ENCOUNTERED FROM (ft.)	ENCOUNTERED TO (ft.)	SATURATED
Plug In Place	0	789	N

WELL LOCATION TO POTENTIAL SOURCES OF POLLUTION

Has this well been disinfected after completion of work? n/a

Are than any potential sources of pollution or wastewater lagoons within 300 ft. of the well? n/a

Distance of Well is n/a from possible source. Type of possible source: n/a

PLUGGING INFORMATION

Date Well or Boring Was Plugged 06/11/2008 | Total Depth of well being plugged 789 ft.

Was the well contaminated or was it plugged as though it was contaminated? Yes

If the well or boring was plugged as if it was contaminated, was the casing removed or perforated? Yes

Was the grout tremied? Yes

Backfilled with Cement Grout | Backfilled from 0 ft. to 789 ft.

Grouted with n/a | Grouted from __ ft. to __ ft.

Grouted with Cement | Grouted from 0 ft. to 789 ft.

Firm Name Associated Environmental Industries, Corp. | D/PC No. DPC-0269

Operator Name DANNY JARMAN | OP No. OP-0253

Date 06/17/2008

Comments: Type of Work: Disposal Injection Wells

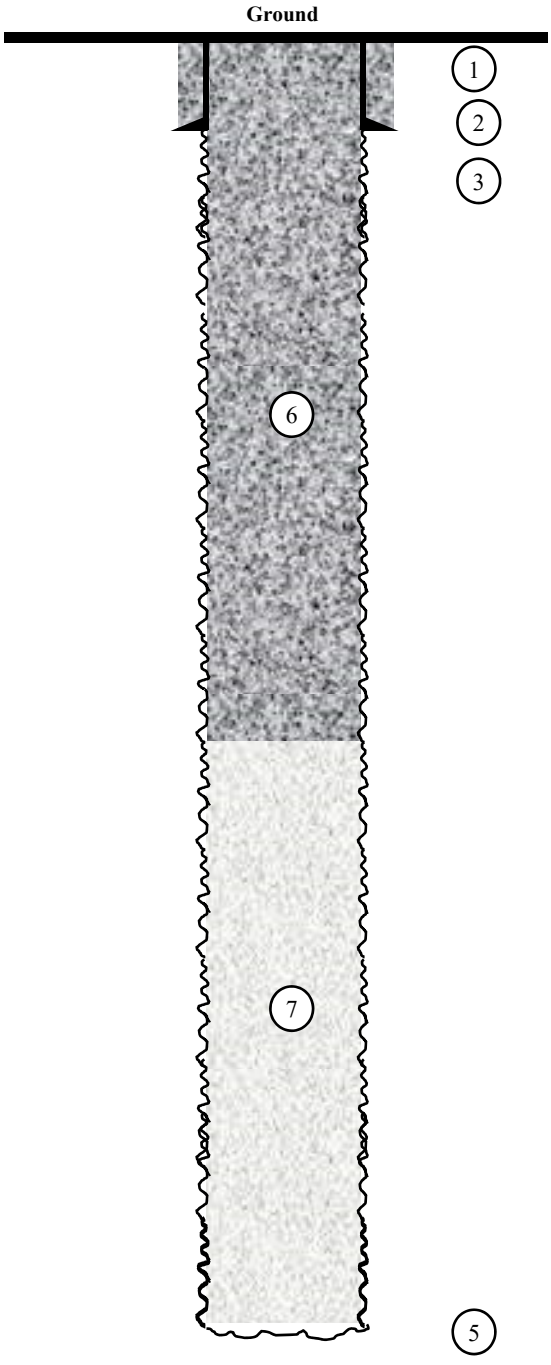
Oklahoma Ordnance Works Authority

Injection Well No. 2

Oklahoma Ordnance Works Authority
No. 2

STATUS: P&A (03/27/1985)

All depths Log Depth



1. **Conductor Pipe**: unknown
2. **Surface Casing:** unknown
3. **Protection Casing:** unknown
4. **Open Hole:** casing shoe to 938’
5. **Total Depth:** 938’
6. **Plug**: 0’ – 473’ (cement, 142 sx ,179 ft^3)
7. **Plug**: 473’ – 938’ (bentonite super gel grout, 16-50# bags, 205.6 ft^3)

Drawn by: KDS 5/31/2017
Rev:
Note: drawing not to scale

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8860 Fallbrook Drive Houston, TX 77064 USA Tel: (346) 314-4347 Fax: (832) 478-5172
Info@geostocksandia.com · www.geostocksandia.com

Industrial Waste Division
Oklahoma State Department of Health
P.O. Box 53551
Oklahoma City, Oklahoma 73152
(405) 271-5338

Injection Well

Plugging Information and Abandonment Affidavit

I. Well Operator:

Name Oklahoma Ordnance Works Authority

Address P.O. Box 945, Pryor, Oklahoma 74362

Injection Well Permit Number ---

II. Description of Plugging: (add additional sheets if necessary)

Plug materials -- type and volume	Depth From - To (feet)
142 sacks of cement-179 cu. ft.	0 - 473'
16-50# bags bentonite super gel-205.6 cu. ft.	473' to 938'

Date Plugging Was Completed: 3/27/85

III. Final Status:

Total volume of waste injected --- as of (date)

Final well shut-in pressure ---

Estimated horizontal extent of injected waste ---

IV. Associated Work:

Pits and excavations filled (X) yes

Equipment and debris removed (X) yes

Permanent monument emplaced (X) yes

Executed this 10th day of April, 1985.

State of Oklahoma County of Mayes

V. Signature and Seal of Certifying Engineer:

(Signature of Affiant)

Ralph H. Hoss, P.E.

On this 10th day of April, 1985, before me appeared OK #5980, known to me to be the person whose name is subscribed to the above instrument, who being by me duly sworn on oath, states that he is authorized to make the above report and that he has knowledge of the facts stated therein, and that said report is true and correct.

SEAL

My commission expires Dec. 6, 1985

(Notary Public)

Plugging witnessed by John Verett
(Authorized State Representative)

ATTACHMENT D

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Attachment D
Maps and Cross-Sections of Underground Sources of Drinking Water

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ATTACHMENT D

Maps and Cross-Sections of Underground Sources of Drinking Water

Attachment D of the Oklahoma Department of Environmental Quality (ODEQ) Underground Injection Control (UIC) permit application is not applicable to the PCC facility injection well as there are no aquifers within the 2.0-mile radius Area of Review, and thus no USDWs. This conclusion is based on the following information.

Northeastern Oklahoma has three geologic formations that are referred to as minor aquifers by the Oklahoma Water Resources Board (OWRB): Southern Neosho River Alluvium and Terrace "minor (Alluvium and Terrace) aquifer," Northeastern Oklahoma Pennsylvanian "minor bedrock aquifer," and the Boone "minor bedrock aquifer." These are all stratigraphically younger than the PCC No. 1 injection well injection interval (Arbuckle dolomite) and are separated from the injection interval by multiple low permeability units (i.e., shale) (see Figure D-1.). The low permeability units form a hydraulic barrier to vertical migration of fluids from the injection interval to any overlying minor aquifers.

The OWRB defines a major aquifer as a distinct underground body of water overlain by contiguous land and having substantially the same geological and hydrological characteristics and from which groundwater wells yield at least fifty (50) gallons per minute (gpm) on the average throughout the basin if from a bedrock aquifer and at least one hundred fifty (150) gpm on the average throughout the basin if from an alluvial aquifer.

The PCC injection well and the majority (about the eastern 2/3) of a circle with a 2-mile radius is co-located within the Roubidoux "major (bedrock) aquifer". The Roubidoux (in eastern Oklahoma) is stratigraphically equivalent to the Arbuckle Group which is the injection interval for the PCC injection well.

The Southern Neosho River Alluvium and Terrace "minor (Alluvium and Terrace) aquifer", Northeastern Oklahoma Pennsylvanian "minor (bedrock) aquifer", and Boone "minor (bedrock) aquifer" appear to be potentially within the Area of Review, but they are stratigraphically above the injection interval. These formations are separated from the injection interval by multiple low permeability units (such as the shales depicted in Figure 1, Appendix D-1). These aquifers do not serve as sources for the public water supply (PWS) wells. In addition, the low permeability units form a hydraulic barrier preventing vertical migration of fluids from the injection interval to any of the overlying minor aquifers or shallow groundwater wells. See Appendix D-1, letter from Dr. Kyle Murray.

OWRB records show only three groundwater wells are permitted as PWS wells in Mayes County, and they are located 5.4, 13.6, and 22.0 miles to the east or northeast of the PCC injection well. There are no wells within a 2-mile radius of the PCC injection well that yield more than 50 gpm or reach deep enough to penetrate the Roubidoux aquifer.

Six domestic use groundwater wells permitted through OWRB are within two miles of the Pryor Class 1 well. These six wells are completed in geologic units that are either minor aquifers or in a geologic zone that is not classified as an aquifer such as perched water formations. See Appendix D-1.

Discussions with local water well drillers (Holman Pump and Well Service) confirm that, due to the depth and location, the listed wells below are not connected to an aquifer but are completed into perched water formations.

Therefore, there are no aquifers above the confining zone and within the PCC injection well 2.0-mile radius Area of Review because none of the fresh water bearing formations have a sufficient yield to meet the definition of an aquifer. If the water bearing formation is not an aquifer, then by definition it cannot be a USDW. *See* 40 CFR §146.3.

TABLE D-1

Groundwater Wells within 2.0-Mile Area of Review

Well ID	Owner	Qtrs	Section Township Range	Latitude Longitude	Built	TD (feet)	Static Water Level	Yield (gpm)
9590	N/A	NWNENW	35-21N-19E	36.262933 -95.250551	01/01/07	55	N/A	N/A
49476	Robin Baldridge	SESESW	04-20N-19E	26.235666 -95.289142	12/16/99	80	N/A	8
113231	Doris McGee	SESESW	34-21N-19E	36.250001 -95.266907	10/24/06	125	60	1.5
131736	Clifford Littledave-Allen Turner	NESESW	35-21N-19E	36.251683 -95.248517	08/18/10	100	34	8
131735	Rebecca Littledave-Allen Turner	NWNENW	35-21N-19E	36.263333 -95.249533	08/17/10	100	59	15
177518	John-Linda Oliver	NWNENW	35-21N-19E	36.26365 -95.2507	10/27/16	100	54	1.5

N/A = not available

FIGURES

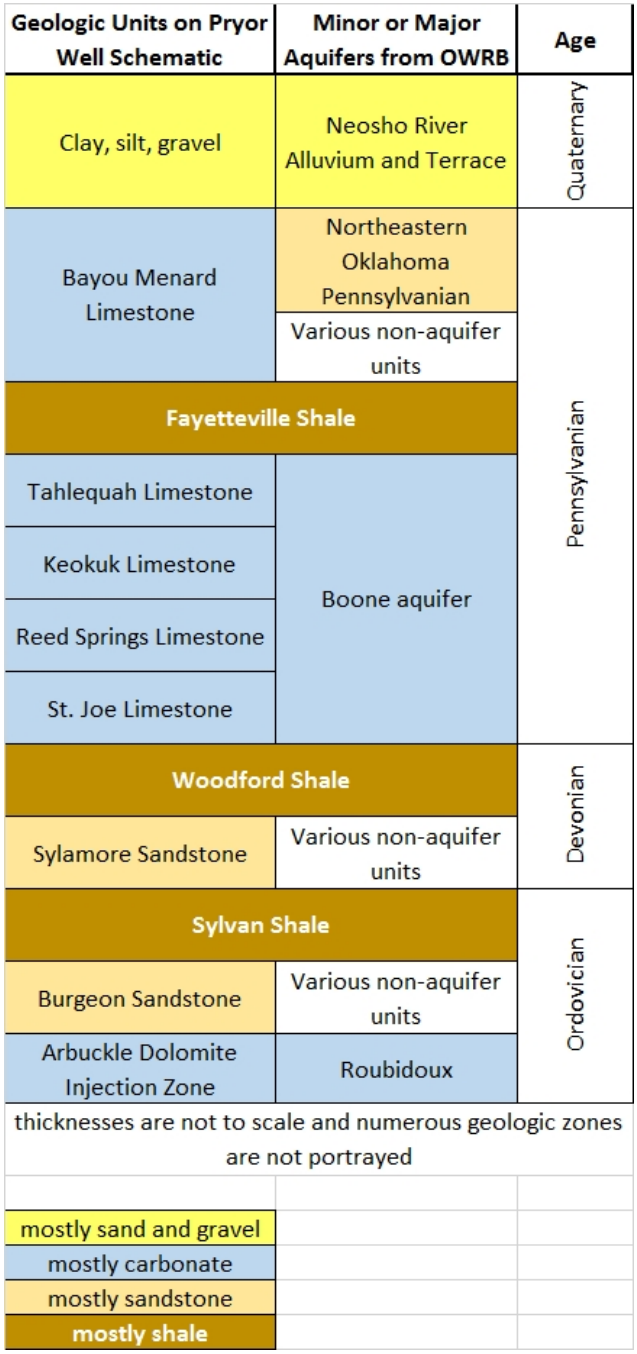

Figure D-1 --- Generalized stratigraphic section in the vicinity of the Pryor Class I well, showing prominent shale units that hydraulically separate aquifers from the injection zone

APPENDIX D-1

APPENDIX D-1
LETTER FROM DR. KYLE MURRAY

June 21, 2017

John Carver
Pryor Chemical Company
16 S. Pennsylvania Avenue
Oklahoma City, OK 73107

Dear Mr. Carver,

I reviewed the wells, Oklahoma Water Resources Board (OWRB) designated aquifers, and public water supplies in the vicinity of your Class I well and summarize my findings below.

The OWRB defines a major aquifer as a distinct underground body of water overlain by contiguous land and having substantially the same geological and hydrological characteristics and from which groundwater wells yield at least fifty (50) gallons per minute (gpm) on the average throughout the basin if from a bedrock aquifer and at least one hundred fifty (150) gpm on the average throughout the basin if from an alluvial aquifer.

The Pryor Class I well and the majority (about the eastern 2/3) of a circle with a 2-mile radius is located within the Roubidoux "major (bedrock) aquifer". The Roubidoux (in eastern Oklahoma) is stratigraphically equivalent to the Arbuckle Group which is the injection interval for the Pryor Class I well.

The Southern Neosho River Alluvium and Terrace "minor (Alluvium and Terrace) aquifer", Northeastern Oklahoma Pennsylvanian "minor (bedrock) aquifer", and Boone "minor (bedrock) aquifer" appear to be potentially within the AOR, but they are stratigraphically above the injection interval. These formations are separated from the injection interval by multiple low permeability units (such as the Woodford, Sylvan, and Fayetteville shales). These aquifers do not serve as sources for public water supply (PWS) wells. In addition, the low permeability units form a hydraulic barrier preventing vertical migration of fluids from the injection interval to any of the overlying minor aquifers or shallow groundwater wells.

A review of OWRB records notes only three groundwater wells are permitted as PWS wells in Mayes County, and they are located 5.4, 13.6, and 22.0 miles to the east or northeast of the Pryor Class I well. There are no wells within a 2-mile radius of the Pryor Class I well that yield more than 50 gpm or reach deep enough to penetrate the Roubidoux aquifer.

Six domestic use groundwater wells permitted through OWRB are within two miles of the Pryor Class I well. These six wells range in depth from about 55 to 125 feet below ground surface as compared to the injection interval of the Pryor Class I well from 451 feet to 912 feet below ground surface. With small yields ranging from 1.5 to 15 gallons per minute (gpm), as listed in Table 1, data indicates that these domestic wells are likely completed in geologic units that are either minor aquifers or in a geologic zone that is not classified as an aquifer such as perched water

formations. Discussions with local water well drillers confirm that due to the depth and location, the wells listed in Table 1 are not connected to an aquifer but are completed in perched water formations.

Table 1 Well permit information for six domestic wells that are within two miles of the Pryor Class I well

Well_ID	Owner_Name	Qtrs	SEC_TWP_RG	LATITUDE	LONGITUDE	Date_Const	TD_ft	Static_WL	Est_Yld	First_Zone
9590	Not Avail.	NWNENW	35-21N-19EI	36.262933	-95.250551	1-Jan-07	55	n/a	n/a	n/a
49476	Robin Baldridge	SESESW	04-20N-19EI	36.235666	-95.289142	16-Dec-99	80	n/a	8	n/a
113231	Doris McGee	SESESW	34-21N-19EI	36.250001	-95.266907	24-Oct-06	125	60	1.5	n/a
131736	Clifford Littledave-Allen Turn	NESESW	35-21N-19EI	36.251683	-95.248517	18-Aug-10	100	34	8	n/a
131735	Rebecca Littledave-Allen Turne	NWNENW	35-21N-19EI	36.263333	-95.249533	17-Aug-10	100	59	15	n/a
177518	John-Linda Oliver	NWNENW	35-21N-19EI	36.26365	-95.2507	27-Oct-16	100	54	1.5	3
TD_ft is total depth in feet below ground surface										
Static_WL is water level in feet below ground surface										
Est_Yld is estimated well yield in gallons per minute (gpm)										
First_Zone is the geologic zone that was first encountered when drilling										

Please contact me at murray.geoconsulting.llc@gmail.com or at 210-287-2907 if you want to discuss the findings in more detail.

Sincerely,

Kyle E. Murray, PhD
Principal Scientist - Hydrogeologist
Murray GeoConsulting, LLC

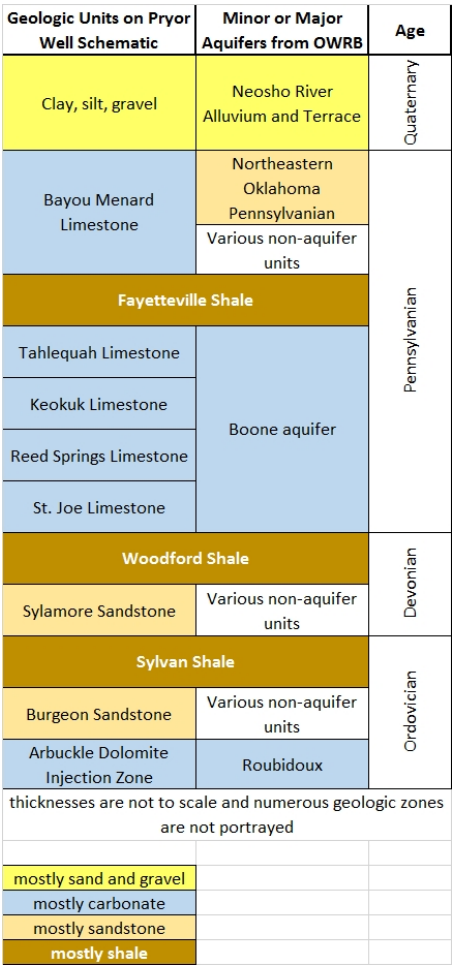

Figure 1 Generalized stratigraphic section in the vicinity of the Pryor Class I well, showing prominent shale units that hydraulically separate aquifers from the injection zone

ATTACHMENT E

ATTACHMENT E

Name and Depths of USDWs (CLASS II)

Not applicable for Class I well.

ATTACHMENT F

ATTACHMENT F

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Attachment F
Maps and Cross-Sections of Geological Structure of Area

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ATTACHMENT F

Maps and Cross-Sections of Geological Structure of Area

Regional and Local Geology

The Pryor Chemical Company (PCC) No. 1 injection well is located in Section 3, Township 20 North, Range 19 East (T20N-R19E) in Mayes County, Oklahoma. Mayes County is located in Northeast Oklahoma, a part of Oklahoma that is situated at the juncture of two regional geologic provinces: the Cherokee Platform and Ozark Plateau (Christenson, et al. 1994). The surface topography of the Ozark Plateau is characterized as rough, with deep V-shaped valleys and flat ridges. The Cherokee Platform's topography is gentle, containing mottled plains, with low relief escarpments and buttes of durable limes and sandstones.

Geologically, the Cherokee Platform is a shallow geologic structure that contains mostly Paleozoic Age rocks that are primarily marine or shallow-marine in origin. The Ozark Uplift, whose orogeny began in the late Paleozoic Age and persisted into the Mississippian era, is located east of the injection well site. Movement associated with the Ozark Uplift was upward, which tilted and exposed the subsurface rocks of the Cherokee Platform. Per Miser (1954), Paleozoic Age rocks exposed at the surface in Northeast Oklahoma include Mississippian and Pennsylvanian rocks, with Mississippian being the oldest. The Seneca Fault is located approximately 3-miles northwest of the injection well. This is a regional feature, extending from southwestern Missouri to northeastern Oklahoma, and runs southwest to northeast across northwestern Mayes County. The fault throw ranges from 5 feet to 100-feet, or more (Siebenthal, 1915). This fault, along with other minor faults associated with it, are self-sealing. See letter from Dr. Kyle Murray (Appendix F-1).

This geologic evaluation of the PCC No. 1 injection well was based upon well log correlations, supplied data, and publicly available data. These data were used to generate subsurface structure and isopach maps, using a Tobin database to prepare the project base map. Maps were interpreted and used to highlight key geological features in the area, which are discussed in the stratigraphy and structure sections of this attachment.

Stratigraphy

Table F-1 presents the stratigraphic column for the area of the injection well. Formations penetrated by wellbores progressively increase in age from Quaternary Alluvium into Paleozoic Age rocks followed finally by Pre-Cambrian Age basement rock. In the injection well, the Pre-Cambrian basement rock was not penetrated, but will be discussed in the Lower Confining Zone section of this attachment.

TABLE F-1

Subsurface Geology/Stratigraphic Column in the Pryor Chemical Company No. 1 Injection Well

Formation	Depth to Top (feet)	Approximate Thickness in PCC No. 1 (feet)	Remarks
Quaternary Alluvium Recent - Tertiary	Surface	10	Clay, grey to brown and Silt with gravel
Moorefield Formation Upper Mississippian	10	33	Limestone, grey, silty and limestone, grey, crystalline, glauconite
Boone Formation Lower Mississippian	43	207	Cherty limestones, bedded chert and fine grained limestone with grey, clear, opaque chert, with shale in lowest part of section
Woodford Lower Mississippian - Devonian (Upper Confining Zone)	250	54	Black fissile shale, with pyrite. Easily identifiable on logs.
Sylamore Sandstone (member of Simpson Formation)	304	78	Sandstone, white to buff in color
Arbuckle Group Ordovician - Cambrian (Injection Zone)	398	461 + Not Fully Penetrated	Nodular cherty dolomite with sandstone lenses
Pre-Cambrian Basement	1,000 - 1,500		In this area, the unit is comprised of Granite, red and grey

The Upper Confining Zone (UCZ) is approximately equivalent to the Woodford Formation. The lithology of the Woodford is predominantly a dark marine shale that is organically rich. The Woodford Shale, as it is described in the PCC area (inner shelf marine shale), can be observed in outcrop near Jane, Missouri (Puckette et al., 2016). In outcrop, the Woodford is an interbedded black and gray shale. The thickest portions of the Woodford Shale are located along the Oklahoma/Texas border. In northeastern Oklahoma, the Woodford generally ranges from less than 50 feet in thickness to no more than 100 feet in thickness (Puckette et al, 2016). It is approximately 54-feet thick in the PCC No. 1 injection well, and averages 60 feet in thickness in the map area and cross-section (Figures F-1 and F-2). As displayed in Figure F-2, the Woodford thickness varies, with the thickest occurrences located near the Seneca Fault (Figure F-3), northwest of the PCC No. 1 injection well. This may be a result of the Seneca Fault affecting the Woodford

thickness via depositional setting or erosion. Kulkarni (2011) indicates that the average total porosity in the Woodford ranges between 4 and 12% and permeability ranges from 145 to 200 nanodarcies. Gupta et al (2013) show a similar range in porosity and permeability from 200 analyzed whole core samples from 6 wells in central Oklahoma. Compositionally, the Woodford Shale is a silica dominated shale, with low proportions of carbonates. Clays are primarily illite and mixed layer illite/smectites (Gupta et al (2013)). Because of these very low permeabilities, the Woodford Shale is capable of providing an effective seal to the underlying Injection Zone.

The base of the UCZ rests unconformably on the top of Ordovician-Cambrian aged formations, referred to as the Arbuckle Group. This group is comprised of the Simpson and Arbuckle formations. Dolomites of the Arbuckle Group comprise the Injection Zone for the PCC No. 1 well.

The Injection Zone (IZ) (Figures F-1 and F-4) is locally considered to be Ordovician-Cambrian aged rock called the Arbuckle Group. The Arbuckle Group includes the Simpson Sand (Burgen equivalent) and Arbuckle Formation. The Sylamore Sandstone, a member of the Simpson Group, is deposited unconformably on the Arbuckle Formation and is present throughout most of the study area. It is relatively thin, averaging 15 feet in the mapped area. However, in the immediate vicinity of the PCC No. 1 injection well, the Simpson Sand is 78 feet thick (Figure F-1), based upon previous maps and log data (ALL Consulting (2006) Figure F-6).

At the PCC facility, the Arbuckle Formation is located at a depth of 383 measured depth (212-mean sea level (msl)). The Injection Interval for the PCC No. 1 injection well is within the Arbuckle Formation, measuring from 451-feet (+139-feet msl) to 912-feet (-322-feet msl) in the open-hole. The Arbuckle Formation may consist of more than 1,000-feet of gross stratigraphic section, made up of cherty dolomites with sandstone lenses. Well data indicates the formation thins eastward at a rate of 100-200 feet per mile (Figure F-5) and thickens to the west. The gross loss of the Arbuckle is attributed to the post-depositional tilting of the region and erosion attributed to the Ozark Uplift.

Lower Confining Zone (LCZ) (Figure F-6) is a tight, non-porous Pre-Cambrian granite that occurs about 1,000-feet below the top of the Injection Zone in the PCC No. 1 injection well area. Based on a limited number of deep well penetrations of the basement within a 7.5-mile radius area, a structure map was generated for the base of the Arbuckle Formation (Figure F-6). The depth of the LCZ changes in the map area from 0-feet msl to greater than -500-feet msl (Figure F-6). The base of the LCZ is unknown.

Petroleum Geology

No oil and gas wells exist near the PCC No. 1 injection well. Within a 2-mile radius of the PCC No. 1 injection well there are 4 injection-related wells (all plugged), 6 domestic groundwater wells, and 6 deep monitoring wells. Because these wells are not oil/gas-related, they are not discussed here.

Structural Geology

To evaluate the subsurface, a series of structure maps were generated for the formations of interest. This included structure maps on the Top of Confining Zone (Figure F-3), the Top of Injection Zone (Figure F-4), and the Top of Lower Confining Zone (Figure F-6). Additionally, a shallower structure map was generated on the top of the Boone Formation (Figure F-7).

The subsurface structure near the PCC No. 1 injection well is considered uniform between formations, recording a gradual westward dip. Minor faulting is identified in the northwestern portion of the map area and appears to be related to the Seneca Fault trend. The maps show that the PCC No. 1 injection well is located on a nose-like structure that dips towards the west-northwest.

The faulting identified in T21N-R19E (Figure F-3) is potentially associated with the regional Seneca Fault. This faulting is located approximately 4-miles northwest of the PCC No. 1 injection well. Throw along the fault appears to increase northward along the fault from 0 to 75 feet, directionally away from PCC. Based upon work performed by Reeder (1971), the fault appears to act as a barrier as evident in water quality (salinity) north of the fault being less saline (i.e., 6,700 parts per million (ppm)) than water south of the fault (37,900 ppm).

Geology of the Injection Zone

The Injection Zone in the PCC No. 1 injection well is the Arbuckle Group. The Arbuckle Group has served as an injection zone for Class I and Class II wells in Oklahoma for nearly 5 decades (Johnson et al., 1980). As currently configured, the PCC injection well is an open-hole completion extending from 451 feet to 912 feet measured depth, in the Arbuckle dolomite. The open hole provides a gross interval thickness of 461 feet of exposed Arbuckle Group rock.

Limited log porosity data is available from the PCC No. 1 injection well within this depth interval. Based on an open hole neutron log, approximately 150 feet of the formation exhibited apparent porosity of at least 10% or more. Based on open hole production logs in the PCC No. 1 well, for this 2017 permit renewal application, a net thickness of 30 feet is used for reservoir engineering calculations. This interval is assigned an average porosity of 10% (ALL Consulting, 2006).

The Arbuckle Group, as used in the PCC No. 1 injection well, is an effective injection zone because:

1. it has sufficient reservoir space (porosity times net reservoir thickness);
2. the injection zone is separated from shallower formations by a laterally-extensive low permeability shale and low permeability carbonates;

3. it is not in an area of active oil/gas exploration or production;
4. only minor surface faulting is evident in the 2.0-mile radius Area of Review, there is no evidence for faulting in the deeper portion of the Area of Review; and
5. it has safely accepted injectate for more than 48 years, with low pressure buildup.

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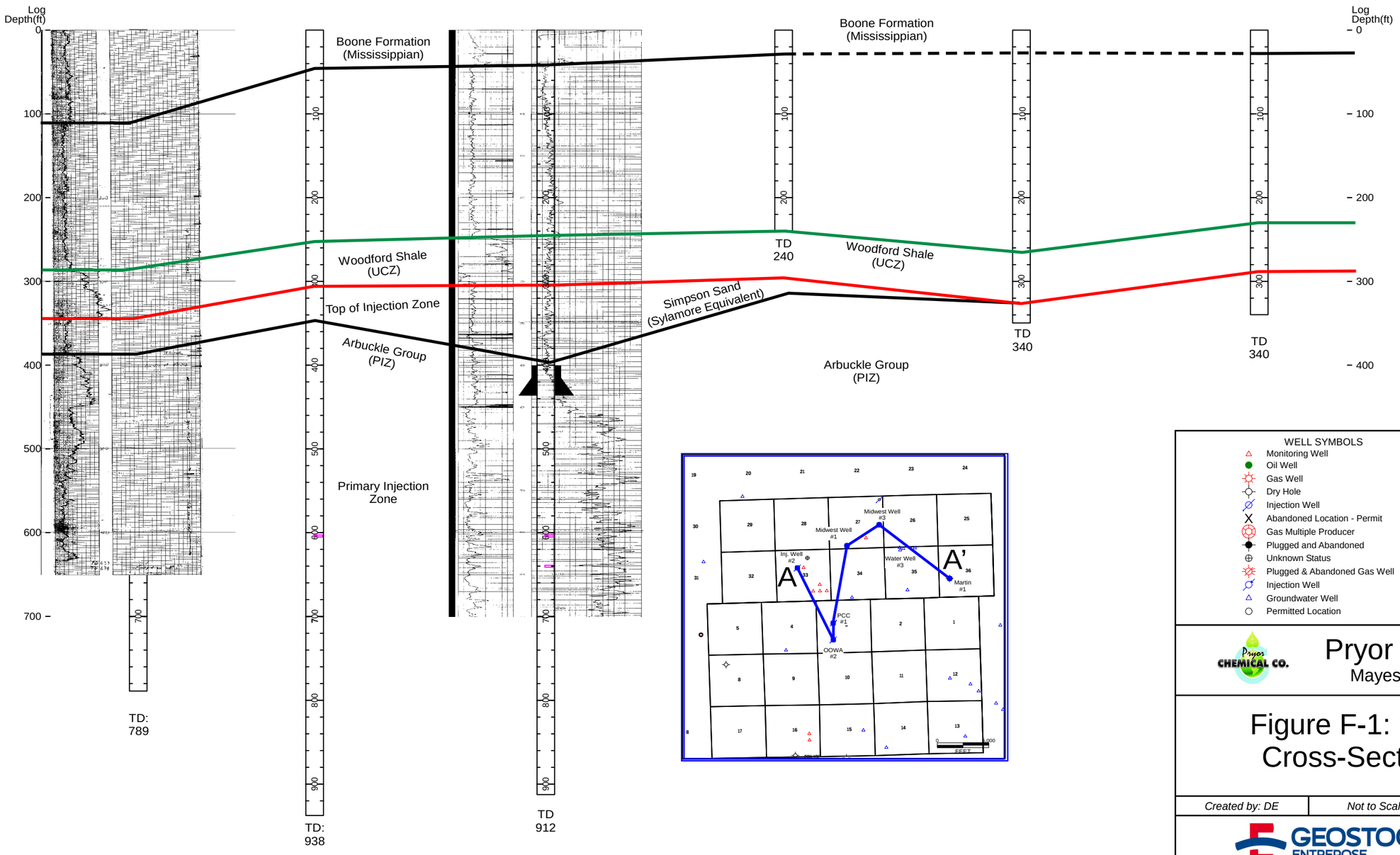
Siebenthal, C.E., 1915, *Origin of the Zinc and Lead Deposits of the Joplin Region, Missouri, Kansas and Oklahoma*, United States Geological Survey, Series 606

FIGURES

A
W

A’
E

Kaiser IW-2	OOWA IW-2	PCC No. 1	Midwest 1	Midwest 3	Martin 1
Datum 599	Datum 600	Datum 590	Datum 600	Datum 345	Datum 600



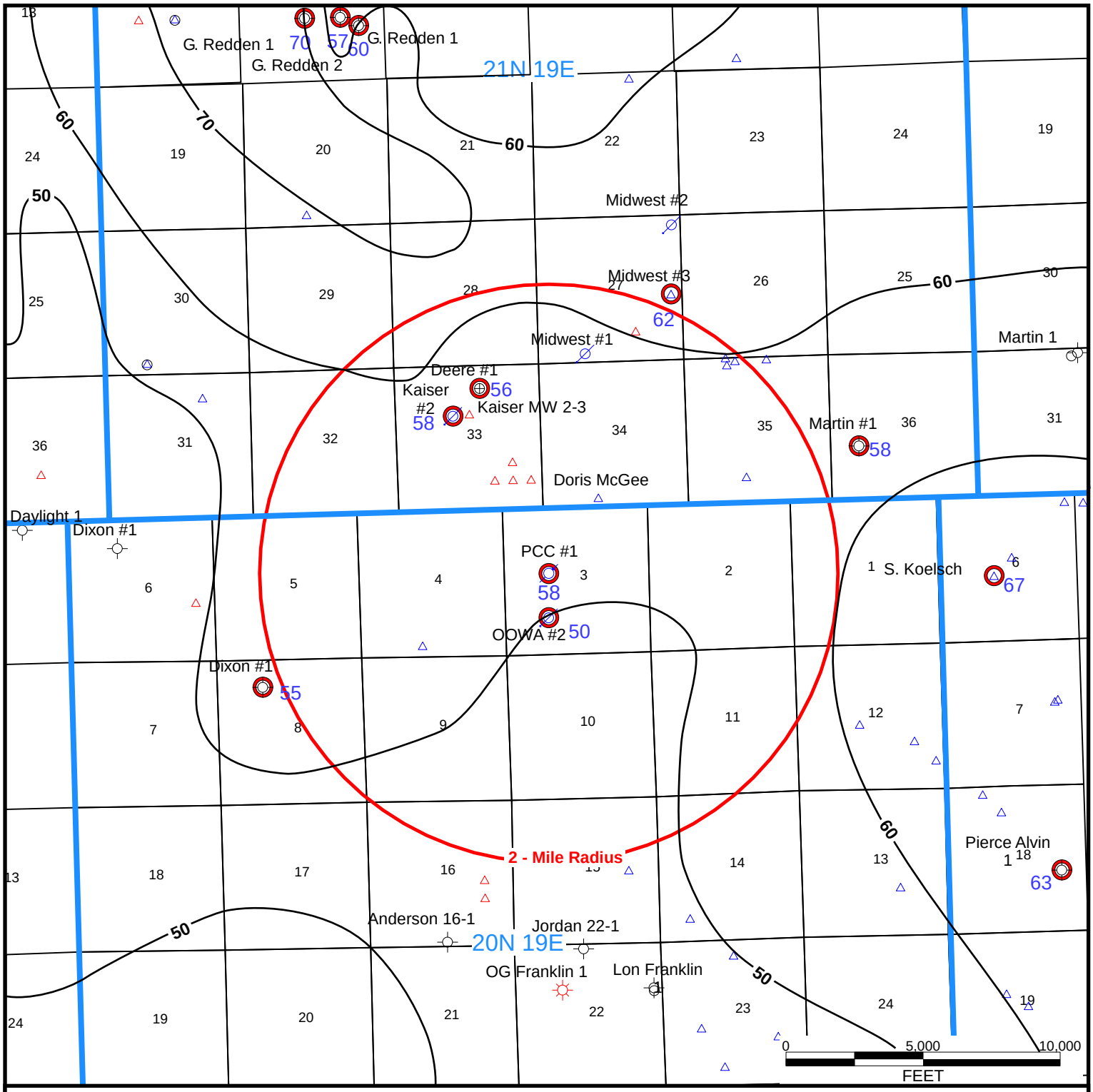
WELL SYMBOLS
- Monitoring Well
- Oil Well
- Gas Well
- Dry Hole
- Injection Well
- Abandoned Location - Permit
- Gas Multiple Producer
- Plugged and Abandoned
- Unknown Status
- Plugged & Abandoned Gas Well
- Injection Well
- Groundwater Well
- Permitted Location

Pryor Chemical Co.
Mayes County, Oklahoma

Figure F-1: Structure Cross-Section A-A’

Created by: DE	Not to Scale	Date: June 2017

GEOSTOCK SANDIA ENTREPOSE



WELL SYMBOLS

- Monitoring Well
- Oil Well
- Gas Well
- Dry Hole
- Injection Well
- Abandoned Location - Permit
- Gas Multiple Producer
- Plugged and Abandoned
- Unknown Status
- Plugged & Abandoned Gas Well
- Injection Well
- Groundwater Well
- Permitted Location

Well Symbol Highlight

Well Name

Formation Top
(subsea value)

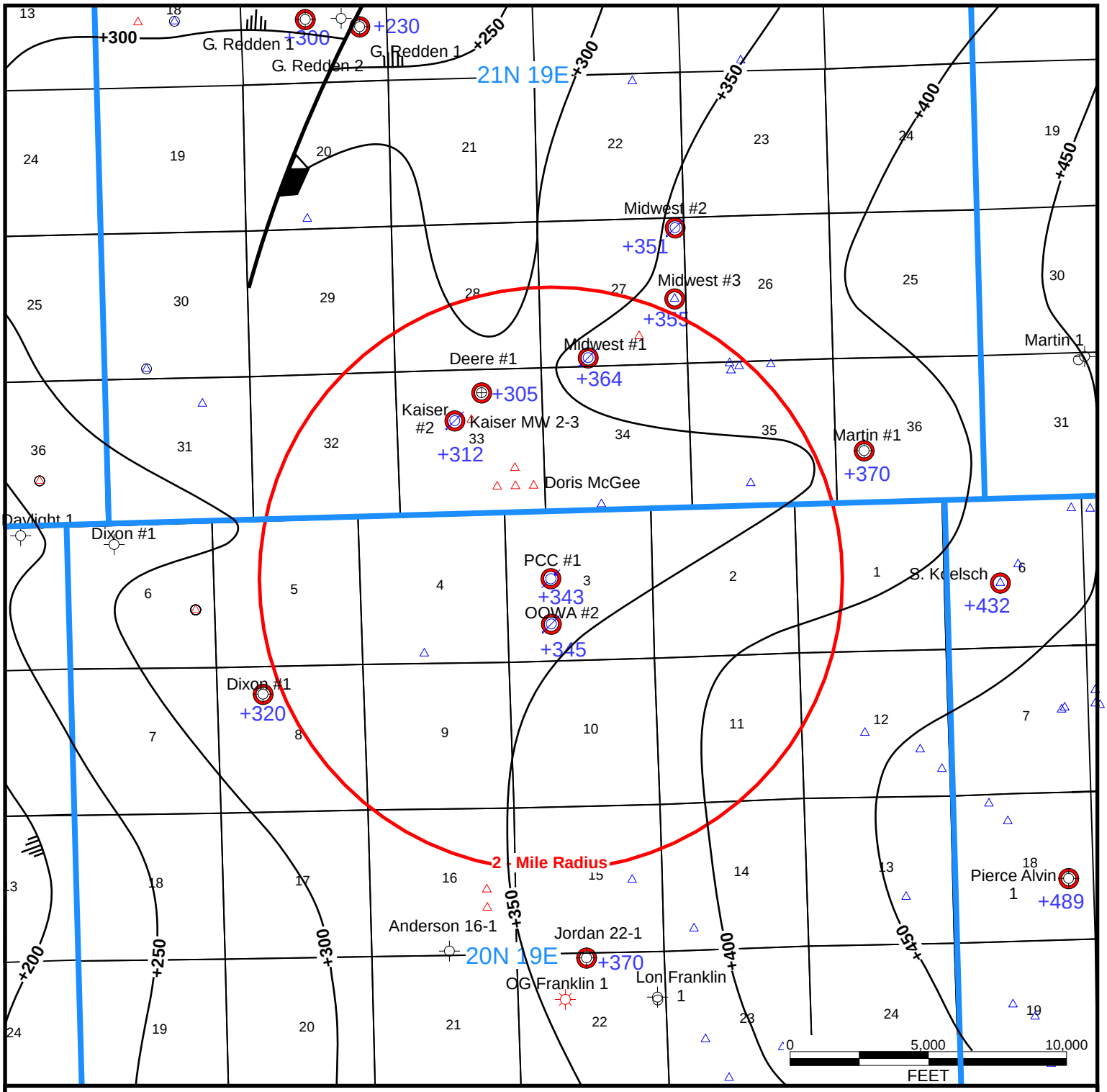
Pryor Chemical Co.

Mayes County, Oklahoma

Figure F-2: Confining Zone (Woodford) Isopach Map

Created by: DC/EDG	C.I. 10 feet	Date: June 2017

GEOSTOCK SANDIA ENTREPOSE



WELL SYMBOLS

- Monitoring Well
- Oil Well
- Gas Well
- Dry Hole
- Injection Well
- Abandoned Location - Permit
- Gas Multiple Producer
- Plugged and Abandoned
- Unknown Status
- Plugged & Abandoned Gas Well
- Injection Well
- Groundwater Well
- Permitted Location

Well Symbol Highlight

Well Name

Formation Top
(subsea value)

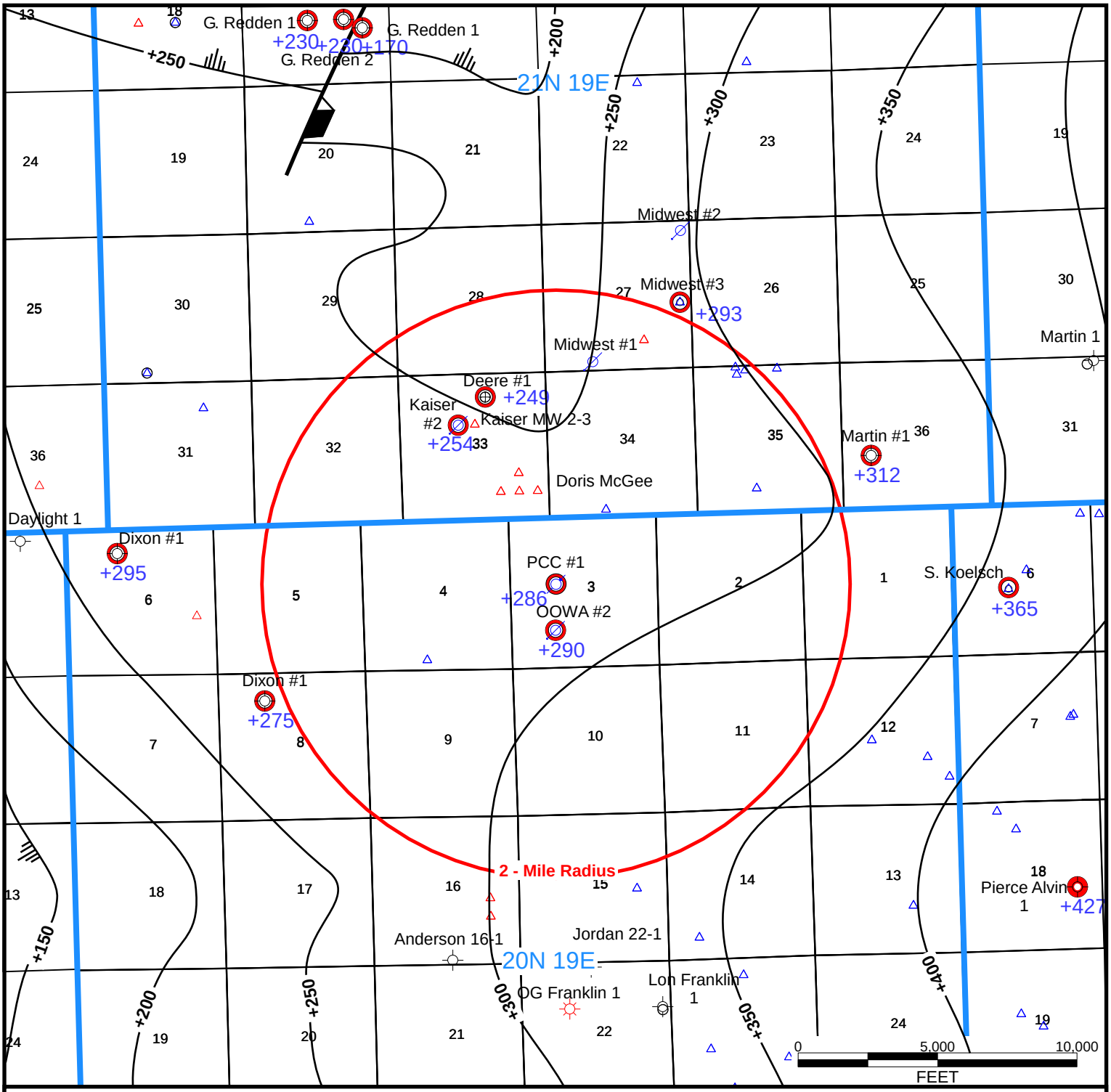
Pryor Chemical Co.

Mayes County, Oklahoma

Figure F-3: Top of Confining Zone (Woodford) Structure Map

Created by: DC/EDG	C.I. 50 feet	Date: June 2017

GEOSTOCK SANDIA ENTREPOSE



WELL SYMBOLS

- Monitoring Well
- Oil Well
- Gas Well
- Dry Hole
- Injection Well
- Abandoned Location - Permit
- Gas Multiple Producer
- Plugged and Abandoned
- Unknown Status
- Plugged & Abandoned Gas Well
- Injection Well
- Groundwater Well
- Permitted Location

Well Symbol Highlight

Well Name

Formation Top (subsea value)

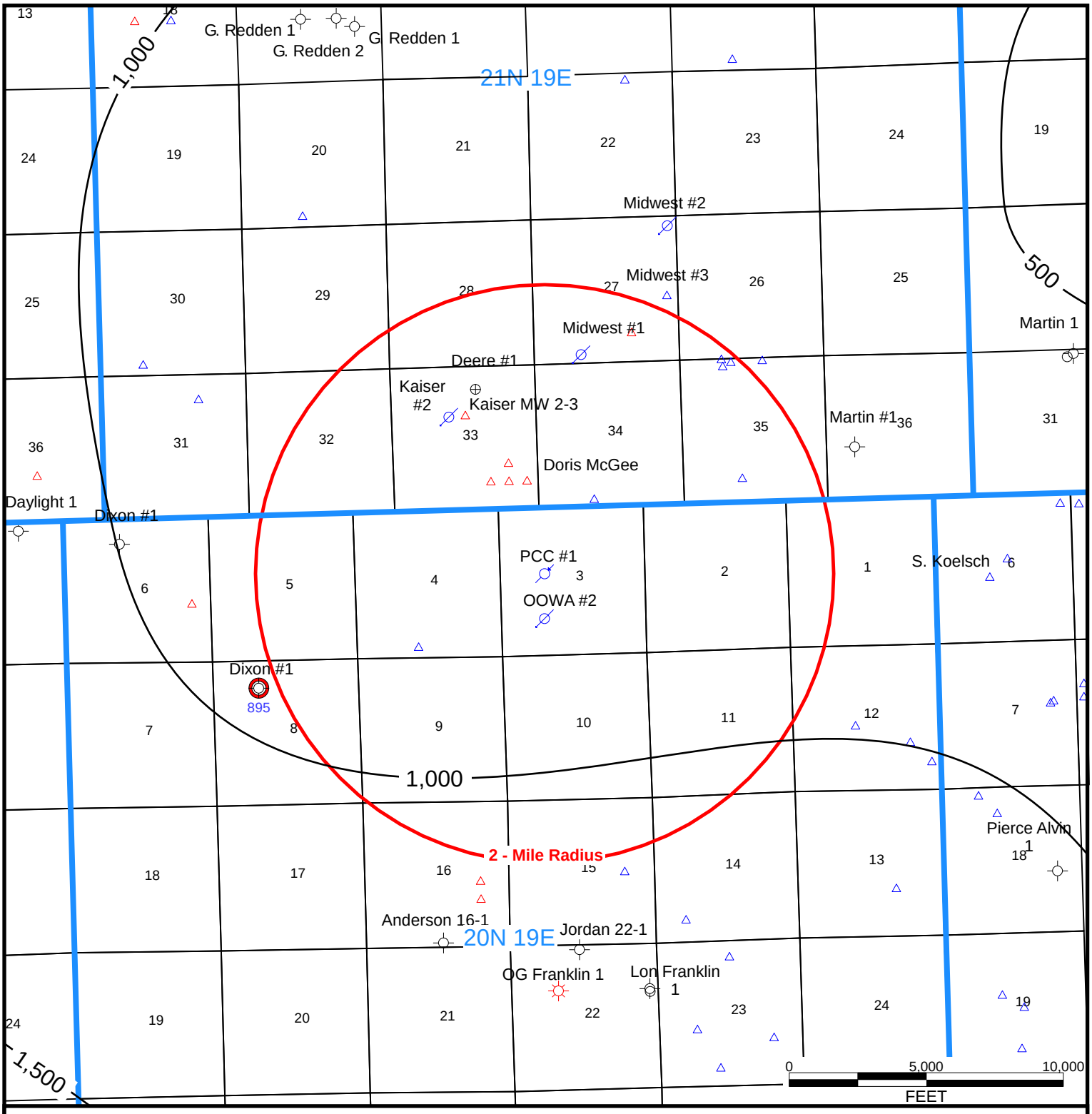
Pryor Chemical Co.

Mayes County, Oklahoma

Figure F-4: Top of Injection Zone (Arbuckle) Structure Map

Created by: DC/EDG	C.I. 500 feet	Date: June 2017

GEOSTOCK SANDIA ENTREPOSE



WELL SYMBOLS

- Monitoring Well
- Oil Well
- Gas Well
- Dry Hole
- Injection Well
- Abandoned Location - Permit
- Gas Multiple Producer
- Plugged and Abandoned
- Unknown Status
- Plugged & Abandoned Gas Well
- Injection Well
- Groundwater Well
- Permitted Location

Well Symbol Highlight

Well Name

Formation Top
(subsea value)

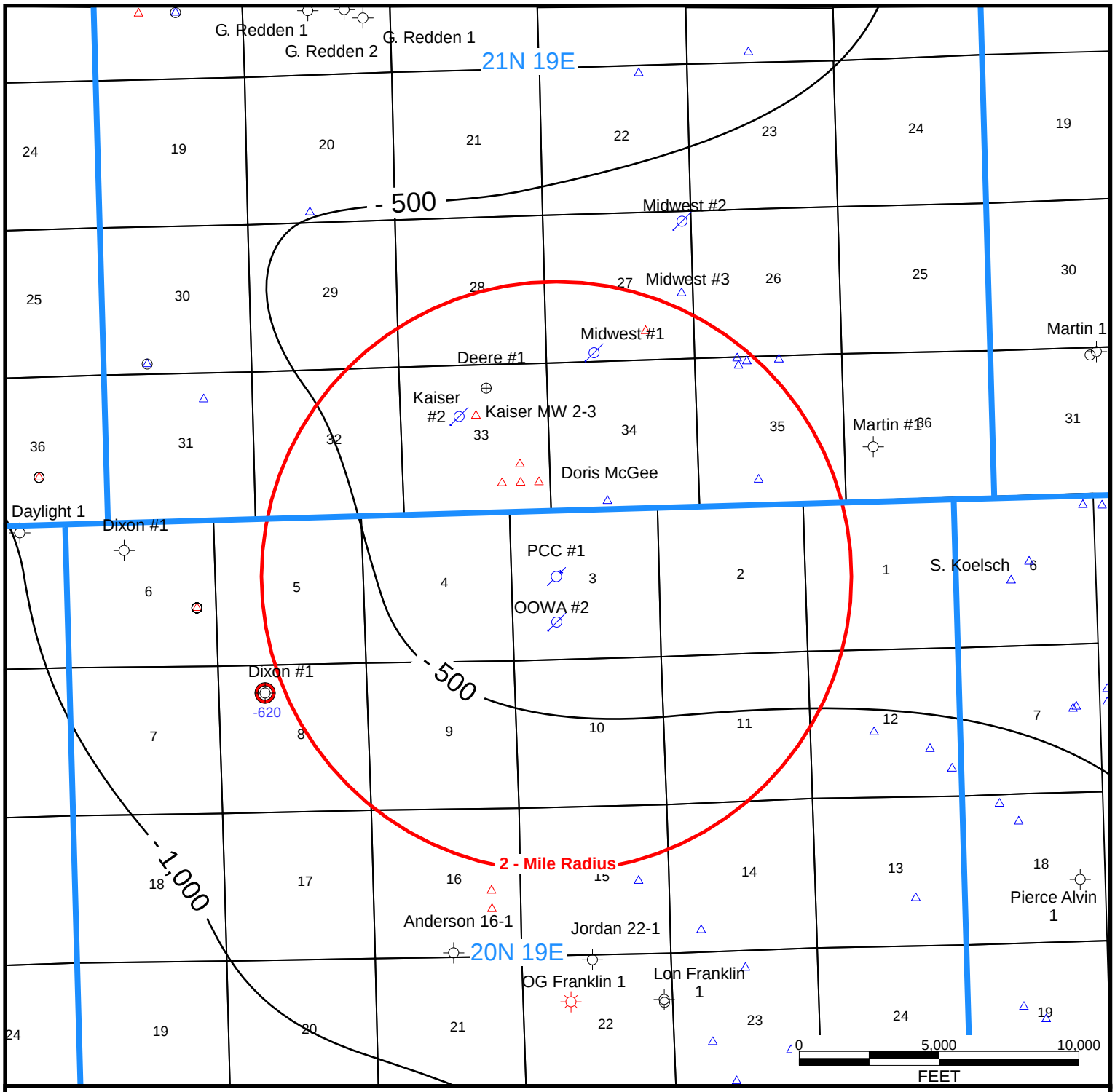
Pryor Chemical Co.

Mayes County, Oklahoma

Figure F-5: Injection Zone (Arbuckle) Isopach Map

Created by: DE & EDG	C.I. 500 feet	Date: June 2017

GEOSTOCK SANDIA ENTREPOSE



WELL SYMBOLS

- Monitoring Well
- Oil Well
- Gas Well
- Dry Hole
- Injection Well
- Abandoned Location - Permit
- Gas Multiple Producer
- Plugged and Abandoned
- Unknown Status
- Plugged & Abandoned Gas Well
- Injection Well
- Groundwater Well
- Permitted Location

Well Symbol Highlight

Well Name

Formation Top (subsea value)

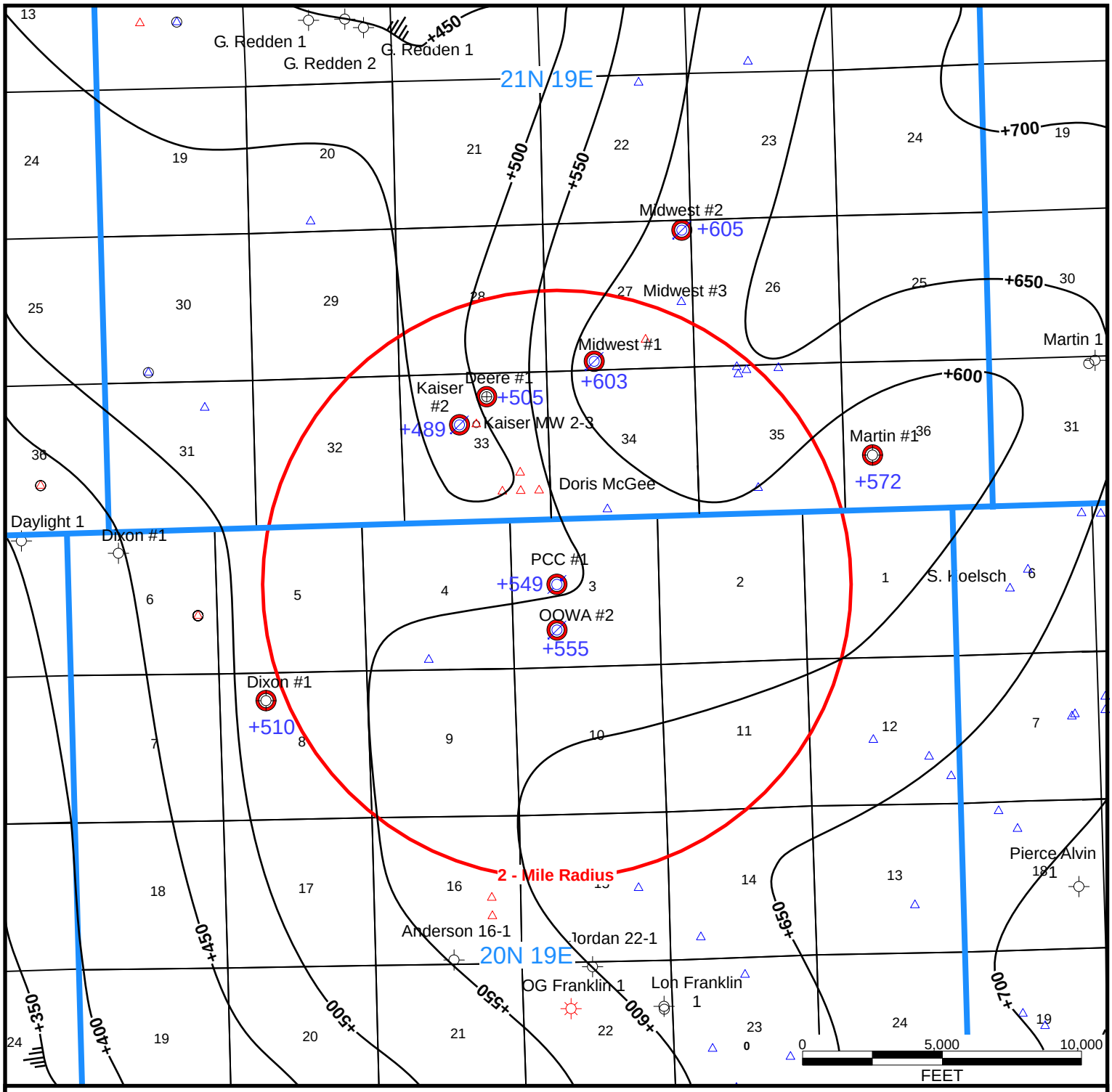
Pryor Chemical Co.

Mayes County, Oklahoma

Figure F-6: Top of Lower Confining Zone Structure Map

Created by: DE & EDG	C.I. 500 feet	Date: June 2017

GEOSTOCK SANDIA ENTREPOSE



WELL SYMBOLS

- Monitoring Well
- Oil Well
- Gas Well
- Dry Hole
- Injection Well
- Abandoned Location - Permit
- Gas Multiple Producer
- Plugged and Abandoned
- Unknown Status
- Plugged & Abandoned Gas Well
- Injection Well
- Groundwater Well
- Permitted Location

Well Symbol Highlight

Well Name

Formation Top
(subsea value)

Pryor Chemical Co.

Mayes County, Oklahoma

Figure F-7: Top of Boone (Mississippian) Structure Map

Created by: DC/EDG	C.I. 50 feet	Date: June 2017

GEOSTOCK SANDIA ENTREPOSE

APPENDIX F-1
LETTER FROM DR. KYLE MURRAY

June 21, 2017

John Carver
Pryor Chemical Company
16 S. Pennsylvania Avenue
Oklahoma City, OK 73107

Dear Mr. Carver,

I reviewed the faults and historic seismic activity in the vicinity of your Class I well and summarize my findings below.

Three faults are located to the west and within about two miles of the Pryor Class I well according to the "Preliminary Oklahoma Optimal Fault Orientations" map by Darold and Holland (2015) of the Oklahoma Geological Survey (OGS). As part of this publication and others by the OGS, the authors established that the regional stress, or maximum horizontal stress field, acting on Oklahoma is directed at about N85E or at an azimuth of 85°. Subject to this regional stress field, faults that are "optimally" oriented to slip are oriented from N45E to N60E, N105E to N120E, or N135E to N150E. From a management standpoint, faults in the "optimal" orientation are most prone to slip when there is a substantial perturbation in the stresses acting on the fault plane so may be of greatest concern. In addition, Darold and Holland (2015) reported that "strike-slip" faults in Oklahoma were most commonly (greater than 90%) displaced during earthquakes in the 2009–2015 timeframe.

The orientations of the fault segments within two miles of the Pryor Class I well are N269E, N7E, N8E, N13E, N15E (sub-optimal) and N197E (moderately optimal), which generally means that they "have a low likelihood to have an earthquake" (Darold and Holland, 2015). In other words the regional stress is acting nearly perpendicular to the plane of the faults and the faults are, in effect, self-sealing. The four nearest earthquakes to the Pryor Class I well were obtained from the OGS Earthquake Catalog, a comprehensive database for seismic activity in Oklahoma from 1882 to May 2017, includes:

- Sep 8, 1978 M 1.4 located 6.0 miles south of the Pryor Class I well (Mayes County)
- Oct 2, 1987 M 1.2 located 14.6 miles west of the Pryor Class I well (Rogers County)
- Jun 11, 1995 M 1.2 located 7.2 miles northeast of Pryor Class I well (Mayes County)
- Apr 1, 2014 M 1.8 located 12.6 miles northwest of Pryor Class I well (Craig County)

The two earthquakes listed above that were in Mayes County are the only earthquakes on record to occur in the County. Because the magnitudes of the aforementioned earthquakes were less than M 2.0 it is highly unlikely that they were felt at the ground surface or caused any ground shaking in the area. These earthquakes and other historic earthquakes in the region are not associated with mapped faults.

Please contact me at murray.geoconsulting.llc@gmail.com or at 210-287-2907 if you want to discuss the findings in more detail.

Sincerely,

Kyle E. Murray, PhD
Principal Scientist - Hydrogeologist
Murray GeoConsulting, LLC

Reference Cited:

Darold, A. P., and Holland, A. A., 2015, Preliminary Oklahoma Optimal Fault Orientations, Oklahoma Geological Survey Open-File Report (OF4-2015): Norman, OK, p. 1 map.

ATTACHMENT G

ATTACHMENT G

Geologic Data on Injection and Confining Zones (CLASS II)

Not applicable to a Class I well.

ATTACHMENT H

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Operating Data

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Operating Data

The PCC injection well system operates as needed to dispose of contaminated storm water runoff, boiler blowdown, cooling tower blowdown, scrubbing system blowdown, and process flush water. The injection rate is adjusted as necessary to meet the demands of plant production. The average and maximum flow rates requested for the injection well and the maximum injection pressure are discussed in the following sections.

Maximum Injection Rate

PCC's existing permit (IW-NH-49022-R1) notes a maximum injection rate of 175 gallons per minute (gpm). PCC has initiated significant source reduction efforts over the past three years resulting in a recent average daily injection rate of approximately 60 gpm. Assuming the 60 gpm rate, the average well in flow will be 86,400 gallons per day (gpd) and at the current maximum permitted injection rate of 175 gpm the maximum flow to the well will be 252,000 gpd. PCC modeled future injection at the maximum injection rate of 175 gpm (see Reservoir Mechanics, Volume I). PCC is requesting that the instantaneous injection rate be calculated and limited as follows:

TABLE H-1
Requested Injection Rate Limitations

Injection Interval	Instantaneous Injection Rate (gpm)	Cumulative Monthly Volume (Gallons)	Cumulative Annual Volume (Gallons)
Arbuckle Interval Maximum	175	7,670,250	92,043,000

* Note cumulative monthly volume based on a 30.4375-day month and cumulative annual volume based on a 365.25-day year; these values are consistent with the time-steps used in the DuPont Deepwell Models

Average and Maximum Injection Pressure

PCC anticipates that maximum daily flow to the injection well will be no more than 252,000 gpd (175 gpm) at full facility operation. The current permitted injection pressure is 450 psi. PCC has supplied the Oklahoma Department of Environmental Quality (ODEQ) with operating data demonstrating compliance with these limits. PCC plans to perform a well workover and stimulation during the third quarter of 2017. After completion of this workover, PCC will forward its anticipated average and maximum operating pressures to ODEQ.

Well Maintenance and Operation

PCC operates the well in compliance with the requirements specified in the current injection permit. The well and surface facilities are maintained in good working order. The well is identified by a posted sign containing the company name, company well number, and ODEQ permit number (see Figure H-1).

Pressure gauges installed at the wellhead, on the injection tubing, and on the annulus between the injection tubing and the long string casing are maintained in good working order at all times. Continuous recording devices record the following data:

- Injection tubing pressures
- Injection flow rates
- Injection fluid temperatures
- Injection volumes
- Tubing by long string casing annulus pressure
- Tank levels
- Injection pump motor amperage

Annulus pressure is maintained above the injection pressure at all times, including those times when the facility is not injecting.

All gauges, pressure sensing devices, and recording devices are tested and calibrated at least quarterly, and the records are maintained at the facility. All instruments are housed in weatherproof enclosures. Monthly average, maximum and minimum values for injection pressure, rate, and annulus pressure are reported quarterly to the ODEQ per 40 CFR §146.13(c)(ii).

Mechanical Integrity Test (MIT) is performed for the injection well at least once every 5 years, and a pressure fall off test is performed at least annually in accordance with 40 CFR §146.13(b)(3) and 40 CFR §146.13(d). Test results are submitted to the ODEQ per the reporting frequencies of 40 CFR §146.13(c)(2).

An automatic interlock system is in place in the event that pressures, flow rates, or other parameters designated by the Executive Director exceed a range or gradient specified in the injection permit.

FIGURES

Figure H-1 PCC Injection Well No.1 Well Signage

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Formation Testing Program

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ATTACHMENT I

Formation Testing Program

The PCC No. 1 injection well has been operational since 1969. Initial installation of the well yielded information on the injection zone and formation fluids. PCC acquired the injection well in 2000, and has conducted annual ambient pressure falloff tests since then. Test reports detailing the procedure, results, and analysis of the results were submitted to the ODEQ to meet the requirements of 40 CFR 146.13(d). Details of the historical annual testing operations are included in the Reservoir Mechanics section of this permit application. (See Volume 1.)

Table I-1 summarizes the formation tests performed and lists the test date, test injection rate, and duration of the falloff period.

TABLE I-1
Historical Formation Test Dates

Month & Year	**Test Injection Rate** (gpm)	**Duration of Falloff Period** (hours)
Jun 1988	189	-unknown-
Apr 1989	174	-unknown-
Mar 1992	162	-unknown-
Apr 2001	170	64.5
Apr 2002	170	119.2
Apr 2003	174	72.0
May 2004	149	72.0
May 2005	146	72.0
May 2006	128	72.1
May 2007	130	73.0
May 2008	138	72.0
May 2009	138	81.3
May 2010	138	48.1
May 2011	138	72.0
May 2012	138	72.0
Aug 2013	138	71.8
Jul 2014	125	70.9
Sep 2015	115	72.3
Aug 2016	115	71.1

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Attachment J
Stimulation Program

ATTACHMENT J

Stimulation Program

If required, typically the PCC injection well will undergo an acid stimulation procedure. Acid volumes are determined by a review of well performance data and formation characteristics determined from wireline log evaluation and core analysis. The acid mixture and emplacement procedures are designed to improve well performance/injectivity.

A well stimulation was performed on the PCC No. 1 injection well in May 2016 and can serve as an example of a basic stimulation procedure. The procedure would be modified to tailor results based on well performance ahead of the stimulation. The basic stimulation procedure can be described as follows.

1. Provide notice of the planned stimulation to the Oklahoma Department of Environmental Quality (ODEQ).
2. Contract required equipment from third-party vendors.
3. Spot temporary storage tanks to hold clean water and receive flowback water in an area convenient to the wellhead. Provide secondary containment (earthen berms, plastic lining) for the flowback tank.
4. Mobilize pressure control and tubing service companies.
5. Rig up coiled tubing and sand mixing equipment.
6. Lock wellhead and remove the uppermost wellhead flange.
7. Attach a companion flange and flow tee to the wellhead.
8. Route flowback iron from the wellhead to the flowback tank.
9. Install a blind on the flowline to the injection well to prevent flowback liquids from entering it.
10. Fill the coiled tubing (1-3/4-inch diameter) with water.
11. Attach jetting equipment to the coiled tubing bottomhole assembly and test that it is functional.
12. Attach the injector head, riser, and blow out preventers to the wellhead equipment and pressure-test them.
13. Open and lower the jetting tool into the openhole section of the wellbore while circulating water at a pre-determined rate. If solids are found in the borehole, circulate them from the borehole until the coiled tubing reaches the well's total depth (912 feet). Reciprocate the coiled tubing during the circulation period rather than allow it to deliver flow to a single point in the wellbore.
14. Load the coiled tubing with sand-laden water, and begin jetting operations. Jet the openhole portion of the borehole from total depth (912 feet) to the casing shoe using a pre-

determined volume of sand (i.e., 7,500 lb of 100 mesh sand). Recover fluid returned during the circulation and jetting process.

15. When all sand introduced to the well is circulated from the coiled tubing, retrieve the jetting tool to the surface and lay it down along with the drilling motor.
16. Attach a multi-port wash tip to the end of the bottomhole assembly and lower the coiled tubing into the wellbore while circulating water and nitrogen.
    a. Reciprocate the wash tip in the openhole section while flowing back the well.
    b. Target a flowback rate equivalent to the rate introduced through circulation. Equivalent rates will indicate no contribution from the formation.
    c. Circulate until sand content in fluid returns diminishes substantially.
    d. End nitrogen injection, and flow residual nitrogen from the wellbore.
17. Rig up acid transport(s) on location and rig up the pump that will deliver acid to the wellbore. Note that acid volume and concentration will be specified for the well condition. A recent cleaning event used 4,200 gallons of 28% hydrochloric acid.
    a. Pump acid through the coiled tubing and emplace acid into the openhole section of the wellbore while retracting the end of the coil from total depth (912 feet) to the casing shoe (451 feet).
    b. Displace acid from the coiled tubing with potassium chloride fluid. The volume will be designed by the well engineer. A recent cleaning event used 10 barrels of 3% potassium chloride fluid, 10 barrels of caustic water, followed by 50 barrels of fresh water.
    c. While displacing, pull the wash tip to above the wellhead and complete displacement step from that point.
18. Leave, in the injection tubing, 3 barrels of 3% potassium chloride fluid and 2 barrels of caustic water.
19. Shut in the wellbore.
20. Displace water in the coiled tubing to the flowback tank with nitrogen.
21. Initiate rig down operations. Rig down the coiled tubing unit, nitrogen unit, fluid pump, sand mixing system, and flowback iron.
22. Re-attach the surface piping and instrumentation to the wellhead.
23. Return the well to Pryor facility personnel for injection service.
24. Clean solids from the flowback tank, and place material in a vacuum box for sampling, classification, and subsequent off-site disposal.
25. Rinse frac tank. Schedule demobilization of the freshwater and flowback tanks.
26. Demobilize remaining rental equipment.

Stimulation operations may be completed in the future if the injection well reservoir parameters derived from daily operations (injection pressure increase, reduced injection rate, etc.) or from the

annual well testing indicate reservoir damage that may be alleviated through a wellbore cleanout/backwash or by chemical stimulation. As needed, stimulation procedures may vary from those noted above and will be submitted to ODEQ for approval prior to conducting field work.

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Injection Procedures

The Pryor Chemical Company (PCC) generates wastewater streams that are discharged to the OOWA POTW (via Oklahoma Ordnance Works Authority – Industrial User Permit No. 106) or are disposed of in the PCC No. 1 injection well, located on-site.

Several PCC chemical manufacturing units/plants operate on a continuous basis:

- #4 Ammonia Plant
- #2 Urea Plant
- #1 Acid Plant
- #4 Acid Plant
- CO_2 Plant
- #2 Ammonium Nitrate Solutions Plant
- UAN Blending Plant

Wastewater streams generated in these areas include contaminated storm water runoff, boiler blowdown, cooling tower blowdown, scrubbing system blowdown, and process flush water. The wastewaters are collected in a system of interconnecting piping, concrete trenches, sumps, and concrete pits. These are pumped through the collection system to above ground tanks and then pumped into the injection well. Prior to injection, the wastewater undergoes pH neutralization using sulfuric acid, oil removal by a skimming system, and solids removal (i.e., settling at multiple stages).

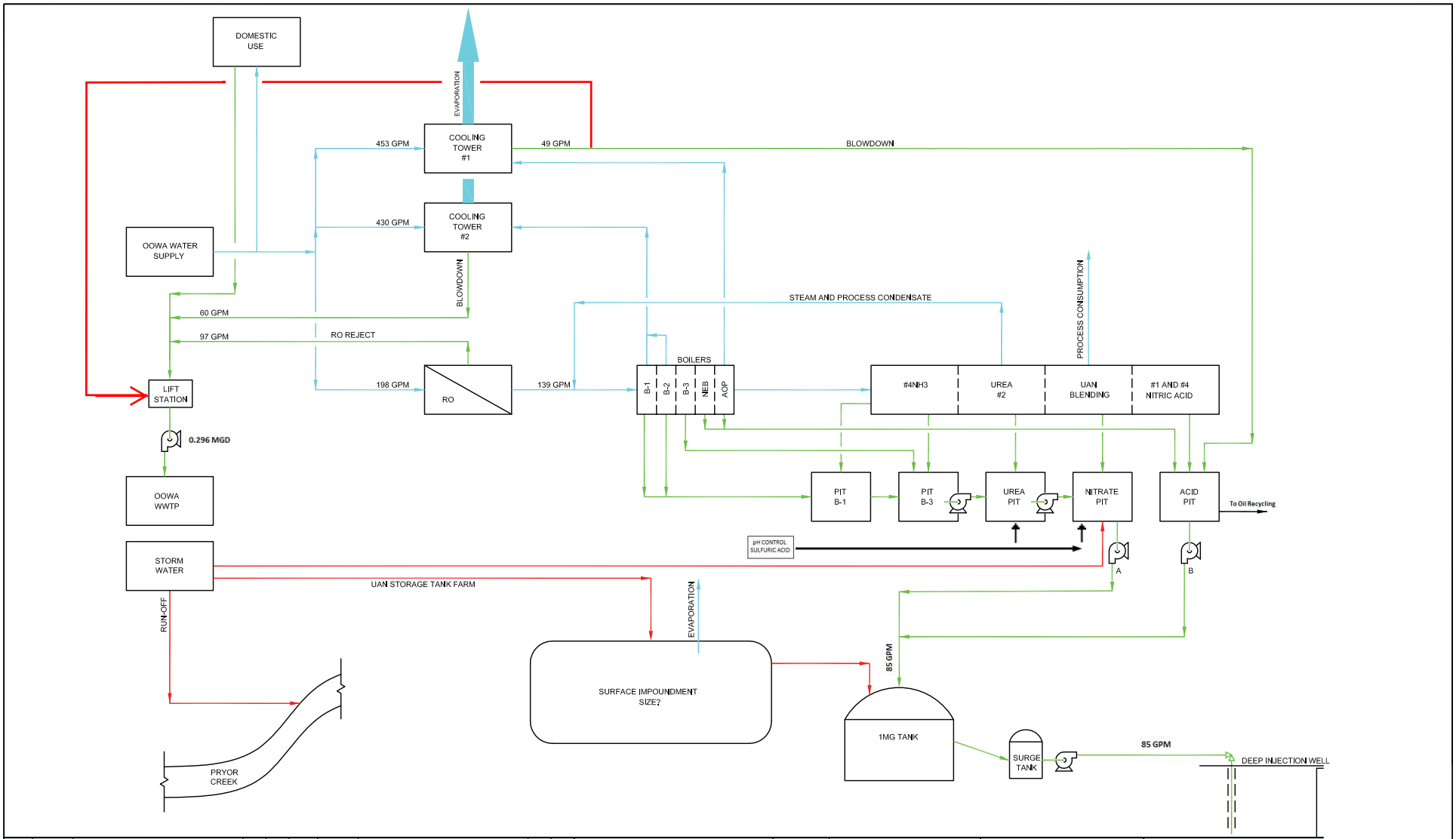
The injection pumps are located inside a building to provide for weather protection. Secondary containment is provided for the pumps, and spills/leaks are collected and processed for appropriate disposal.

Pressure gauges installed at the wellhead on the injection tubing and on the annulus between the injection tubing and the long-string casing are maintained in good working order at all times. Continuous recording devices record the following data:

- Injection tubing pressures
- Injection flow rates
- Injection fluid temperatures
- Injection volumes
- Tubing by longstring casing annulus pressure
- Tank levels
- Injection pump motor amperage

All gauges, pressure sensing devices, and recording devices are tested and calibrated quarterly. Test and calibration records are maintained at the facility. All instruments are housed in weatherproof enclosures.

FIGURES



MK	DATE	REVISIONS	BY	AP.
P1	--/--/--	ISSUED FOR REVIEW	AMM	BW

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DWG. NO.	REFERENCE DRAWINGS

PRYOR CHEMICAL CO.
PRYOR, OKLAHOMA

FIGURE 2.2 EXISTING WATER I-LINE DIAGRAM

DES. BW	JOB NO.	DWG. NO.
DR. AMM	SCALE: NONE	
CH. BW	DATE: 02/25/16	REV. P1
AP. BW	SHEET: 1 OF 1	

Figure K-1 Piping & Instrumentation Diagram - Injection Well System

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Construction Procedures

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Construction Procedures

Introduction

The PCC No. 1 injection well was originally installed by the Oklahoma Ordnance Works Authority (OOWA) in 1968 and injection began in 1969. The facility was transferred to Wil-Gro Fertilizer in 1989. In December 2000, LSB Industries, the parent company of PCC, acquired the site and injection well. From 2000 and into 2009, the injection well was used for the management of storm water only. Since 2009, when operations were commissioned, PCC has also operated the injection well as required to manage injectate generated from the manufacturing of fertilizer and related products.

Original Installation

The PCC No. 1 injection well was drilled in 1968 by the OOWA to a total depth of 912 feet below ground level (bgl) and completed as an open hole (417 – 912 feet bgl) in the permitted injection zone (Arbuckle Group). The Confining Zone was designated as the Woodford Shale which is located at a depth between 270 to 320 feet bgl.

A 14-inch surface casing string was installed to 20 feet bgl and cemented in place. A 10-inch protection casing string was set at 417 feet bgl and cemented to surface.

Workover History

The injection well underwent a major workover in January 1969, when 7-inch casing was installed to 451 feet. The casing was cemented by circulating cement to the surface. The well was completed with a 4.5-inch injection tubing and Baker Model A-3 Lok-Set Retrievable casing packer set at a depth of 364 feet bgl in the 7-inch casing.

A second workover was performed in 2011 to install a 5-1/2-inch casing to 413 feet. The casing was cemented to surface. A 3-1/2-inch tubing string was installed to 405 feet and held in place by a D&L Casing Packer set at 369 feet bgl. The tubing delivers injectate to the open hole portion of the well, between depths of 451 to 912 feet bgl.

Well Casing and Tubing

Specifications

Tubular	Length (feet)	Size (inch)
Surface Casing	20	14
Casing	417	10
Casing	451	7
Casing	413	5-½
Injection Tubing	405	3-½

Various operators, including the OOWA, Cherokee Nitrogen Co., Wil-Gro Fertilizer, and Pryor Chemical Company have operated the well for waste disposal injection since 1969. Since the 1960s the facility has manufactured nitrogen fertilizers and associated products. Anhydrous ammonia, urea ammonium nitrate solution, and carbon dioxide are the main products produced by the plant. Currently, the plant runs on a 24-hour schedule. In addition to contaminated storm water, the injection well is used to dispose of select process waste.

Well Construction Engineering Schematic

For an engineering schematic of the current completion in the PCC No. 1 injection well, see Figure M-1. The schematic shows casing measurements and setting depths, cement information, and completion details. The annulus system configuration is shown in Figure M-2.

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Construction Details

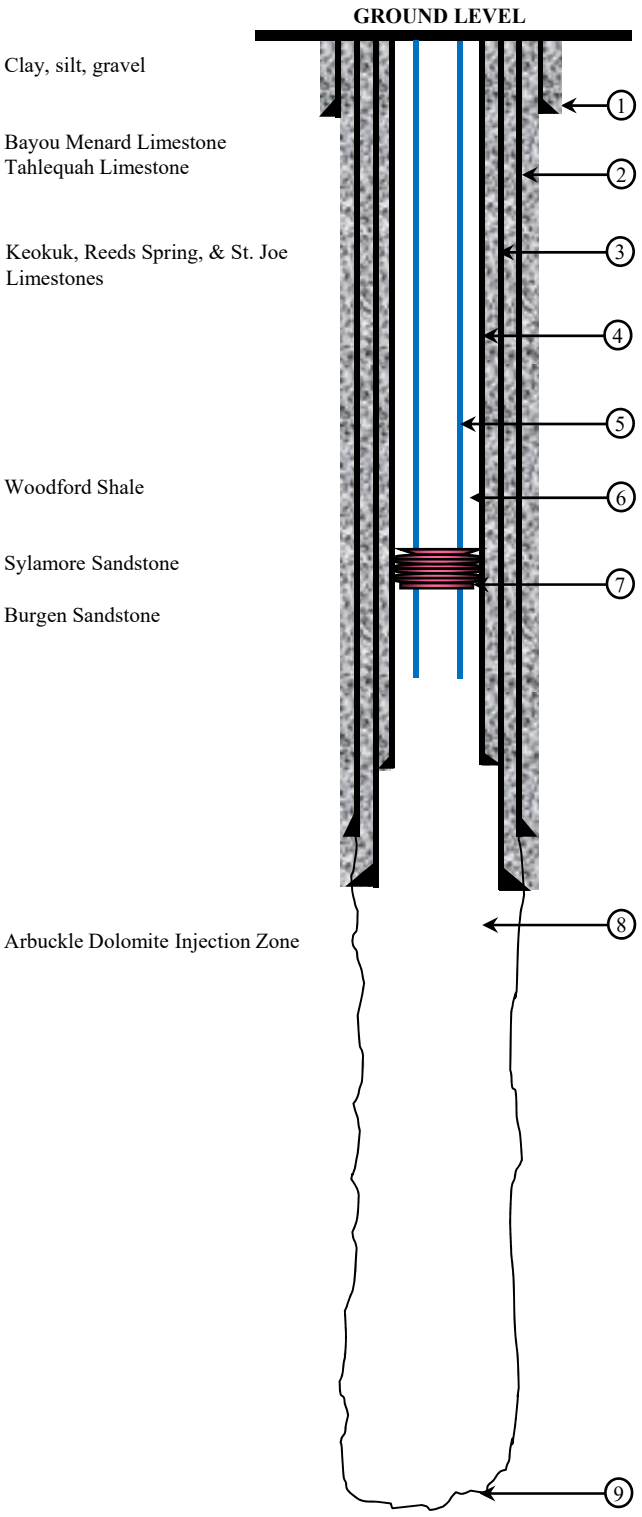
Construction details for the Pryor Chemical Company (PCC) No. 1 injection well are shown on Figure M-1 (wellbore schematic) and Figure M-2 (wellhead and annulus system).

FIGURES

Pryor Chemical Company

Mayes County Oklahoma

Injection Well No. 1 (IW-NH-49022-R1)



COMPLETION DETAILS

1. **Surface Casing**: 14” set at 20’ cemented to surface.
2. **Protection Casing:** 10” set at 417’ cemented to surface.
3. **Casing:** 7” set at 451’ cemented to surface.
4. **Casing:** 5-1/2” set at 413’ cemented to surface with 60 sx Class A Portland cement (no additives). Casing is flush-joint 17 lb/ft, J-55, Range 3, 8rd.
5. **Tubing:** 3-1/2” set at 405’. Tubing is flush-joint 9.3 lb/ft, N-80, CS Hydril, R-2
6. **Annulus fluid:** Water with inhibitor
7. **Packer:** D&L Casing Packer set at 369’.
8. **Open Hole:** 912’ to 451’.
9. **Total Depth:** 912’.

Figure M-1: PCC No. 1 Injection Well Completion Schematic

GEOSTOCK SANDIA ENTREPOSE
8860 Fallbrook Drive, Houston, TX 77064
Tel: (346) 314-4347 Fax: (832) 478-5172

Checked by: NM	Date: 3/31/2017	*Drawing not to scale*

REVISIONS					
ZONE	REV	DESCRIPTION	DATE	DR	APVD
	0		05/03/17	FOX-1	

LOCALLY MOUNTED (FIELD)

CONTROL ROOM – PANEL MOUNTED

PLC/HMI FUNCTION

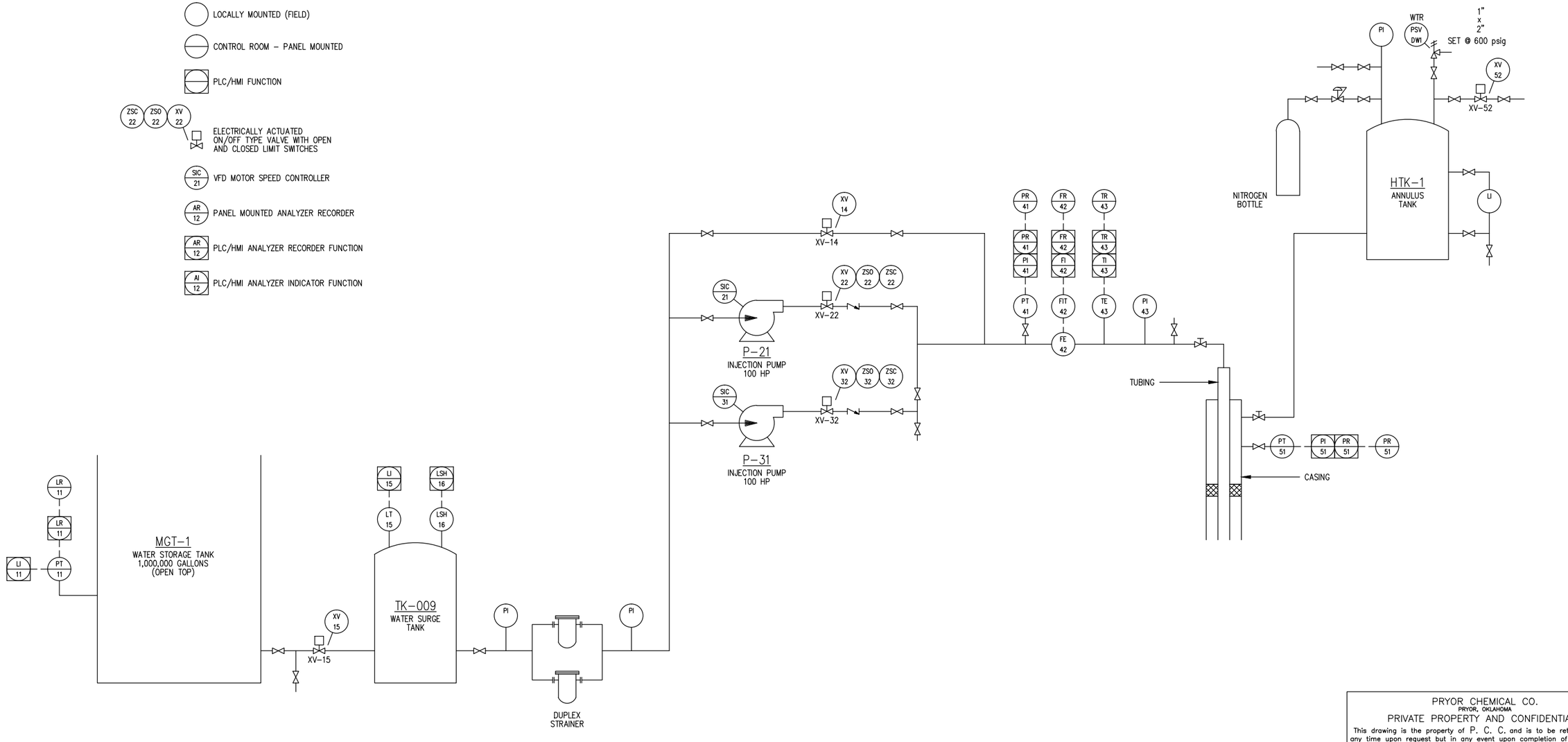
ZSC 22 / ZSO 22 / XV 22 — ELECTRICALLY ACTUATED ON/OFF TYPE VALVE WITH OPEN AND CLOSED LIMIT SWITCHES

SIC 21 — VFD MOTOR SPEED CONTROLLER

AR 12 — PANEL MOUNTED ANALYZER RECORDER

AR 12 — PLC/HMI ANALYZER RECORDER FUNCTION

AI 12 — PLC/HMI ANALYZER INDICATOR FUNCTION



			PRYOR CHEMICAL CO. PRYOR, OKLAHOMA	
			PRIVATE PROPERTY AND CONFIDENTIAL	
			This drawing is the property of P. C. C. and is to be returned at any time upon request but in any event upon completion of the work of job. Information contained hereon is confidential and must not be reproduced without written permission of P. C. C.	
			PLANT: PRYOR, OK	DEPT: –
			INJECTION WELL UPGRADE WATER SYSTEM PIPING & INSTRUMENT DIAGRAM	
			DR BY: MDT	CHK: JTH/GLB
------	------ -------		APVD: –	SCALE: NONE
REF NO.	TITLE	REF IDENT NO.	DATE: 05/03/17	DWG NO. 13053-P01 REV 0
	REFERENCES		SH 1 OF 1	

Figure M-2: Injection Wellhead and Annulus Pressure System

FILE NAME: 13053-P01

ATTACHMENT N

ATTACHMENT N

Changes in Injected Fluid (Class III Wells Only)

Not applicable to a Class I well.

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Plans for Well Failures

ATTACHMENT O

Plans for Well Failures

Pressure Increase

The operating injection pressure will not be allowed to rise above the permitted limit at any time. This is accomplished by means of a programmable logic controller (PLC) system consisting of sensors, actuated valves, variable frequency drives, and control configurations with interlocks. If the injection well performance degrades to a point such that the pressure limit cannot be maintained without implementing significant injectate flow reductions, the well will be shut in and mechanical work over will be performed to improve the injectivity of the well (see Attachment J). If the work undertaken does not reduce the injection pressure, additional studies and testing will be conducted to determine the cause of the pressure increase and a remedial strategy will be developed.

If an injection well shutdown is triggered, PCC will immediately investigate and, as expeditiously as possible, identify the cause of the abnormal operating condition. If, upon investigation, the well appears to lack mechanical integrity, PCC will:

1. Immediately cease injection of effluent unless continued or resumed injection is authorized by the Executive Director.
2. Take steps necessary to determine the presence or absence of a leak.
3. Notify the Executive Director within 24 hours of the shutdown.

If a loss of mechanical integrity is discovered during the investigation (or during required mechanical integrity testing), PCC will:

1. Cease injection immediately.
2. Determine if an effluent release into an unauthorized zone has occurred.
3. Notify the Executive Director within 24 hours of discovery of loss of mechanical integrity.
4. Notify the Executive Director when injection can be expected to resume.
5. Restore and demonstrate mechanical integrity, or demonstrate that continued injection will not cause movement of fluid into or between USDWs, to the satisfaction of the Executive Director prior to resuming effluent injection.

If there is evidence that there has been a release to an unauthorized zone PCC will:

1. Notify the Executive Director within 24 hours of obtaining such evidence.
2. Take steps to identify and characterize the extent of the release.
3. Propose a remediation plan for review and approval.
4. Comply with and implement any remediation plan specified by the Executive Director.
5. Notify the local health authority, place a notice in a newspaper of general circulation, and send notification by mail to adjacent landowners when there has been a release into a groundwater-bearing zone.

Fluid Migration

If any injection survey indicates injection fluid migrating above the authorized Injection Interval, tests will be run to determine how the fluid is leaving the reservoir and where it is going. If the migrating fluid were to pass into the groundwater-bearing zone, PCC will shut in the well, perforate the casing above the injection zone and perform a "squeeze cement" job to stop the migration. If all measures fail, the injection zone will be squeeze-cemented and plugged. The well will be plugged and abandoned according to the Plugging and Abandonment Plan in Attachment Q, as required by 40 CFR §146.14 (a)(12).

Annulus Pressure or Annulus Tank Volume Changes

The annular system utilizes an annulus tank filled with glycol that is pressurized with compressed air. The tank has sensors and relief valves to monitor the well annulus pressure and annulus tank fluid level. The system is designed to maintain positive annulus pressure in excess of the injection pressure. A drawing of the well annulus monitoring system is shown in Figure M-2.

Seasonal changes are expected in the annulus volume and pressure due to temperature-induced fluid expansion and contraction, potentially requiring periodic adjustments to the annulus pressure and/or annulus tank fluid volume. These changes will be noted on the charts recording the annulus pressure and volume. If there are significant and/or sudden changes to the annulus pressure or volume, the well will be shut in and the cause of the problem will be investigated. If the results of the testing indicate a loss in mechanical integrity, the well will remain shut in until appropriate repairs can be made.

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Monitoring Program

Injection Wellhead Monitoring Program

PCC monitors the Class I well to ensure compliance with the provisions specified or referenced in the Oklahoma Department of Environmental Quality (ODEQ) operating permit (IW-NH-49022-R1). The well and surface facilities are maintained in good working order. Pressure gauges installed at the injection wellhead, on the injection tubing, and on the annulus between the injection tubing and the long-string casing are maintained in good working order. Continuous recording devices installed at the surface facilities record the following data:

- Tank levels
- Injection tubing pressures
- Injection flow rates
- Pump amperage
- Annulus pressure
- Injection fluid temperatures

All gauges, pressure sensing devices, and recording devices are tested and calibrated at least annually, and these records are maintained at the facility. All instruments are housed in weatherproof enclosures. Quarterly reports are submitted in accordance with 40 CFR §146.13(c) addressing the physical and chemical characteristics of injection fluids and data from the monitoring well consistent with 40 CFR §146.13(b). Monitoring taps as required by Oklahoma Administrative Code (OAC) 252:652-7-1(2) (ODEQ Permit Condition A.7) are located by the wellhead adjacent to the pressure monitoring equipment.

Pressure falloff tests are conducted annually with results reported to the ODEQ per 40 CFR §146.13(d). Annulus pressure tests are conducted by ODEQ personnel semi-annually per the requirements of OAC 252:652-9-1(4). Once each five years, the well's mechanical integrity is tested by conducting a differential temperature survey as required by regulations (or alternate tests as may be approved by ODEQ). Results of this test are submitted to the ODEQ. ODEQ will be notified in advance of the test and have an opportunity to witness the upcoming test.

The most recent 5-Year mechanical integrity test was conducted in 2015 and included a differential temperature survey run from the surface to total depth (see Appendix P-1). The differential survey confirmed there was no evidence of vertical fluid movement out of the permitted injection interval.

Results of the wellhead-monitoring program are submitted quarterly to the ODEQ. These reports contain, at a minimum, the following.

- Monthly average injection pressure, flow rate, injection volume, and annular pressure
- Monthly maximum and minimum injection pressure, flow rate, injection volume, and annular pressure
- Results of waste analysis sampling conducted and descriptions of well work conducted during the quarter.

Ambient Monitoring Program

Monitoring Method

Per the ambient monitoring requirements of OAC 252:652-7-1(4), the PCC facility installed two wells to monitor the groundwater near the injection well site. Static water levels are recorded prior to acquiring monthly water samples. At least once each month, ground water from the monitoring wells is sampled and analyzed for parameters specified in the permit: ammonia, nitrate, specific conductivity, pH, and temperature. The analysis and water levels are submitted to the ODEQ as part of the required quarterly report. The construction and monitoring procedures for each well are described in the following sections.

Monitoring Well Construction

The PCC facility has two monitor wells for the No. 1 injection well: Deep Monitor Well No. 1 located south, southwest of the injection well and Deep Monitor Well No. 2 located north, northwest of the injection well.

Deep Monitor Well No. 1 was installed in July 1996. It was drilled to a depth of 76 feet below ground level to the Keokuk Chert/Formation. Four-inch casing was installed from surface to 55 feet; it was cemented to surface with a bentonite-water-Portland cement grout. A slotted screen was attached at the end of the casing and extends to total depth (76 feet). The well is outfitted with a submersible pump.

Deep Monitor Well No. 2 was installed in July 1996 and completed to a depth of 231 feet below ground level to the Reed Springs Formation. Four-inch casing was installed from surface to 180 feet; it was cemented to surface with a bentonite-water-Portland cement grout. A slotted screen is installed from 180 feet to 220 depth. The well is outfitted with a submersible pump.

See Figures P-1 and P-2 for a schematic of the construction of each monitor well.

Waste Description

The PCC Pryor facility injects a composite waste stream that consists of contaminated storm water runoff, boiler blowdown, cooling tower blowdown, scrubbing system blowdown, and process flush water. Table P-1 provides the average of values for 2016 quarterly sampling of the composite waste stream for the required parameters listed in the underground injection control (UIC) permit. The samples are 24-hour composites collected at a location downstream of the injection pumps with a stationary sample composite system. Analysis is performed by a National Environmental Laboratory Accreditation Conference (NELAC) certified third-party laboratory. We note that source reduction was initiated in the third quarter of 2015 and has yielded significant reduction of wastewater volumes. Ongoing source reduction projects and filtering will further reduce wastewater volumes and contaminant levels. We will update this information as the source reduction and filtering efforts are completed.

Final effluent stream chemical and physical characteristics are dependent on the actual operating and environmental conditions.

TABLE P-1
Waste Stream Quarterly Samples
2016

Parameter	Range	Average	Units
Temperature	15.3 – 23.7	19.6	degrees C
pH	8.3 – 9.7	9.18	S. U.
Ammonia	313 – 9,200	3,707	mg/L
Nitrates	2.57 – 3,070	793	mg/L

Waste Stream pH and Specific Gravity

The pH of the effluent stream typically ranges from 8 to 10 standard units. The specific gravity of the injectate is expected to be, on average, 1.00.

Waste Analysis Plan

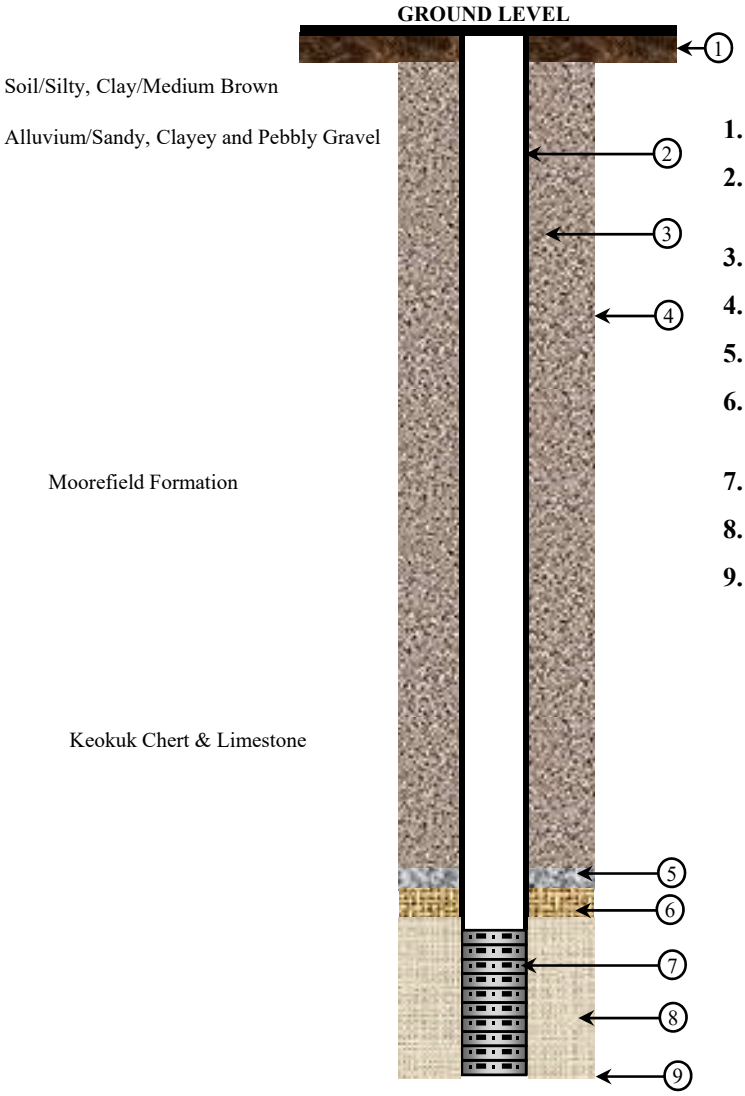
Pursuant to 40 CFR § 146.13(b)(1), PCC will analyze the effluent for the PCC No. 1 injection well with sufficient frequency to yield representative data of effluent characteristics. Test results are submitted in accordance with 40 CFR § 146.13(c).

FIGURES

Pryor Chemical Company

Mayes County Oklahoma
Monitor Well No. 1

COMPLETION DETAILS



1. **Concrete Pad**: 4’ by 4’.
2. **Protection Casing:** 4” with screen attached set at 76’.
3. **Grout:** 6% Bentonite, Water, and Portland cement.
4. **Borehole:** 8” borehole diameter.
5. **Bentonite Plug:** 4’ thick set from 46’-50’.
6. **Gravel Pack:** 20/40 mesh sand, 2’ thick set from 50’-52’.
7. **Screen:** 0.020 slots set from 55’-76’.
8. **Gravel Pack:** 8/12 mesh sand set from 52’ to 76’.
9. **Total Depth:** 76’.

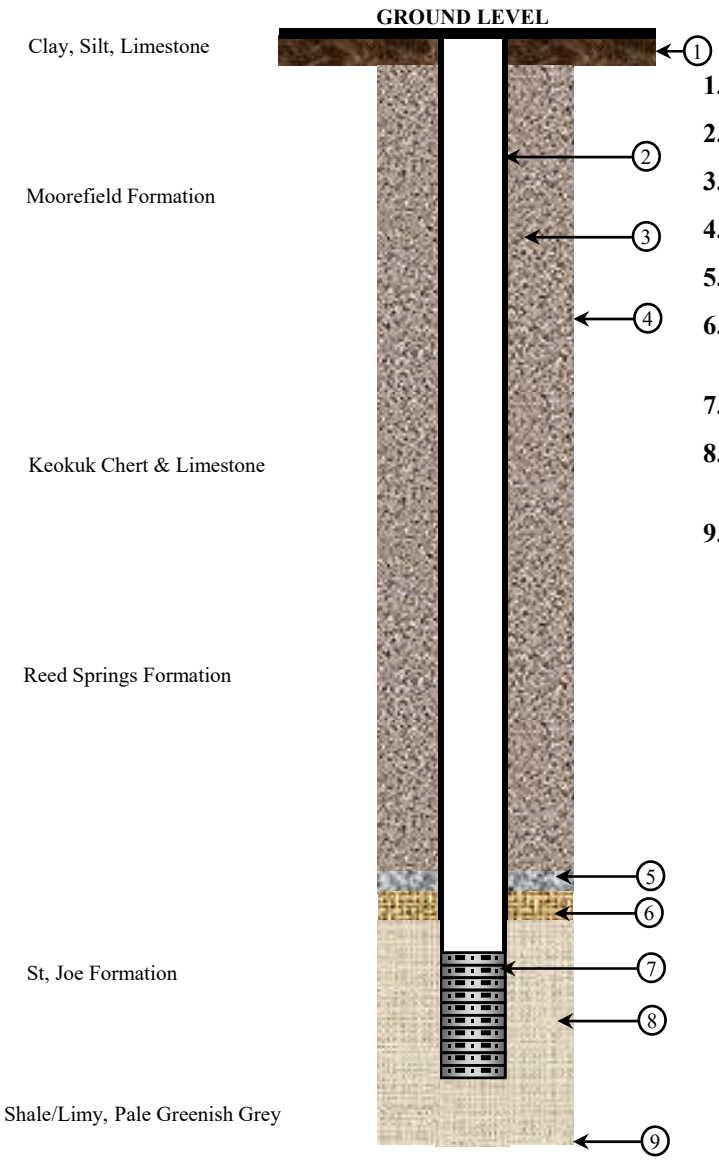
Figure P-1
Monitor Well No. 1
Completion Schematic

GEOSTOCK SANDIA ENTREPOSE
8860 Fallbrook Drive, Houston, TX 77064
Tel: (346) 314-4347 Fax: (832) 478-5172

Checked by: NM	Date: 4/4/2017	*Drawing not to scale*

Pryor Chemical Company

Mayes County Oklahoma
Monitor Well No. 2



COMPLETION DETAILS

1. **Concrete Pad**: 4’ by 4’.
2. **Protection Casing:** 4” set at 180’.
3. **Grout:** Bentonite, Water, and Portland cement.
4. **Borehole:** 8” borehole diameter.
5. **Bentonite Plug:** 2’ thick set from 172’-174’.
6. **Gravel Pack:** 20/40 mesh sand, 2’ thick set from 174’-176’.
7. **Screen:** 0.020 slots set from 180’-220’.
8. **Gravel Pack:** 8/12 mesh sand set from 176’ to 231’.
9. **Total Depth:** 231’.

Figure P-2
Monitor Well No. 2
Completion Schematic

GEOSTOCK SANDIA ENTREPOSE
8860 Fallbrook Drive, Houston, TX 77064
Tel: (346) 314-4347 Fax: (832) 478-5172

Checked by: NM	Date: 4/4/2017	*Drawing not to scale*

ATTACHMENT P, APPENDIX -P-1

COASTAL WIRELINE SERVICES

DIFFERENTIAL TEMPERATURE SURVEY

Company	PRYOR CHEMICAL COMPANY
Well	IW-NH-49 022-R1
Field	PRYOR OKLAHOMA
County	MAYES
State	OKLAHOMA
Country	U.S.A.

Location: API #: N/A

SEC TWP RGE

Other Services: CFM, GR

Permanent Datum	GROUND LEVEL	Elevation	N/A
Log Measured From	0.0'		
Drilling Measured From	KELLY BUSHING		

Elevation: K.B. N/A, D.F. N/A, G.L. N/A

Date	03/30/2015
Run Number	ONE
Depth Driller	912'
Depth Logger	728'
Bottom Logged Interval	725'
Top Log Interval	0'
Open Hole Size	N/A
Type Fluid	WASTE WATER
Density / Viscosity	N/A
Max. Recorded Temp.	73.3 @ 600'
Estimated Cement Top	SURFACE
Time Well Ready	13:30
Time Logger on Bottom	14:44
Equipment Number	P-104
Location	PEARLAND
Recorded By	S.JOHNSON
Witnessed By	MR. D. STAHLE

Borehole Record

Run Number	Bit	From	To

Tubing Record

Size	Weight	From	To
3 1/2"	N/A	SURFACE	405'

Casing Record	Size	Wgt/Ft	Top	Bottom
Surface String	10"	N/A	SURFACE	417'
Prot. String	7"	N/A	SURFACE	451'
Production String	5 1/2"	N/A	SURFACE	413'
Liner				

<<< Fold Here >>>

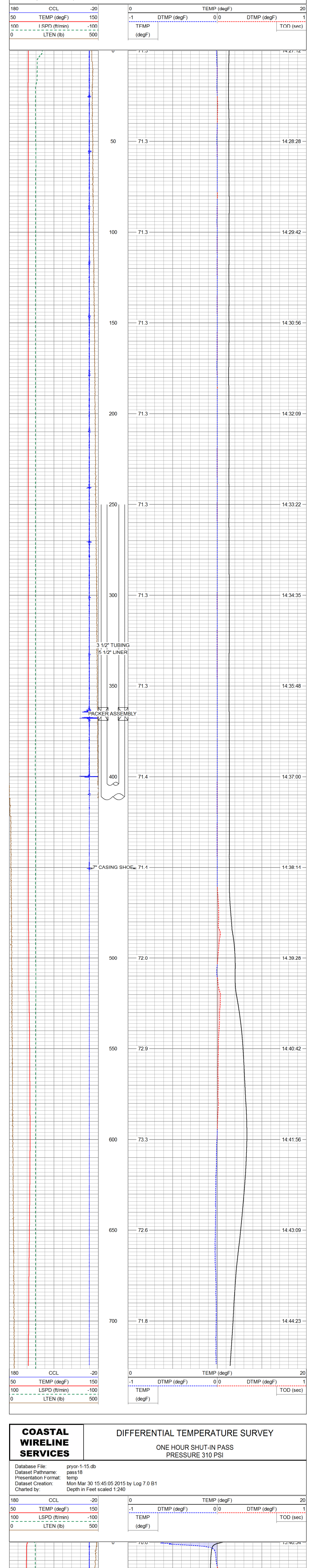
All interpretations are opinions based on inferences from electrical or other measurements and we cannot and do not guarantee the accuracy or correctness of any interpretation, and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, costs, damages, or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. These interpretations are also subject to our general terms and conditions set out in our current Price Schedule.

Comments

COASTAL WIRELINE SERVICES — DIFFERENTIAL TEMPERATURE SURVEY

INJECTION RATE 140 GPM AT 400 PSI

Database File:	pryor-1-15.db
Dataset Pathname:	pass17
Presentation Format:	temp
Dataset Creation:	Mon Mar 30 14:26:37 2015 by Log 7.0 B1
Charted by:	Depth in Feet scaled 1:240



COASTAL WIRELINE SERVICES — DIFFERENTIAL TEMPERATURE SURVEY

ONE HOUR SHUT-IN PASS
PRESSURE 310 PSI

Database File:	pryor-1-15.db
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Presentation Format:	temp
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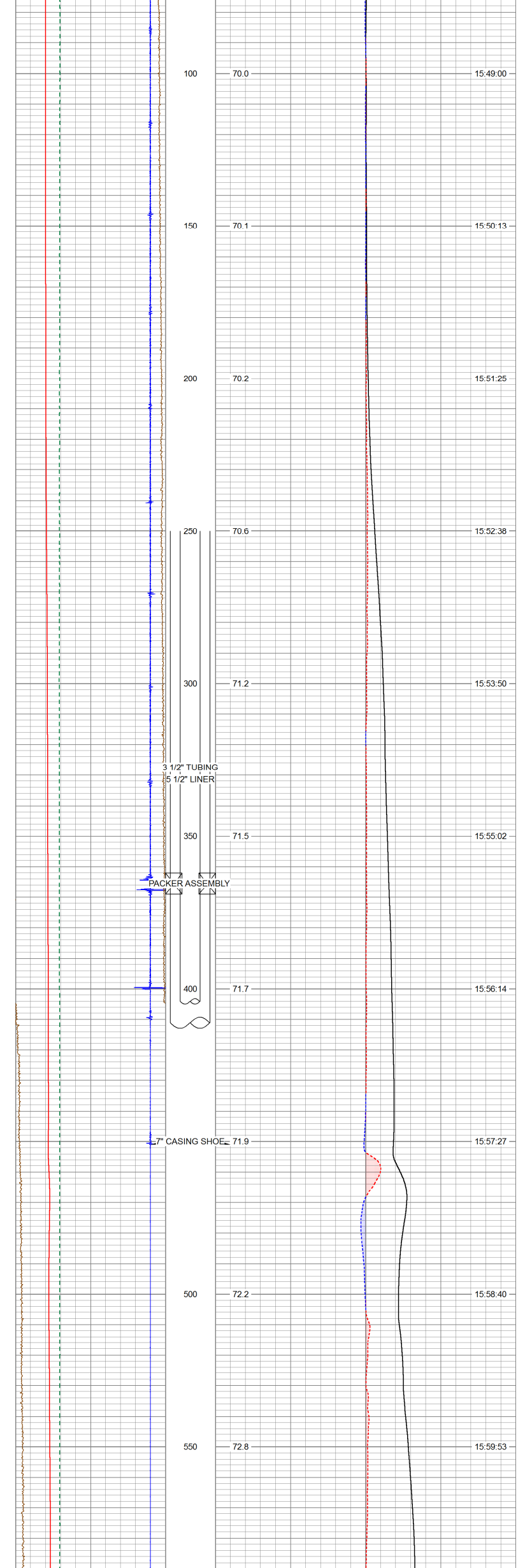
Charted by:	Depth in Feet scaled 1:240



COASTAL WIRELINE SERVICES — DIFFERENTIAL TEMPERATURE SURVEY

2 HOUR SHUT-IN PASS
PRESSURE 300 PSI

Database File:	pryor-1-15.db
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Presentation Format:	temp
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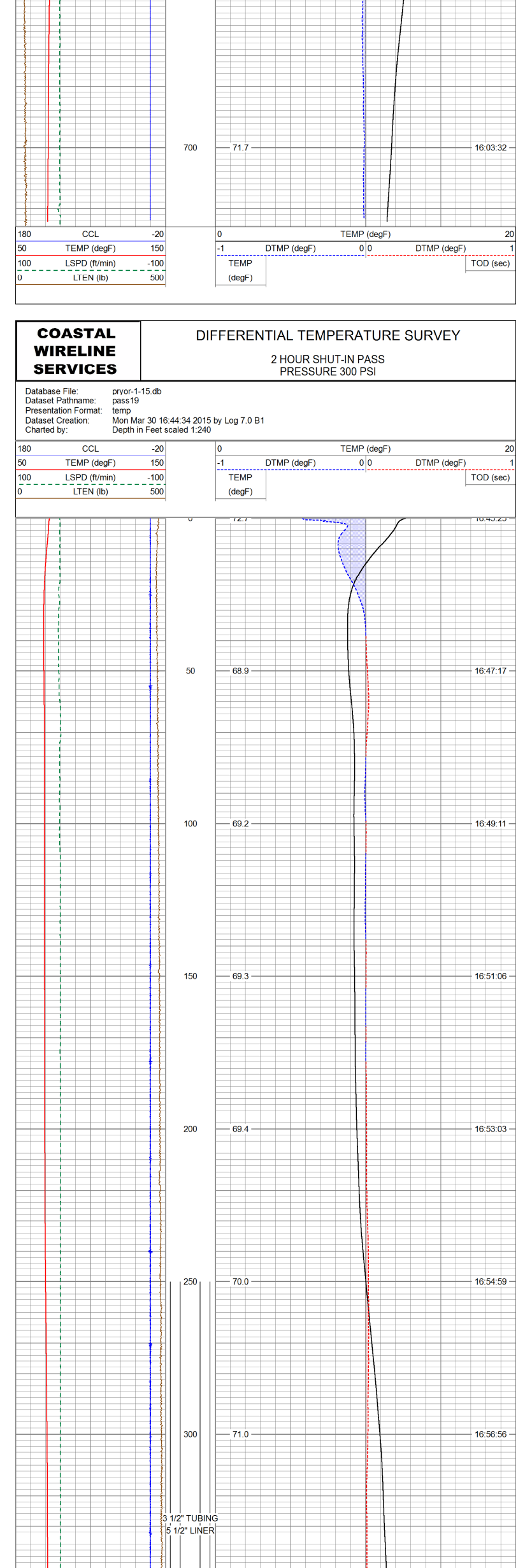
Charted by:	Depth in Feet scaled 1:240



COASTAL WIRELINE SERVICES — DIFFERENTIAL TEMPERATURE SURVEY

WELL STATIC 17 HOURS
PRESSURE 20 PSI

Database File:	pryor-1-15.db
Dataset Pathname:	pass21
Presentation Format:	temp
Dataset Creation:	Tue Mar 31 07:25:12 2015 by Log 7.0 B1
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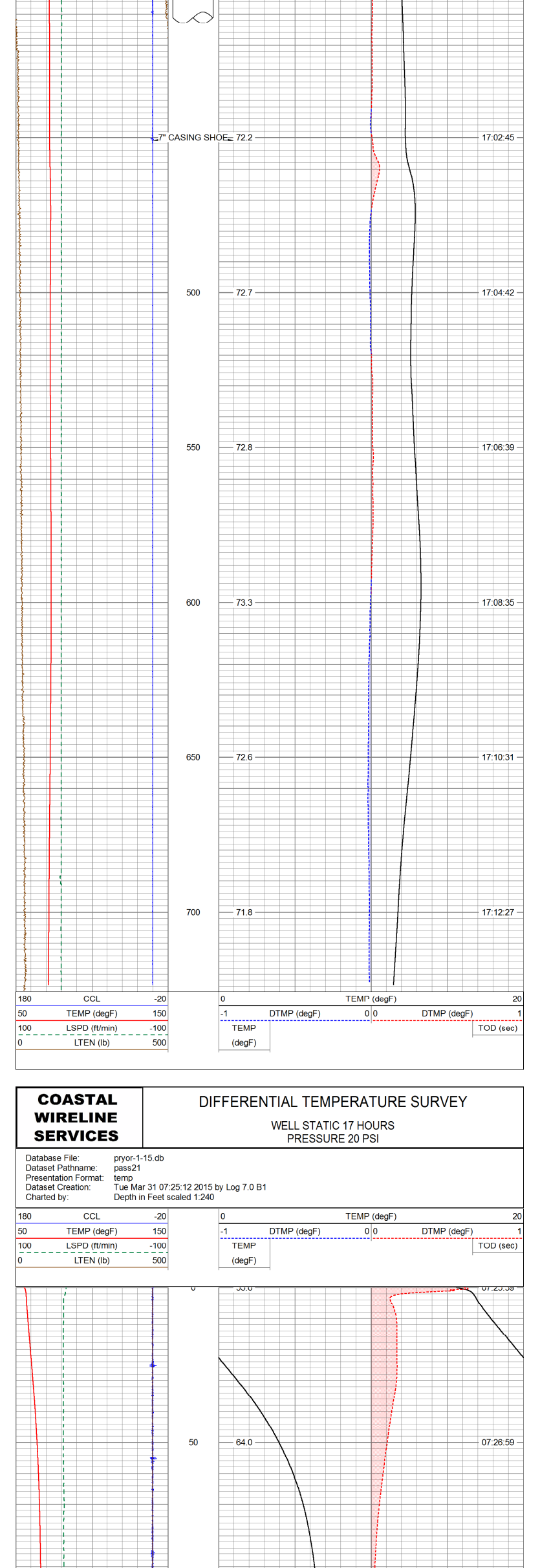

Database File:	pryor-1-15.db
Dataset Pathname:	pass22
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Dataset Creation:	Tue Mar 31 14:49:01 2015 by Log 7.0 B1
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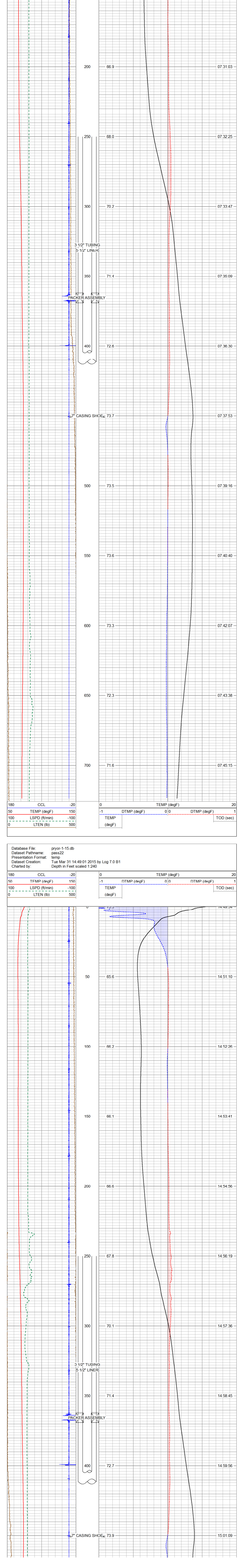
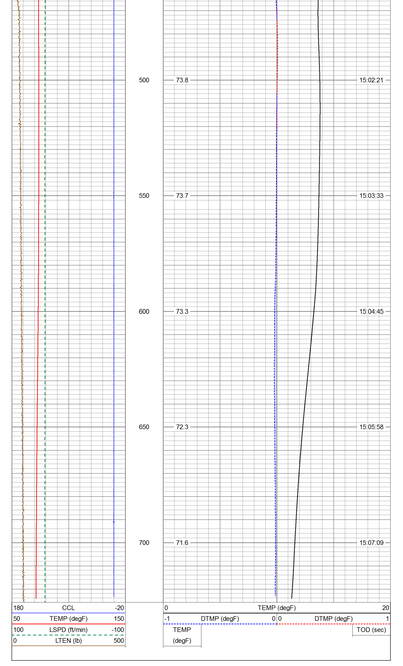




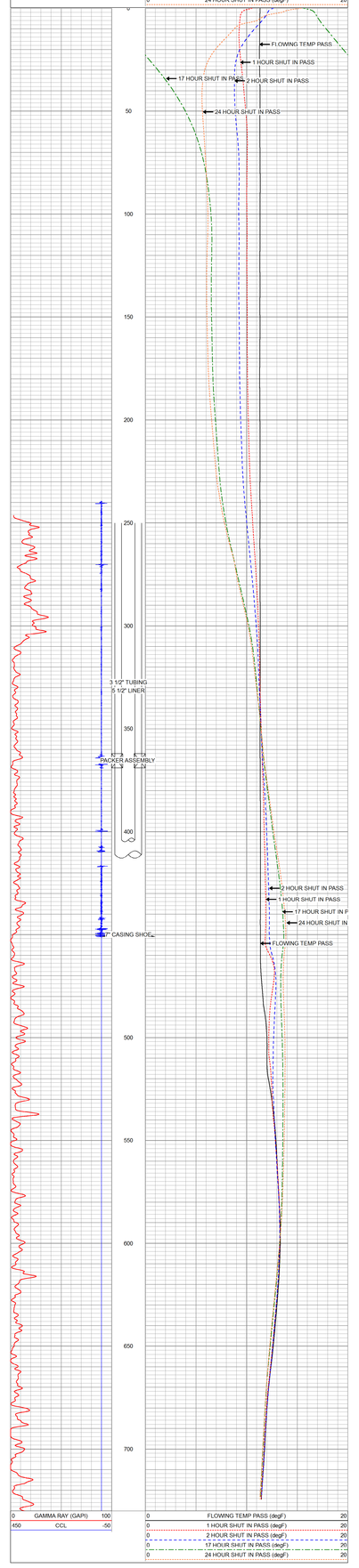
COASTAL WIRELINE SERVICES

MERGED TEMPERATURE PASSES

Database File: proxr-1-15.db
Dataset Pathname: merge5
Presentation Format: proxr5
Dataset Creation: Tue Mar 31 15:21:09 2015
Charted by: Depth in Feet scaled 1:240

0 GAMMA RAY (GAPI) 100
450 CCL -50

0 FLOWING TEMP PASS (degF) 20
0 1 HOUR SHUT IN PASS (degF) 20
0 2 HOUR SHUT IN PASS (degF) 20
0 17 HOUR SHUT IN PASS (degF) 20
0 24 HOUR SHUT IN PASS (degF) 20



0 GAMMA RAY (GAPI) 100
450 CCL -50

0 FLOWING TEMP PASS (degF) 20
0 1 HOUR SHUT IN PASS (degF) 20
0 2 HOUR SHUT IN PASS (degF) 20
0 17 HOUR SHUT IN PASS (degF) 20
0 24 HOUR SHUT IN PASS (degF) 20

ATTACHMENT Q

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Attachment Q
Plugging and Abandonment Plan

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ATTACHMENT Q

Plugging and Abandonment Plan

The plugging and abandoning procedures for the PCC No. 1 injection well are designed to be used if effluent disposal well operations are discontinued or if the well reaches the end of its useful life. The well closure procedure is described below. Pursuant to 40 Code of Federal Regulations (CFR) §146.10 and Oklahoma Administrative Code (OAC), Subchapter 9 – §252:652-5-1(5), the well will be plugged in a manner that will prevent movement of fluids either into or between underground sources of drinking water (USDWs).

PCC will notify the Oklahoma Department of Environmental Quality (ODEQ) of the intent to plug the injection well at least 180 days prior to closure. PCC will also notify the ODEQ of the exact time when plugging operations will take place. The following information will be provided:

- Type and number of plugs;
- Placement of each plug, including the elevation of both the top and bottom of the plug;
- Type, grade, and quantity of the plugging material and additives to be used;
- Method used to place plugs in hole;
- Procedure used to plug and abandon each well; and
- Any information on newly constructed or discovered wells or additional well data within the Area of Review (AOR).

Plugging and Abandonment Procedures for Injection Well PCC No. 1

Plugging for well closure is described below. Pursuant to 40 CFR §146.10 and Oklahoma Administrative Code, Subchapter 9 – §252:652-5-1(5), the well will be plugged in a manner that will prevent movement of fluids either into or between USDWs:

1. Record pressure decay in the injection zone for a time specified by ODEQ.
2. Conduct annulus pressure test, temperature log, and radioactive tracer survey.
3. If pressure exists at the wellhead, inject enough heavy sodium chloride brine to ensure that no pressure exists at the wellhead.
4. Prepare location for workover rig.
5. Move workover rig onto location.
6. Rig up workover rig. Install blowout preventers.
7. Remove the wellhead and install well control equipment.
8. Kill the well with heavy brine.
9. Release the packer. Pull out injection tubing string with packer.
10. Conduct a casing inspection survey and cement bond/evaluation log if more than five years have passed since the last casing inspection.
11. Pick up enough joints of tubing work string to reach total depth at 912 feet.
12. Circulate well fluid.
13. Run a cement retainer with work string and set at 360 feet in the 5-1/2-inch liner casing.
14. Run in hole with work string and sting into retainer at 360 feet.
15. Mix and pump 60 barrels (461 feet plus 50% excess) of 12.5 pounds per gallons (ppg) cement with lost circulation material into the injection zone.
16. Pull tubing from retainer and pump 1.2 barrels of cement on top of retainer (50 feet). Pull tubing up to 300 feet and reverse-circulate to clean tubing.
17. Wait for cement to harden for four hours.
18. Lower end of work string to top of first cement plug at approximately 310 feet. Set 3,000 lbs. of work string weight on the plug to confirm integrity of the plug.
19. Mix and fill the remainder of the 5-1/2" casing with 8 barrels of 12.5 ppg of cement to 3 feet below the ground surface (bgs).
20. Cut off casing 3 feet bgs and weld steel plate on top.
21. Inscribe on steel plate the following information: injection well number, location, dates of use, date of plugging, total volume injected, and well owner.
22. Rig down and release rig.
23. Erect a permanent marker at the well site. The marker will contain pertinent well information: permit number, date of abandonment, and company name.

Figure Q-1 is a schematic of the injection well plugging plan. A plugging report will be filed with ODEQ within 30 days after completion of plugging.

Plugging and Abandonment Procedures for Monitor Well No. 1

Plugging operations will be conducted as follows:

1. Prepare location for workover rig.
2. Move workover rig onto location.
3. Rig up workover rig.
4. Remove wellhead and submersible pump.
5. Run in hole with work string to approximately 40 feet.
6. Pump approximately 1.2 barrels (73 feet plus 10% excess) of 12.5 ppg cement from total depth to 3 feet below the ground level.
7. Pull the work string out of the wellbore.
8. Fill any void at top of casing with cement after work string is retrieved, if necessary.
9. Wait enough time for the cement to harden.
10. Cut surface casing 3 feet below ground level and weld steel plate on top.
11. Rig down and release rig.
12. Inscribe on plate the monitoring well number, location, dates of use, date of plugging, and owner of well.
13. Erect a permanent marker at the well site. The marker will contain all pertinent well information (permit number, date of abandonment, and company name).

Figure Q-2 is a diagram of the monitoring well plugging. A plugging report will be filed with ODEQ and Oklahoma Water Resources Board (OWRB) within 30 days after completion of plugging.

Plugging and Abandonment Procedures for Monitor Well No. 2

Plugging operations will be conducted as follows:

1. Prepare location for workover rig.
2. Move workover rig onto location.
3. Rig up workover rig.
4. Remove wellhead and submersible pump.
5. Run in hole with work string to approximately 100 feet.
6. Pump approximately 4 barrels (228 feet plus 10% excess) of 12.5 ppg cement from total depth to 3 feet below the ground level.
7. Pull the work string out of the wellbore.
8. Fill any void at top of casing with cement after work string is retrieved, if necessary.
9. Wait enough time for the cement to harden.
10. Cut surface casing 3 feet below ground level and weld steel plate on top.
11. Rig down and release rig.
12. Inscribe on plate the monitoring well number, location, dates of use, date of plugging, and owner of well.
13. Erect a permanent marker at the well site. The marker will contain all pertinent well information (permit number, date of abandonment, and company name).

Figure Q-3 is a diagram of the monitoring well plugging. A plugging report will be filed with ODEQ and OWRB within 30 days after completion of plugging.

Post-Closure Plan

Upon closure of the PCC No. 1 injection well, PCC will submit a survey plat to the local zoning authority that will indicate the location of the injection well relative to permanently surveyed benchmarks. PCC will also submit a copy of the plat and provide information necessary to impose appropriate conditions on subsequent drilling activities that may penetrate the well's confining or injection zones.

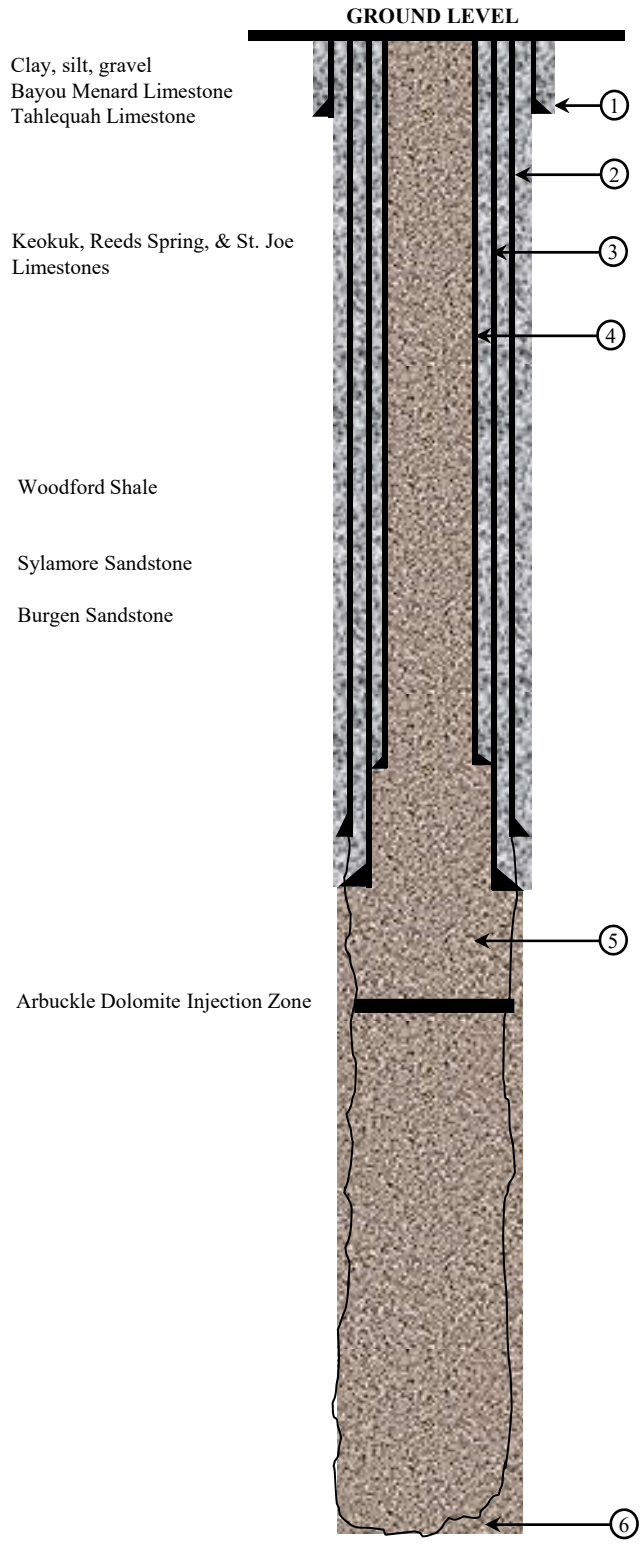
PCC will retain records reflecting the nature, composition, and volume of all injected fluids for a five-year period following plugging and abandonment.

FIGURES

FIGURES

Pryor Chemical Company

Mayes County Oklahoma
Injection Well (IW-NH-49022-R1)



COMPLETION DETAILS

1. **Surface Casing**: 14” set at 20’ cemented to surface.
2. **Protection Casing:** 10” set at 417’ cemented to surface.
3. **Casing:** 7” set at 451’ cemented to surface.
4. **Casing:** 5-1/2” set at 413’ cemented to surface.
5. **Cement:** 912’ to surface.
6. **Total Depth:** 912’.

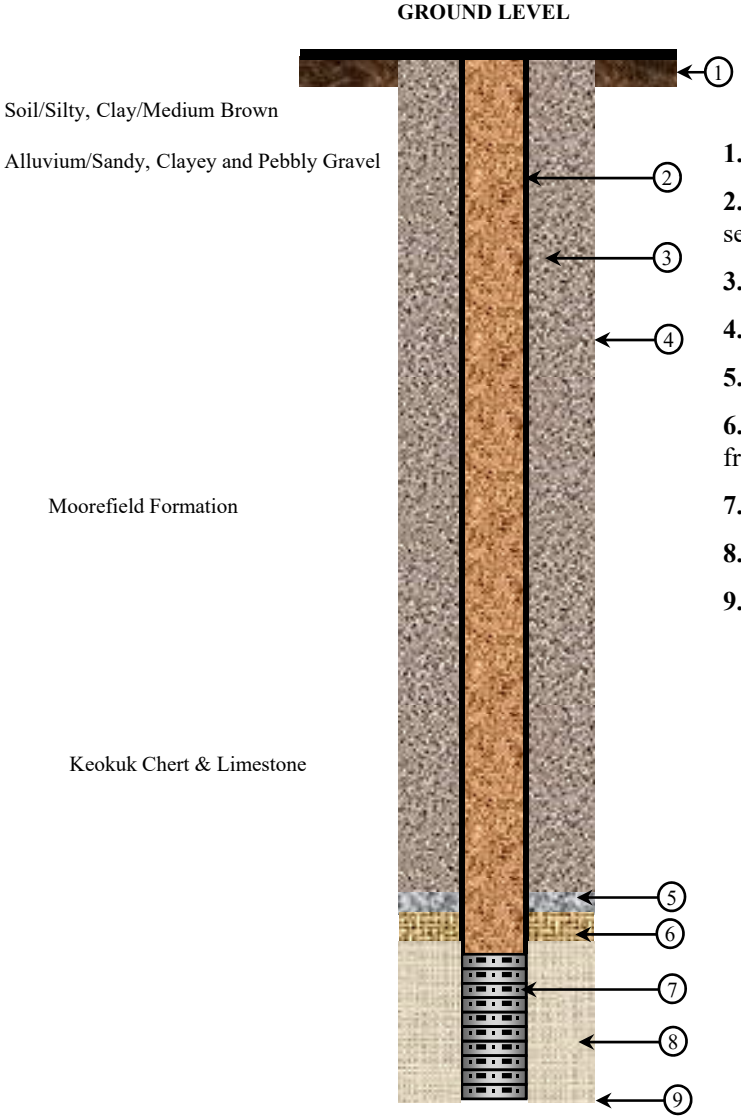
Figure Q-1: PCC No. 1 Injection Well Post Plug & Abandonment Schematic

GEOSTOCK SANDIA ENTREPOSE
8860 Fallbrook Drive, Houston, TX 77064
Tel: (346) 314-4347 Fax: (832) 478-5172

Checked by: NM	Date: 3/31/2017	*Drawing not to scale*

Pryor Chemical Company

Mayes County Oklahoma
Monitor Well No. 1



COMPLETION DETAILS

1. **Concrete Pad**: 4’ by 4’.
2. **Protection Casing:** 4” with screen attached set at 76’.
3. **Grout:** 6% Bentonite, Water, and Portland cement.
4. **Borehole:** 8” borehole diameter.
5. **Bentonite Plug:** 4’ thick set from 46’-50’.
6. **Gravel Pack:** 20/40 mesh sand, 2’ thick set from 50’-52’.
7. **Screen:** 0.020 slots set from 55’-76’.
8. **Gravel Pack:** 8/12 mesh sand set from 52’ to 76’.
9. **Total Depth:** 76’.

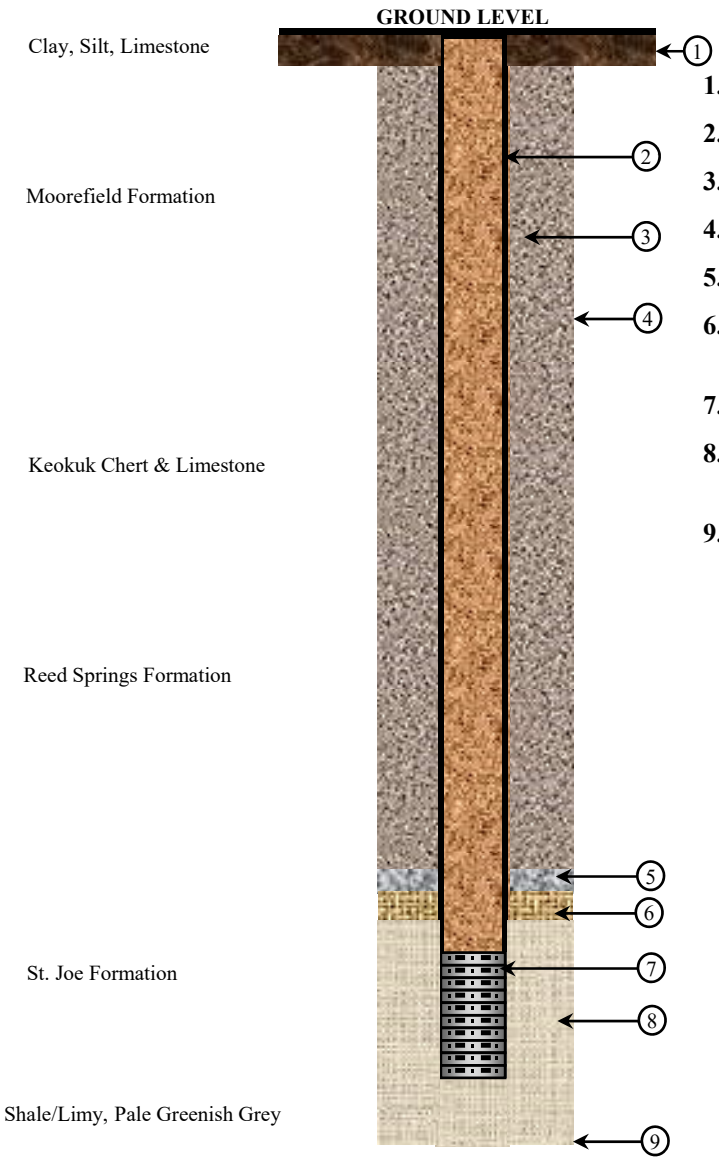
Figure Q-2: Monitor Well No. 1
Post Plug & Abandonment Schematic

GEOSTOCK SANDIA ENTREPOSE
8860 Fallbrook Drive, Houston, TX 77064
Tel: (346) 314-4347 Fax: (832) 478-5172

Checked by: NM	Date: 4/4/2017	*Drawing not to scale*

Pryor Chemical Company

Mayes County Oklahoma
Monitor Well No. 2



COMPLETION DETAILS

1. **Concrete Pad**: 4’ by 4’.
2. **Protection Casing:** 4” set at 220’.
3. **Grout:** Bentonite, Water, and Portland cement.
4. **Borehole:** 8” borehole diameter.
5. **Bentonite Plug:** 2’ thick set from 172’-174’.
6. **Gravel Pack:** 20/40 mesh sand, 2’ thick set from 174’-176’.
7. **Screen:** 0.020 slots set from 180’-220’.
8. **Gravel Pack:** 8/12 mesh sand set from 176’ to 231’.
9. **Total Depth:** 231’.

Figure Q-3: Monitor Well No. 2
Post Plug & Abandonment Schematic

GEOSTOCK SANDIA ENTREPOSE
8860 Fallbrook Drive, Houston, TX 77064
Tel: (346) 314-4347 Fax: (832) 478-5172

Checked by: NM	Date: 4/4/2017	*Drawing not to scale*

ATTACHMENT R

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Attachment R
Necessary Resources

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Necessary Resources

Per Oklahoma Department of Environmental Quality (ODEQ) regulations, PCC must submit evidence to the ODEQ that it has sufficient financial resources to close Injection Well No. 1 in a manner prescribed by the Executive Director. The following sections provide information on the plugging and abandoning (P&A) costs and the financial methods selected by PCC to comply with the ODEQ regulations.

Estimated Plugging Cost – Injection Well (PCC No. 1)

A total cost of $74,591 is estimated to cover the plugging and abandonment of the PCC No. 1 injection well. The estimate assumes that a balance plug method will be used to place the plugs and a set of well logs and tests will be conducted prior to plugging. The cost estimate for well plugging and abandonment (P&A) is provided below.

2017 Closure and Post-Closure Cost Estimate for Injection Well

Description	Unit Cost	Injection Well P&A Cost
Rig Mobilize/Demobilize with Trucking	1 @ $5,000/day	$5,000
Workover Rig	4 days @ $5,500/day	$22,000
Rental Equipment & Tanks	3 days @ $200/day	$600
Brine	$15/bbl	$750
Cement	$25/bbl	$1,750
Cement Pumping Services	2 jobs @ $5,000/job	$10,000
Welding/Casing Cutting	1 @ $1,500	$1,500
Waste Management	1 @ $500	$500
Wireline Logging	1 @ $10,000	$10,000
Handling Fee on 3rd Party Expenses	10%	$5,210
Field Supervision Expenses	5 days@ $1,700/day	$8,500
Project Management and Report	1 @ $2,000	$2,000
	Subtotal	$67,810
Project Contingency	10%	$6,781
	Project Total	**$74,591**

Financial Assurance

Financial assurance for the plugging and abandonment of the PCC No. 1 injection well is being assured by a performance bond in the amount of $75,000. A copy of the performance bond can be found in Appendix R-1.

Estimated Plugging Cost – Monitor Wells

P&A cost of the two PCC monitor wells is estimated at $34,642. The estimate assumes that a balance plug method will be used to place the plugs. The cost estimate is provided below.

2017 Closure and Post-Closure Cost Estimate for Monitor Well Nos. 1 and 2

Description	Unit Cost	Monitor Well No. 1	Monitor Well No. 2
Rig Mobilization/Demobilization	0.5 day @ $5,000/day	$2,500	$2,500
Workover Rig	1 day @ $5,000/day	$5,000	$5,000
Cement	$25/bbl	$50	$125
Cement Pumping Services	1 job @ $3,000/job	$3,000	$3,000
Welding/Casing Cutting	1 @ $500	$500	$500
Handling Fee	10%	$1,105	$1,113
Field Supervision Expenses	1 day @ $1,700/day	$2,550	$2,550
Report	1 @ $1,000	$1,000	$1,000
	Subtotal	$15,705	$15,788
Project Contingency	10%	$1,571	$1,579
	Project Total	**$17,276**	**$17,366**

APPENDIX R-1

APPENDIX R-1

2017 Performance Bond
for
Closure of PPC Injection Well No. 1

Appendix R-1 Pryor Chemical Company Performance Bond

PERFORMANCE BON.

Bond Number: TXIFSU0287618 Effective Date: 5-15-2017
Replaces 105327552
Bond Premium: $: 750.00 Execution Date: 3-15-2017

Principal Name & Business Address: Pryor Chemical Company, 16 S. Pennsylvania, OKC, OK 73107

Type of Organization: Corporation State of Incorporation: Oklahoma

Surety Name & Business Address: International Fidelity Insurance Company

One Newark Center, Newark, NJ 07102-5207

Name, Address & Plugging & Abandonment Amount(s) for Each Injection Well Guaranteed by This Bond:

Oklahoma Department of Environmental Quality Permit No. IW-NH-49022-RI

Total Penal Sum of Bond: Seventy Five Thousand and 00/100 ($75,000.00)

Know All Men By These Presents, That We, the Principal and Surety(ies) hereto are firmly bound to the Oklahoma Department of Environmental Quality (hereinafter called DEQ), in the above penal sum for the payment of which we bind ourselves, our heirs, executors, administrators, successors, and assigns jointly and severally; provided that, where the Surety(ies) are corporations acting as co-sureties, we, the Sureties, bind ourselves in such sum "jointly and severally" only for the purpose of allowing a joint action or actions against any or all of us, and for all other purposes each Surety binds itself, jointly and severally with the Principal, for the payment of such sum only as is set forth opposite the name of such Surety, but if no limit of liability is indicated, the limit of liability shall be the full amount of the penal sum.

Whereas said Principal is required, under the Underground Injection Control Regulations, as amended, to have a permit or comply with provisions to operate under rule for each injection well identified above, and

Whereas said Principal is required to provide financial assurance for plugging and abandonment as a condition of the permit or approval to operate under rule, and

Whereas said Principal shall establish a standby trust fund as is required when a surety bond is used to provide such financial assurance;

Now, Therefore, the conditions of this obligation are such that if the Principal shall faithfully perform plugging and abandonment, whenever required to do so, of each injection well for which this bond guarantees plugging and abandonment, in accordance with the plugging and abandonment plan and other requirements of the permit or provisions for operating under rule and other requirements of the permit or provisions for operating under rule as may be amended, pursuant to all applicable laws, statutes, rules and regulations, as such laws, statutes, rules, and regulations may be amended.

Or, if the Principal shall provide alternate financial assurance as specified in Oklahoma Administrative Code (OAC) 252:652 and subpart F of 40 CFR part 144, and obtain the DEQ Executive Director's written approval of such assurance, within 90 days after the date of notice of cancellation is received by both the Principal and the DEQ Executive Director from the Surety(ies), then this obligation shall be null and void, otherwise it is to remain in full force and effect.

The Surety(ies) shall become liable on this bond obligation only when the Principal has failed to fulfill the conditions described above.

Upon notification by the DEQ Executive Director that the Principal has been found in violation of the plugging and abandonment requirements of 40 CFR part 144, for an injection well which this bond guarantees performance of plugging and abandonment, the Surety(ies) shall either perform plugging and abandonment in accordance with the plugging and abandonment plan and other permit requirements or provisions for operating under rule and other requirements or place the amount for plugging and abandonment into a standby trust fund as directed by the DEQ Executive Director.

Upon notification by the DEQ Executive Director that the Principal has failed to provide alternate financial assurance as specified in OAC 252:652 and subpart F of 40 CFR part 144, and obtain written approval of such assurance from the DEQ

PERFORMANCE BON.

Executive Director during the 90 days following receipt by both the Principal and the DEQ Executive Director of a notice of cancellation of the bond, the Surety(ies) shall place funds in the amount guaranteed for the injection well(s) into the standby trust fund as directed by the DEQ Executive Director.

The Surety(ies) hereby waive(s) notification of amendments to plugging and abandonment plans, permits, applicable laws, statutes, rules, and regulations and agrees that no such amendment shall in any way alleviate its (their) obligation on this bond.

The liability of the Surety(ies) shall not be discharged by any payment or succession of payments hereunder, unless and until such payment or payments shall amount in the aggregate to the penal sum of the bond, but in no event shall the obligation of the Surety(ies) hereunder exceed the amount of said penal sum.

The Surety(ies) may cancel the bond by sending notice by certified mail to the owner or operator and to the DEQ Executive Director, provided, however, that cancellation shall not occur during the 120 days beginning on the date of receipt of the notice of cancellation by both the Principal and the DEQ Executive Director, as evidenced by the return receipts.

The Principal may terminate this bond by sending written notice to the Surety(ies), provided, however, that no such notice shall become effective until the Surety(ies) receive(s) written authorization for termination of the bond by the DEQ Executive Director.

In Witness Whereof, The Principal and Surety(ies) have executed this Performance Bond and have affixed their seals on the date set forth above.

The persons whose signatures appear below hereby certify that they are authorized to execute this surety bond on behalf of the Principal and Surety(ies) and that the wording on this surety bond is substantially the same as the wording specified in OAC 252:652 and 40 CFR 144.70(c) as such regulation was constituted on the date this bond was executed.

Principal:

Pryor Chemical Company
Name of Principal

Signature

Michael J. Foster, Sr. V.P.
Name & Title

(Corp. Seal)

Countersigned:
By: N/A
Oklahoma Non-Resident Agent

Surety:

International Fidelity Insurance Company
Name of Surety

Signature

Shelli R. Samsel, Attorney-in-Fact
Name & Title

One Newark Center, Newark, NJ 07102-5207
Address of Surety

New Jersey
State of Incorporation

(Corp. Seal)

Tel (973) 624-7200

POWER OF ATTORNEY

INTERNATIONAL FIDELITY INSURANCE COMPANY
ALLEGHENY CASUALTY COMPANY

ONE NEWARK CENTER, 20TH FLOOR NEWARK, NEW JERSEY 07102-5207

KNOW ALL MEN BY THESE PRESENTS: That **INTERNATIONAL FIDELITY INSURANCE COMPANY**, a corporation organized and existing under the laws of the State of New Jersey, and **ALLEGHENY CASUALTY COMPANY** a corporation organized and existing under the laws of the State of New Jersey, having their principal office in the City of Newark, New Jersey, do hereby constitute and appoint

VAUGHN GRAHAM, JR., VAUGHN P. GRAHAM, CATHY COMBS, SHELLI R. SAMSEL, STEPHEN M. POLEMAN, TRAVIS E. BROWN, DWIGHT A. PILGRIM, J. KELLY DEER, DEBORAH L. RAPER, JAMIE M. BURRIS, RYAN MATTHEW SANDERS, ROBBIE LOYD

Tulsa, OK.

their true and lawful attorney(s)-in-fact to execute, seal and deliver for and on its behalf as surety, any and all bonds and undertakings, contracts of indemnity and other writings obligatory in the nature thereof, which are or may be allowed, required or permitted by law, statute, rule, regulation, contract or otherwise, and the execution of such instrument(s) in pursuance of these presents, shall be as binding upon the said INTERNATIONAL FIDELITY INSURANCE COMPANY and ALLEGHENY CASUALTY COMPANY, as fully and amply, to all intents and purposes, as if the same had been duly executed and acknowledged by their regularly elected officers at their principal offices.

This Power of Attorney is executed, and may be revoked, pursuant to and by authority of the By-Laws of INTERNATIONAL FIDELITY INSURANCE COMPANY and ALLEGHENY CASUALTY COMPANY and is granted under and by authority of the following resolution adopted by the Board of Directors of INTERNATIONAL FIDELITY INSURANCE COMPANY at a meeting duly held on the 20th day of July, 2010 and by the Board of Directors of ALLEGHENY CASUALTY COMPANY at a meeting duly held on the 15th day of August, 2000:

"RESOLVED, that (1) the President, Vice President, Chief Executive Officer or Secretary of the Corporation shall have the power to appoint, and to revoke the appointments of, Attorneys-in-Fact or agents with power and authority as defined or limited in their respective powers of attorney, and to execute on behalf of the Corporation and affix the Corporation's seal thereto, bonds, undertakings, recognizances, contracts of indemnity and other written obligations in the nature thereof or related thereto; and (2) any such Officers of the Corporation may appoint and revoke the appointments of joint-control custodians, agents for acceptance of process, and Attorneys-in-fact with authority to execute waivers and consents on behalf of the Corporation; and (3) the signature of any such Officer of the Corporation and the Corporation's seal may be affixed by facsimile to any power of attorney or certification given for the execution of any bond, undertaking, recognizance, contract of indemnity or other written obligation in the nature thereof or related thereto, such signature and seals when so used whether heretofore or hereafter, being hereby adopted by the Corporation as the original signature of such officer and the original seal of the Corporation, to be valid and binding upon the Corporation with the same force and effect as though manually affixed."

IN WITNESS WHEREOF, INTERNATIONAL FIDELITY INSURANCE COMPANY and ALLEGHENY CASUALTY COMPANY have each executed and attested these presents on this 31st day of December, 2015.

INTERNATIONAL FIDELITY INSURANCE COMPANY CORPORATE SEAL 1904 NEW JERSEY

STATE OF NEW JERSEY
County of Essex

ROBERT W. MINSTER
Chief Executive Officer (International Fidelity Insurance Company) and President (Allegheny Casualty Company)

ALLEGHENY CASUALTY COMPANY 1936 NEW JERSEY

On this 31st day of December 2015, before me came the individual who executed the preceding instrument, to me personally known, and, being by me duly sworn, said he is the therein described and authorized officer of INTERNATIONAL FIDELITY INSURANCE COMPANY and ALLEGHENY CASUALTY COMPANY; that the seals affixed to said instrument are the Corporate Seals of said Companies; that the said Corporate Seals and his signature were duly affixed by order of the Boards of Directors of said Companies.

IN TESTIMONY WHEREOF, I have hereunto set my hand affixed my Official Seal, at the City of Newark, New Jersey the day and year first above written.

CATHY CRUZ NOTARY PUBLIC MY COMMISSION EXPIRES 04-16-2019 STATE OF NEW JERSEY

A NOTARY PUBLIC OF NEW JERSEY
My Commission Expires April 16, 2019

CERTIFICATION

I, the undersigned officer of INTERNATIONAL FIDELITY INSURANCE COMPANY and ALLEGHENY CASUALTY COMPANY do hereby certify that I have compared the foregoing copy of the Power of Attorney and affidavit, and the copy of the Sections of the By-Laws of said Companies as set forth in said Power of Attorney, with the originals on file in the home office of said companies, and that the same are correct transcripts thereof, and of the whole of the said originals, and that the said Power of Attorney has not been revoked and is now in full force and effect.

IN TESTIMONY WHEREOF, I have hereunto set my hand this 15th day of March, 2017

MARIA BRANCO, Assistant Secretary

ATTACHMENT S

ATTACHMENT S

Aquifer Exemptions

The Pryor Chemical Company (PCC) facility is not requesting an aquifer exemption for any groundwater-bearing unit.

ATTACHMENT T

ATTACHMENT T

Existing ODEQ/EPA Permits

Existing or pending ODEQ and EPA permits for the PCC Facility include the following:

- Oklahoma Underground Injection Operating Permit: IH-NH-49022-R1
- Oklahoma Storm Water Multi-Sector General Industrial Permit: Permit No. OKR050830
- Oklahoma Air Permit: Permit No. 2008-100-C (M-2)
- Water (OOWA) Industrial User Permit: Permit No. 106
- Oklahoma Surface Impoundment Permit: Permit No. WD12-821
- Oklahoma Radiation Permit: Permit No. XR327

ATTACHMENT U

ATTACHMENT U

Description of Business

Pryor Chemical Company (PCC) is a wholly-owned subsidiary of LSB Industries. PCC is based in Pryor, Oklahoma. The PCC facility has manufactured nitrogen fertilizers (anhydrous ammonia, and urea ammonium nitrate solution) since 2009. Prior to this time, the facility had several periods where it was idled because of unfavorable business conditions.

Facility Physical Address

PRYOR CHEMICAL COMPANY
4463 HUNT STREET
PRYOR OK 74361
(918) 825-9021 Contact: Mr. Dale Fentress

Facility Mailing Address

PRYOR CHEMICAL COMPANY
PO BOX 429
PRYOR OK 74362