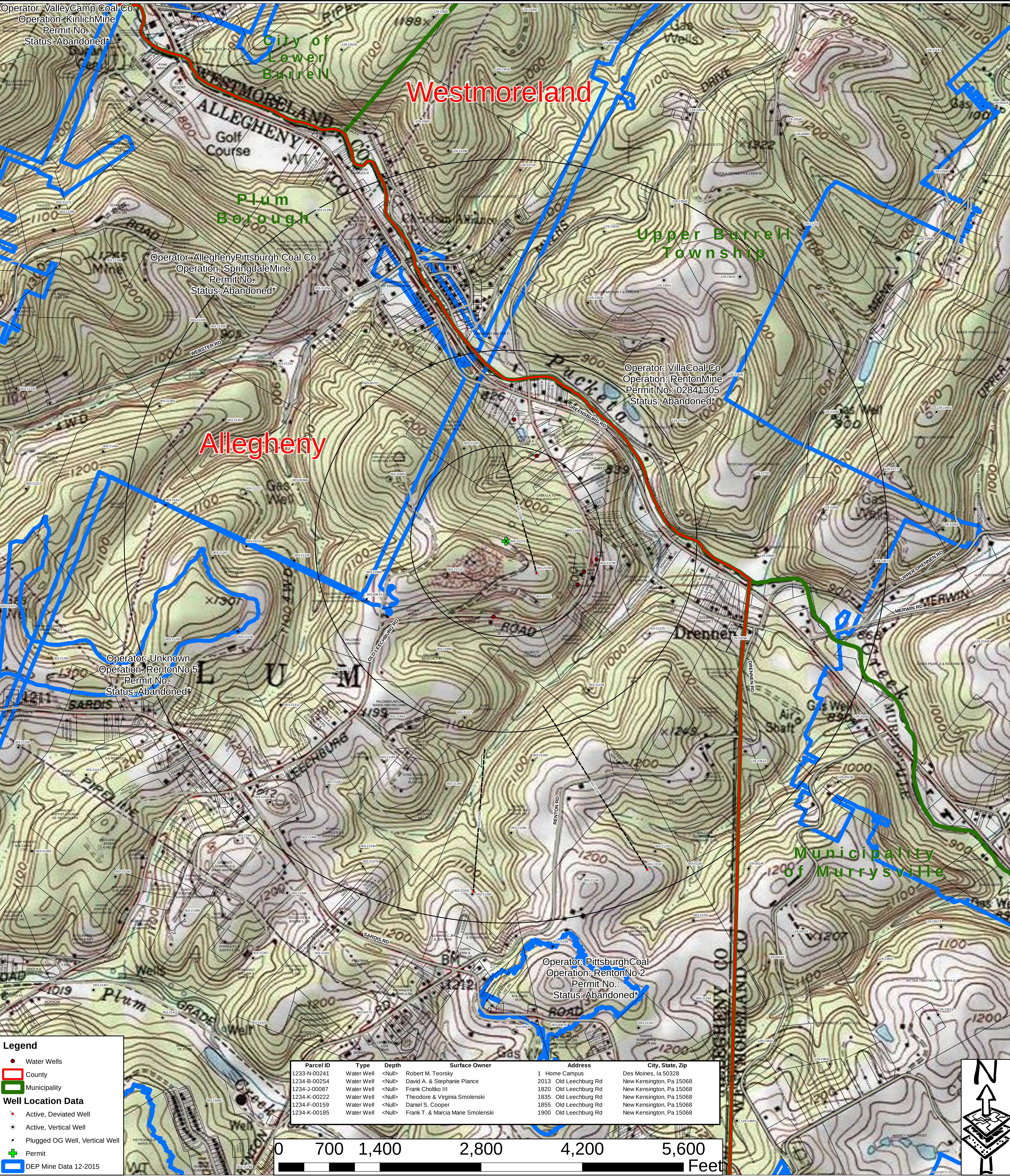




BY: MEC

CHK:

DATE: 12-15-2015

Scale: 1" = 400'

FILE: ARC-Plan-View-A

JOB NO: 677415

PROPOSED INJECTION WELL

FOR

PENNECO ENVIRONMENTAL

SOLUTIONS, LLC

Plum Borough, Allegheny County

Commonwealth of Pennsylvania

FOX & FOX, INC.

58 Timber Bridge Rd.

Clarion, PA 16214

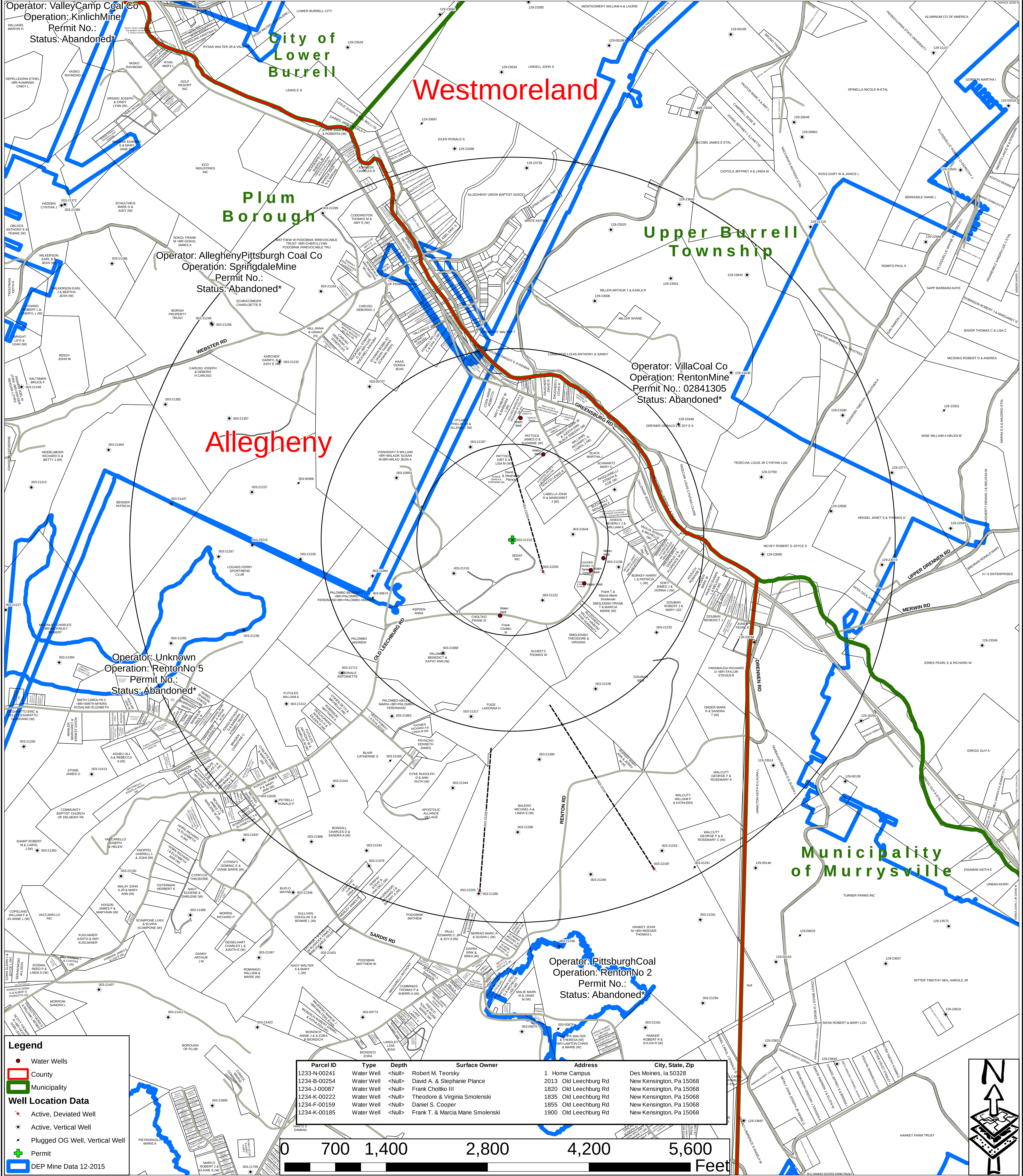
Phone: 814-745-2861

Fax: 814-745-2248

email: ronaldfoxf@foxandfoxinc.us

web: www.foxandfoxinc.us

REVISIONS:



BY: MEC

CHK:

DATE: 12-15-2015

Scale: 1" = 400'

FILE: ARC-Plan-View-B

JOB NO: 677415

PROPOSED INJECTION WELL
FOR
PENNECO ENVIRONMENTAL
SOLUTIONS, LLC
Plum Borough, Allegheny County
Commonwealth of Pennsylvania

FOX & FOX, INC.
58 Timber Bridge Rd.
Clarion, PA 16214
Phone: 814-745-2861
Fax: 814-745-2248
email: ronaldfox@foxandfoxinc.us
web: www.foxandfoxinc.us

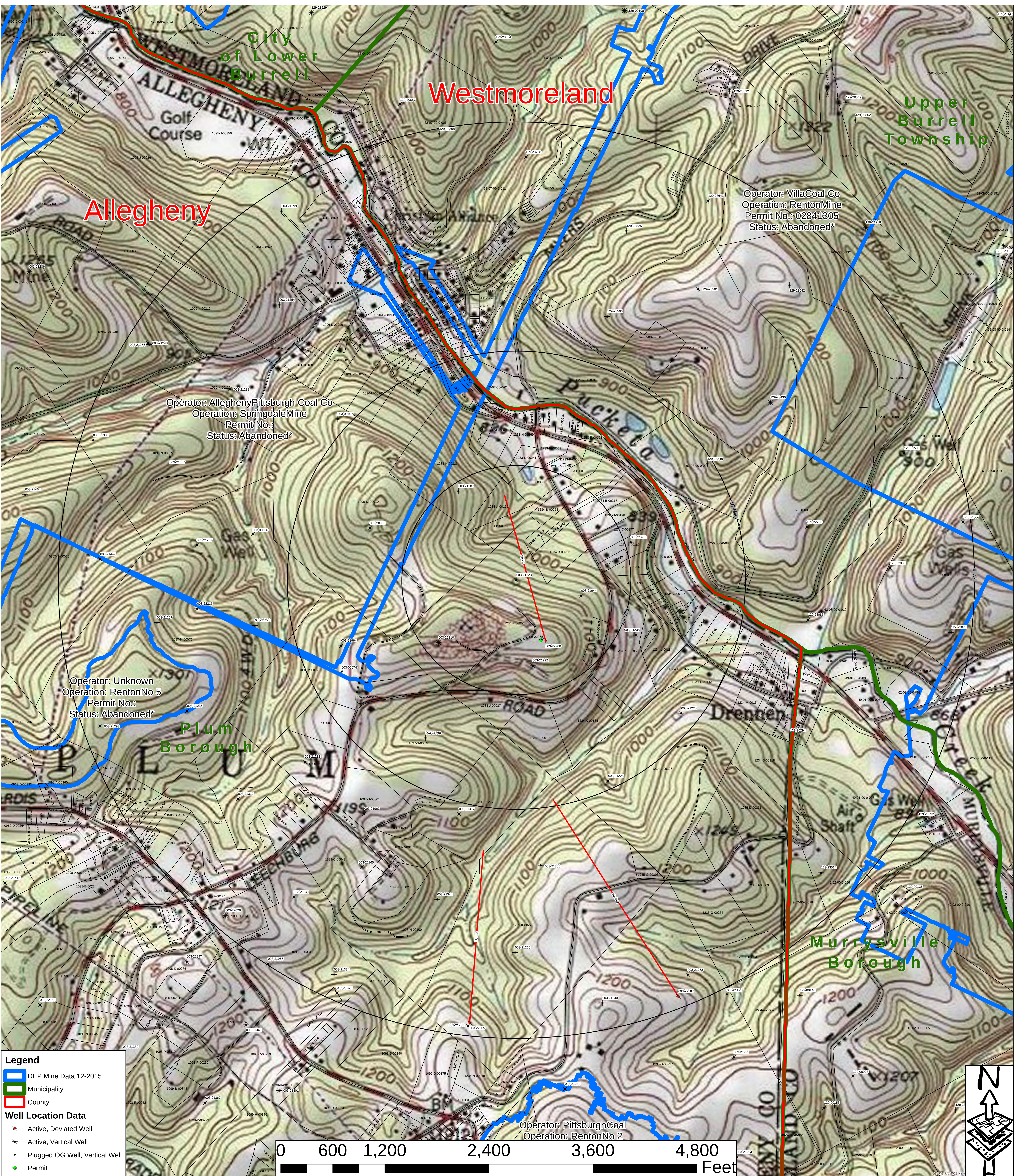
REVISIONS:

ATTACHMENT "B"
Maps of Well Area/Area of Review Methods
Sedat #3A Injection Well

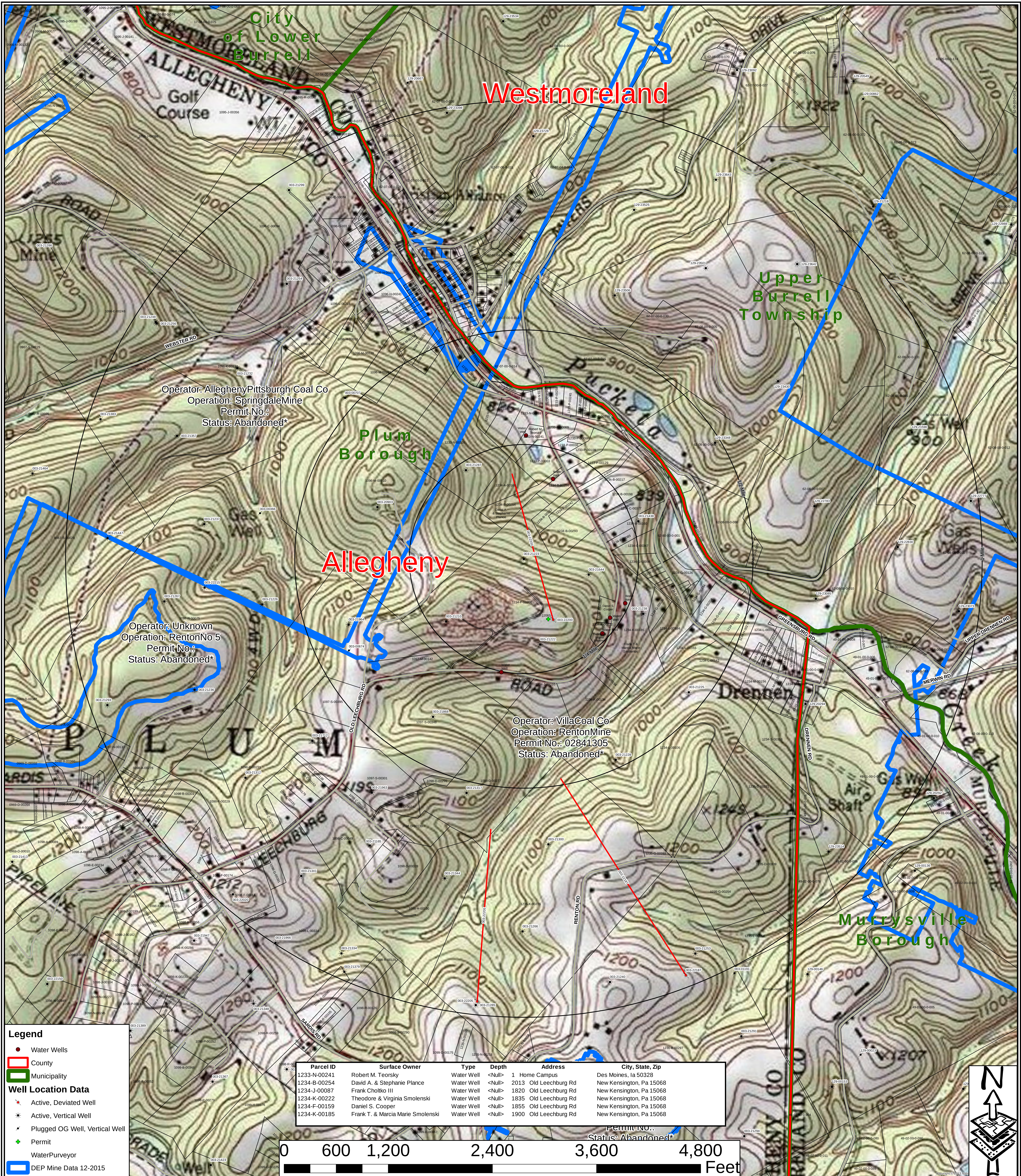
ATTACHMENT "B"
Maps of Well Area/Area of Review Methods
Sedat #3A Injection Well

Maps of Well Area Sedat #3 Injection Well

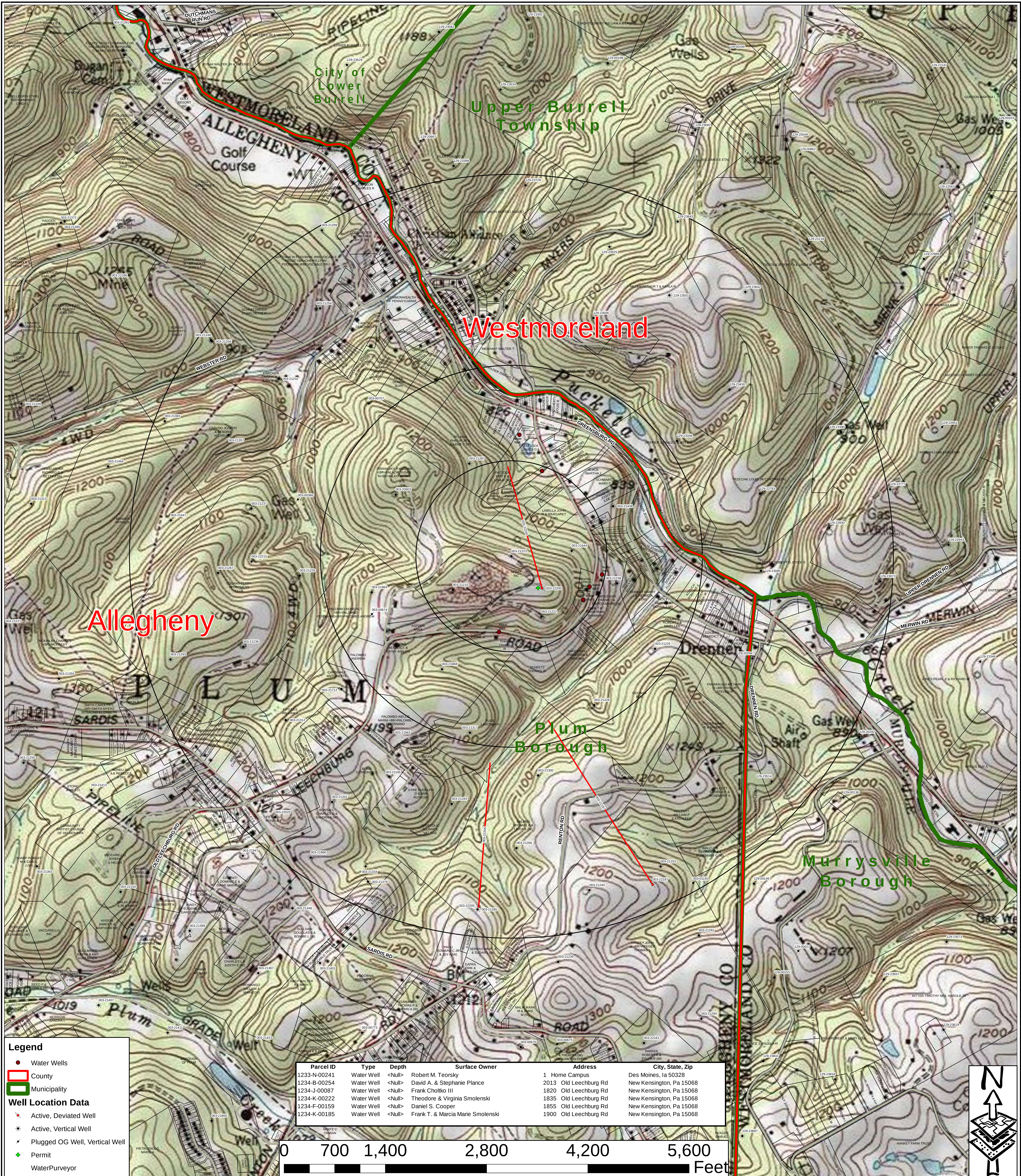
This section contains $\frac{1}{4}$ mile, $\frac{1}{2}$ mile and 1 mile radius maps of the AOR, along with a comprehensive Topographical and Plan View map of the AOR. Well records for wells within the AOR are also included in this section.



BY: MEC CHK: DATE: 12-15-2015 Scale: 1" = 333' FILE: PennecoV2 JOB NO:	PROPOSED INJECTION WELL FOR PENNECO OIL COMPANY, INC. Plum Borough, Allegheny County Commonwealth of Pennsylvania	FOX & FOX, INC. 58 Timber Bridge Rd. Clarion, PA 16214 Phone: 814-745-2861 Fax: 814-745-2248 email: ronaldfox@foxandfoxinc.us web: www.foxandfoxinc.us	REVISIONS:
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BY: MEC	PROPOSED INJECTION WELL FOR PENNECO OIL COMPANY, INC. Plum Borough, Allegheny County Commonwealth of Pennsylvania	FOX & FOX, INC. 58 Timber Bridge Rd. Clarion, PA 16214 Phone: 814-745-2861 Fax: 814-745-2248 email: ronaldfox@foxandfoxinc.us web: www.foxandfoxinc.us	REVISIONS:
CHK:			
DATE: 12-15-2015			
Scale: 1" = 333'			
FILE: PennecoV2			
JOB NO:			



BY: MEC CHK: DATE: 12-15-2015 Scale: 1" = 400' FILE: PennecoV2 JOB NO: 677415	PROPOSED INJECTION WELL FOR PENNECO ENVIRONMENTAL SOLUTIONS Plum Borough, Allegheny County Commonwealth of Pennsylvania	FOX & FOX, INC. 58 Timber Bridge Rd. Clarion, PA 16214 Phone: 814-745-2861 Fax: 814-745-2248 email: ronaldfox@foxandfoxinc.us web: www.foxandfoxinc.us	REVISIONS:
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	Sedat #3 A Injection well inventory													
	API	SPUD_DATE	OPERATOR	COUNTY	MUNICIPALITY	FARM_NAME	WELL_CODE_DESC	WELL_STATUS	LATITUDE	LONGITUDE	CONFIGURATION	UNCONVENTIONAL		
1	003-00366	1/1/1800 0:00:00	PEOPLES NATURAL GAS CO	Allegheny	Plum Boro	PITTSBURGH CONSOLIDATION COAL CO.	GAS	Plugged OG Well	40.528646	-79.724456	Vertical Well	No		
2	003-00674	1/1/1800 0:00:00	PHILLIPS EXPLORATION INC	Allegheny	Plum Boro	M HAMILTON 108A 1	GAS	Plugged OG Well	40.524366	-79.720644	Vertical Well	No		
3	003-00707	1/1/1800 0:00:00	PEOPLES NATURAL GAS CO	Allegheny	Plum Boro	ESTHER MC LAUGHLIN 938	GAS	Active	40.532352	-79.721039	Vertical Well	No		
* 4	003-01191	1/1/1800 0:00:00	PEOPLES TWLP LLC	Allegheny	Plum Boro	FRANK BEIGHLEY 2	GAS	Plugged OG Well	40.514433	-79.704377	Vertical Well	No		
5	003-20903	12/28/1976	PETRO SVC PARTNERS INC	Allegheny	Plum Boro	GEORGE E MILKO 3	GAS	Active	40.528921	-79.7196	Vertical Well	No		
6	003-21165	1/1/1800 0:00:00	PEOPLES TWLP LLC	Allegheny	Plum Boro	ALEX J SERAKOWSKI ETUX H L WALDSMIR	GAS	Plugged OG Well	40.518216	-79.719598	Vertical Well	No		
7	003-21210	3/5/1988	DAKOTA OIL & GAS CO	Allegheny	Plum Boro	SEDAT 1	COMB. OIL&GAS	Active	40.525353	-79.71665	Vertical Well	No		
8	003-21222	1/12/1989	PENNECO OIL CO INC	Allegheny	Plum Boro	SEDAT 2A	GAS	Active	40.524694	-79.712729	Vertical Well	No		
9	003-21223	1/25/1989	PENNECO OIL CO INC	Allegheny	Plum Boro	SEDAT 3A	GAS	Active	40.527384	-79.713484	Vertical Well	No		
10	003-21225	11/30/1988	PENNECO OIL CO INC	Allegheny	Plum Boro	DZIUBAN 1	GAS	Active	40.523287	-79.706527	Vertical Well	No		
11	003-21226	12/30/1988	PENNECO OIL CO INC	Allegheny	Plum Boro	SPORTSMAN CLUB 1	OIL	Active	40.525764	-79.724275	Vertical Well	No		
12	003-21228	3/21/1989	PENNECO OIL CO INC	Allegheny	Plum Boro	DZIUBAN 2	GAS	Active	40.521099	-79.709491	Vertical Well	No		
13	003-21232	10/17/1989	DAKOTA OIL & GAS CO	Allegheny	Plum Boro	KARCHER 1	GAS	Active	40.533216	-79.725536	Vertical Well	No		
14	003-21236	11/2/1989	DAKOTA OIL & GAS CO	Allegheny	Plum Boro	SPORTSMEN'S CLUB 5	GAS	Active	40.523019	-79.727008	Vertical Well	No		
15	003-21237	10/25/1989	PENNECO OIL CO INC	Allegheny	Plum Boro	SPORTSMEN'S CLUB 2	GAS	Active	40.528261	-79.726758	Vertical Well	No		
16	003-21238	11/13/1989	PENNECO OIL CO INC	Allegheny	Plum Boro	SMOLENSKI 1	GAS	Active	40.525737	-79.708484	Vertical Well	No		
17	003-21240	12/5/1989	PENNECO OIL CO INC	Allegheny	Plum Boro	HANKEY 1	GAS	Active	40.514072	-79.709527	Vertical Well	No		
* 18	003-21248	1/1/1800 0:00:00	VICTORY ENERGY CO	Allegheny	Plum Boro	HENRY J. BORISH 1	GAS	Active	40.534617	-79.72896	Vertical Well	No		
19	003-21253	3/5/1991	DAKOTA OIL & GAS CO	Allegheny	Plum Boro	HANKEY 2	GAS	Active	40.515026	-79.706018	Vertical Well	No		
20	003-21254	10/19/1990	PENNECO OIL CO INC	Allegheny	Plum Boro	STONIS 1	GAS	Active	40.53592	-79.723558	Vertical Well	No		
21	003-21256	1/24/1991	PENNECO OIL CO INC	Allegheny	Plum Boro	BORISH 1	GAS	Active	40.534574	-79.728918	Vertical Well	No		
22	003-21266	2/22/1991	DAKOTA OIL & GAS CO	Allegheny	Plum Boro	BURTON 1	GAS	Active	40.515609	-79.713196	Vertical Well	No		
23	003-21267	3/13/1991	PENNECO OIL CO INC	Allegheny	Plum Boro	SPORTSMAN'S CLUB 3	GAS	Active	40.52579	-79.72834	Vertical Well	No		
24	003-21285	10/18/1991	PENNECO OIL CO INC	Allegheny	Plum Boro	BURTON 2	GAS	Active	40.513248	-79.715066	Vertical Well	No		
25	003-21287	9/24/1991	PENNECO OIL CO INC	Allegheny	Plum Boro	HOWARD 1	GAS	Active	40.530156	-79.715967	Vertical Well	No		
26	003-21293	6/24/1992	PENNECO OIL CO INC	Allegheny	Plum Boro	SPORTSMEN'S CLUB 4	GAS	Active	40.522469	-79.730605	Vertical Well	No		
27	003-21299	3/19/1992	PENNECO OIL CO INC	Allegheny	Plum Boro	STONIS 2	GAS	Active	40.538884	-79.723559	Vertical Well	No		
28	003-21300	3/9/1992	PENNECO OIL CO INC	Allegheny	Plum Boro	BURTON 3	GAS	Active	40.518381	-79.712207	Vertical Well	No		
29	003-21312	10/27/1992	PENNECO OIL CO INC	Allegheny	Plum Boro	LECORCHICK UNIT 1	GAS	Active	40.520274	-79.724814	Vertical Well	No		
30	003-21317	12/31/1992	DAKOTA OIL & GAS CO	Allegheny	Plum Boro	MILLER 1	GAS	Active	40.519946	-79.715642	Vertical Well	No		
31	003-21334	11/9/1993	DAKOTA OIL & GAS CO	Allegheny	Plum Boro	BONSALL 1	GAS	Active	40.514785	-79.720676	Vertical Well	No		
32	003-21341	3/4/1994	PENNECO OIL CO INC	Allegheny	Plum Boro	BONSALL 2	GAS	Active	40.517203	-79.722417	Vertical Well	No		
33	003-21344	5/11/1994	PENNECO OIL CO INC	Allegheny	Plum Boro	DYKE 1	GAS	Active	40.517228	-79.716469	Vertical Well	No		
34	003-21357	10/21/1994	PENNECO OIL CO INC	Allegheny	Plum Boro	CARUSO 1	GAS	Active	40.531035	-79.727969	Vertical Well	No		
35	003-21379	10/2/1995	PENNECO OIL CO INC	Allegheny	Plum Boro	BONSALL 3	OIL	Active	40.514206	-79.720539	Vertical Well	No		
36	003-21383	1/5/1996	PENNECO OIL CO INC	Allegheny	Plum Boro	CARUSO 2	GAS	Active	40.531507	-79.731154	Vertical Well	No		
37	003-21438	1/4/1999	PENNECO OIL CO INC	Allegheny	Plum Boro	CONSOLIDATION COAL CO 8	GAS	Active	40.52866	-79.708772	Vertical Well	No		
38	003-21447	3/7/2000	DAKOTA OIL & GAS CO	Allegheny	Plum Boro	BENDER 1	GAS	Active	40.52775	-79.73075	Vertical Well	No		
39	003-21644	6/18/2004	PENNECO OIL CO INC	Allegheny	Plum Boro	SEDAT 4A	GAS	Active	40.526935	-79.710783	Vertical Well	No		
40	003-21712	12/30/2005	XTO ENERGY INC	Allegheny	Plum Boro	MARGARET HAMILTON 2	GAS	Active	40.521494	-79.722083	Vertical Well	No		
41	003-21868	11/30/2007	XTO ENERGY INC	Allegheny	Plum Boro	MARGARET HAMILTON 3	GAS	Active	40.522332	-79.7171	Vertical Well	No		
42	003-21963	11/13/2008	XTO ENERGY INC	Allegheny	Plum Boro	MARGARET HAMILTON 4	GAS	Active	40.519891	-79.719567	Vertical Well	No		
43	003-21964	6/22/2009	XTO ENERGY INC	Allegheny	Plum Boro	MARGARET HAMILTON 5	GAS	Active	40.525188	-79.72068	Vertical Well	No		
44	003-21966	9/11/2008	PENNECO OIL CO INC	Allegheny	Plum Boro	BONSALL 4	GAS	Active	40.515074	-79.723422	Vertical Well	No		
45	003-22020	5/6/2009	PENNECO OIL CO INC	Allegheny	Plum Boro	PETRELLI 1	GAS	Active	40.516574	-79.725228	Vertical Well	No		
46	003-22187	6/13/2011	PENNECO OIL CO INC	Allegheny	Plum Boro	HANKEY UNIT 6H	OIL	Active	40.514333	-79.706388	Deviated Well	No		
47	003-22200	1/10/2012	PENNECO OIL CO INC	Allegheny	Plum Boro	SEDAT 5H	OIL	Active	40.525486	-79.712216	Deviated Well	No		
48	003-22205	6/14/2012	PENNECO OIL CO INC	Allegheny	Plum Boro	BURTON UNIT 4H	OIL	Active	40.513358	-79.715013	Deviated Well	No		
49	003-22215	3/29/2012	PENNECO OIL CO INC	Allegheny	Plum Boro	LOGANS FERRY SPORTSMANS CLUB 6	GAS	Active	40.526255	-79.726688	Vertical Well	No		
50	129-20294	1/1/1800 0:00:00	XTO ENERGY INC	Westmoreland	Murrysville Boro	PGH CONSOLIDATION COAL 1	GAS	Active	40.523	-79.70168	Vertical Well	No		
51	129-21590	1/1/1800 0:00:00	ECONOMY NATURAL GAS IN	Westmoreland	Upper Burrell Twp	WM F & R N CROOKS #1	GAS	Active	40.531666	-79.697527	Vertical Well	No		
52	129-22777	2/24/1986	DAKOTA OIL & GAS CO	Westmoreland	Upper Burrell Twp	MORROW 1	COMB. OIL&GAS	Active	40.529535	-79.695019	Vertical Well	No		

[illegible]

Attachment A
Area of Review Methods
Sedat #3A Injection Well

Area of Review Methods:

The size of the area of review was determined by a fixed radius of one quarter mile as required by permit application. Maps with a half mile, and one mile radius were also prepared. Maps detailing the area of review are in Attachment B. Research was conducted by:

- 1) Survey by Fox and Fox, Inc. registered professional surveyors
- 2) Conversation with surface landowners by Fox and Fox, representatives of Penneco Environmental Solutions LLC.
- 3) Research of Pennsylvania Bureau of Oil and Gas Management's well records
- 4) Research of Pennsylvania Geological Survey publications covering the area of review
- 5) Research of USGS publications covering the area of review.
- 6) Master Thesis (Two) From West Virginia University
- 7) Series of reservoir test by HFrac Consulting Services.

Using the results from the above research, along with topographic and tax maps displaying surface features such as buildings, and streams, maps of the AOR were prepared for and included in Attachment B.

The same research used to map the area of review was used to provide data on the geology of the injection zone and the confining formations described in Attachment G.

As part of larger study to assess its lease acreage in the area of the Sedat lease Penneco ran a series of reservoir tests using HFrac Consulting Services to determine the character of the Murrysville reservoir and the results are included in Attachment H.

ATTACHMENT "C"
Corrective Action Plan

Attachment C
Corrective Action Plan and Well Data
Sedat #3A Injection Well

If any upward fluid migration should occur through the well bore of any know or unknown well or any improperly plugged well due to the injection of permitted fluids, injection will be stopped until the situation can be remedied. Should any problem develop with the casing of the injection well, injection will be stopped until repairs can be completed to the casing. Injection will be stopped in the event of any mechanical integrity failure or some other major failure and the Pennsylvania DEP and the EPA will be notified of the problem.

In addition to the proposed injection well there are five (5) wells in the ¼ mile AOR that penetrate the injection and are shown in the table below. Well records for the wells and a map showing their location are in Attachment B. Well permit # 003-21210 will be converted into an observation well.

Tabulation of Wells Penetrating the Injection Zone

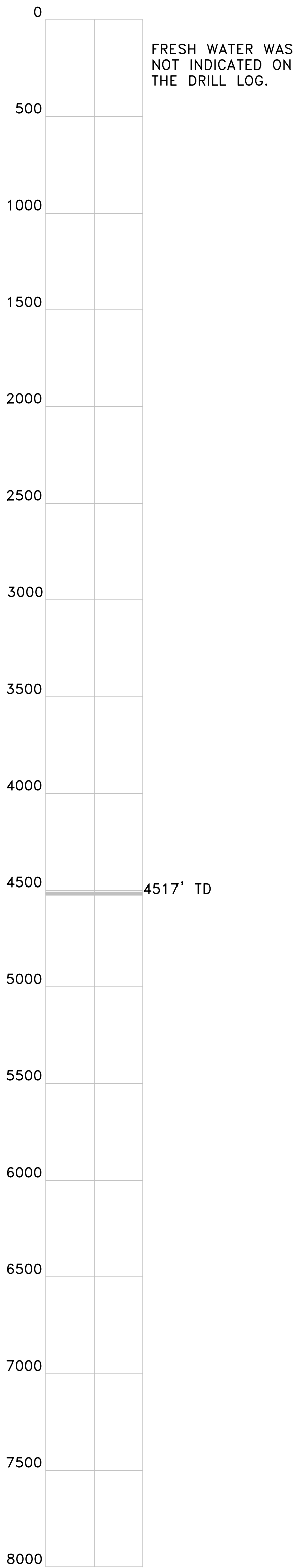
Well Permit #	Well Type	Construction	Date Drilled	Location *	Total Depth	Completion
003-21287	Gas	Rotary/Air	9/24/1991	North West	4,121'	Cased
003-21644	Gas	Rotary/Air	6/21/2004	South East	3,925'	Cased
003-22200**	Gas /Oil	Rotary/Air & Mud	1/12/2012	South East	3,343' True VD	Cased
003-21222	Gas	Rotary/Air	1/12/1989	South	4,323'	Cased
003-21210	Gas	Rotary/Air	3/5/1988	South West	3,522'	Cased

Well records and completion reports are included in Attachment B of the application.

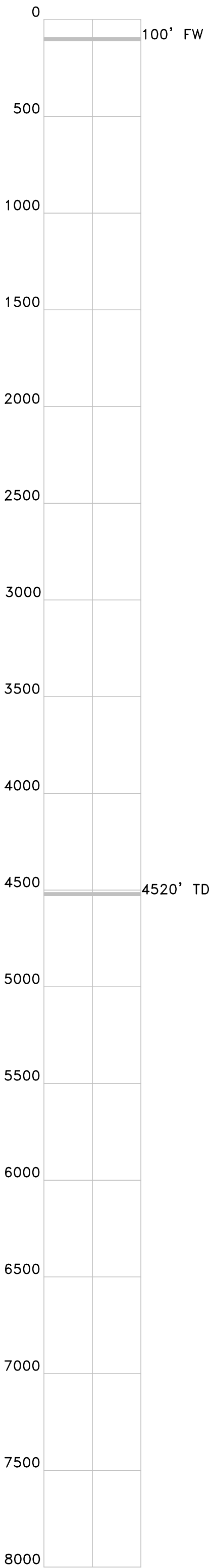
*Location given in reference to proposed injection well Permit #003-21223

**Horizontal Well, lateral drilled to NW, for more information see well record in Attachment B and AOR map.

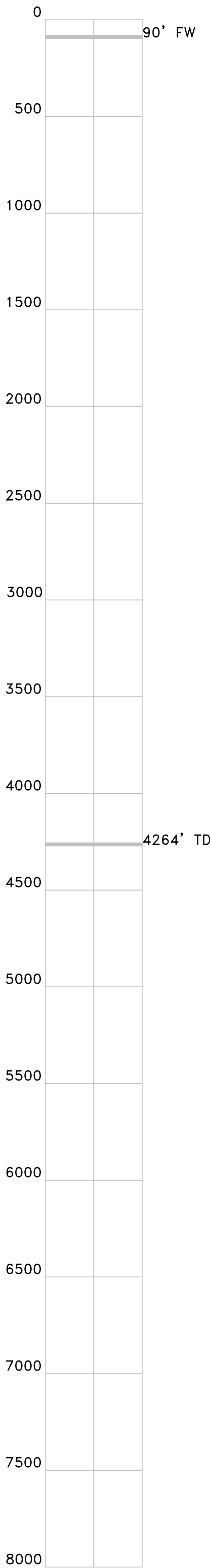
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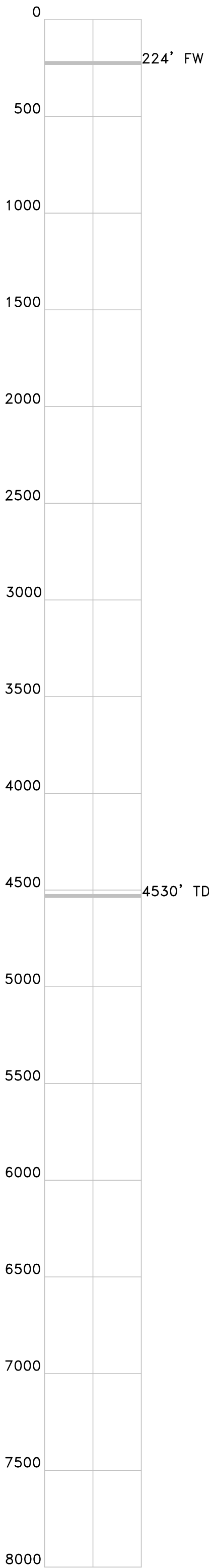
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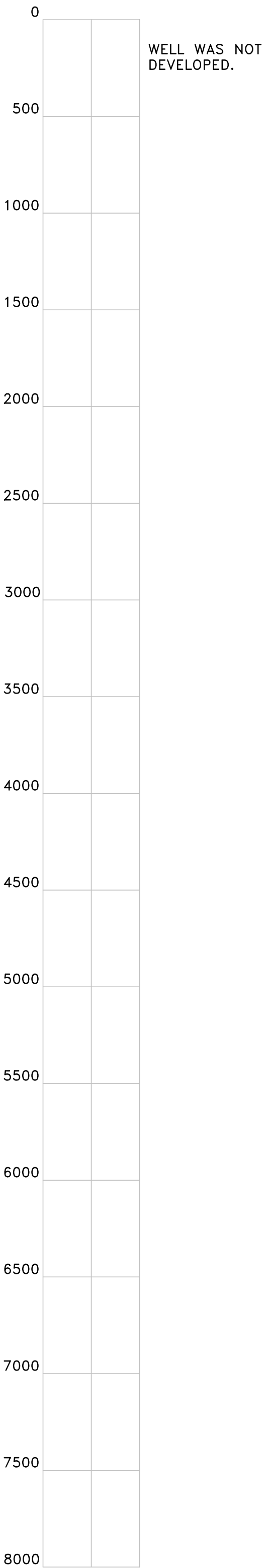
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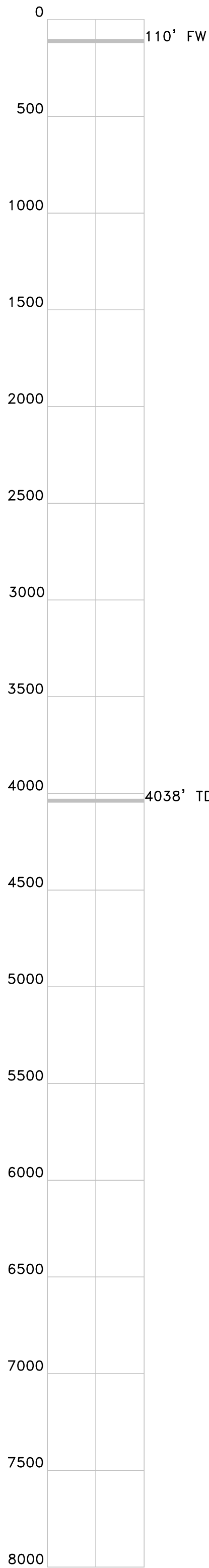
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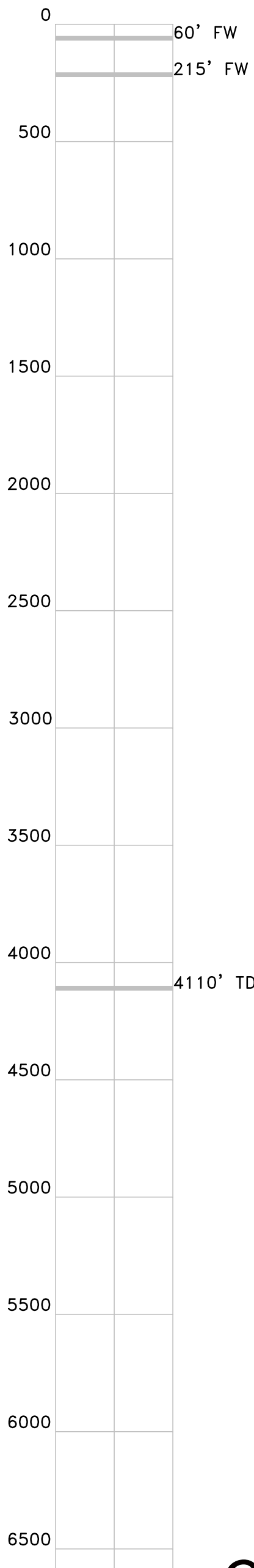
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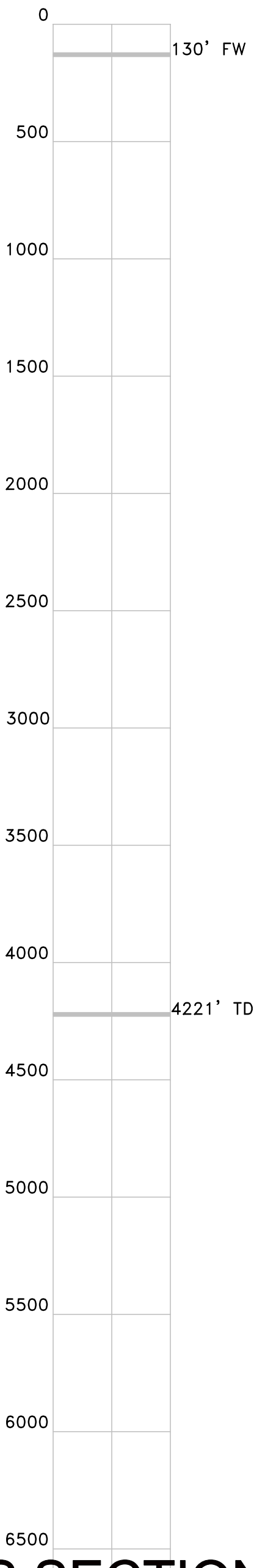
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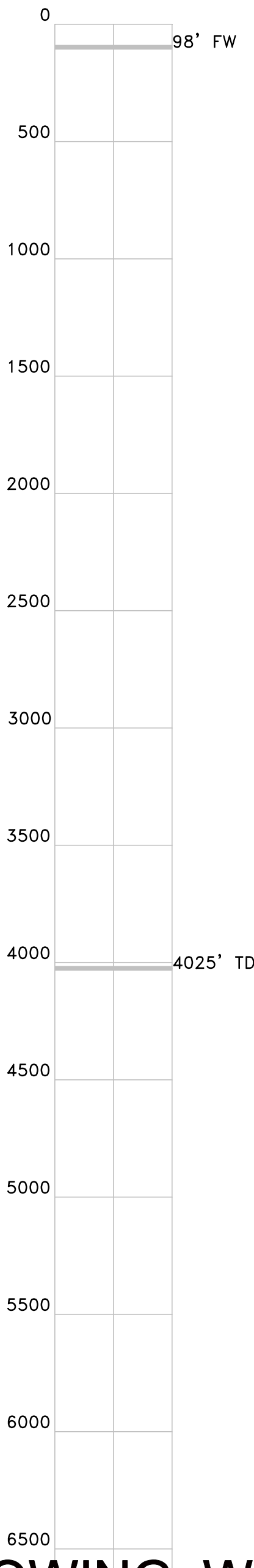
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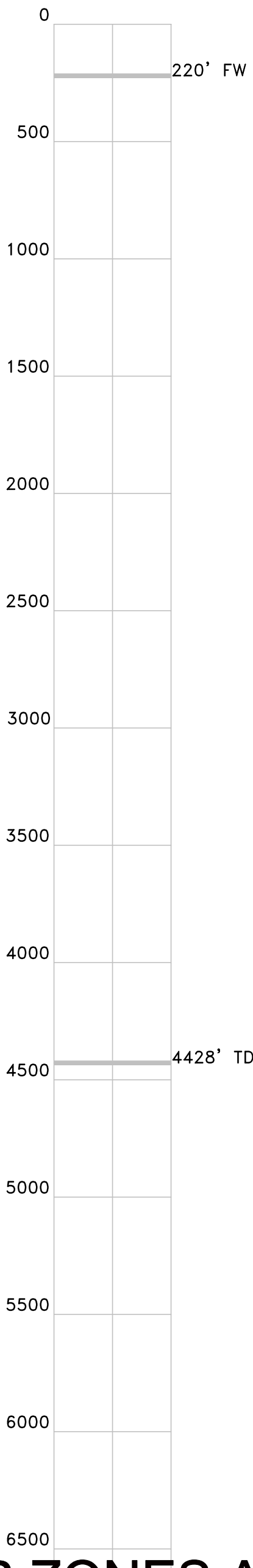
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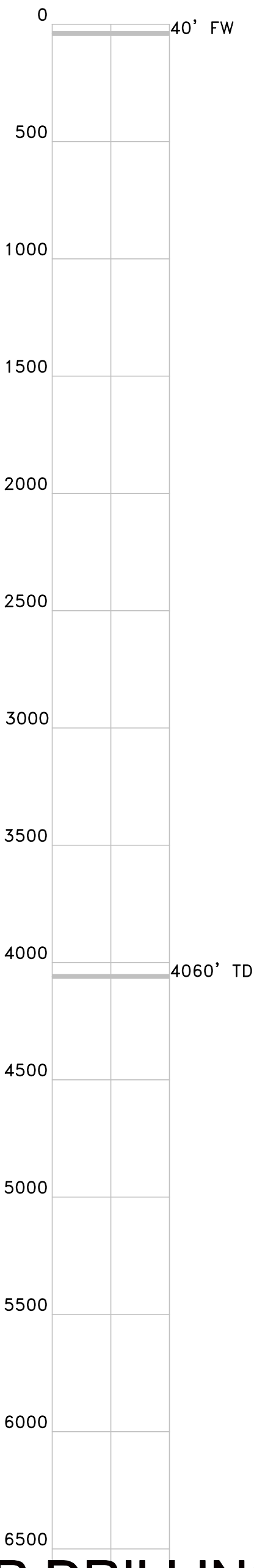
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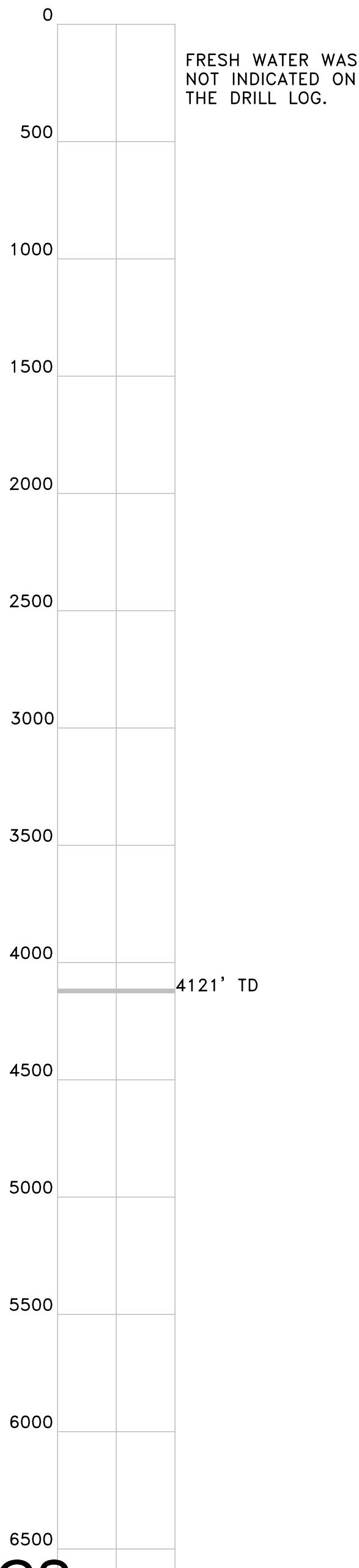
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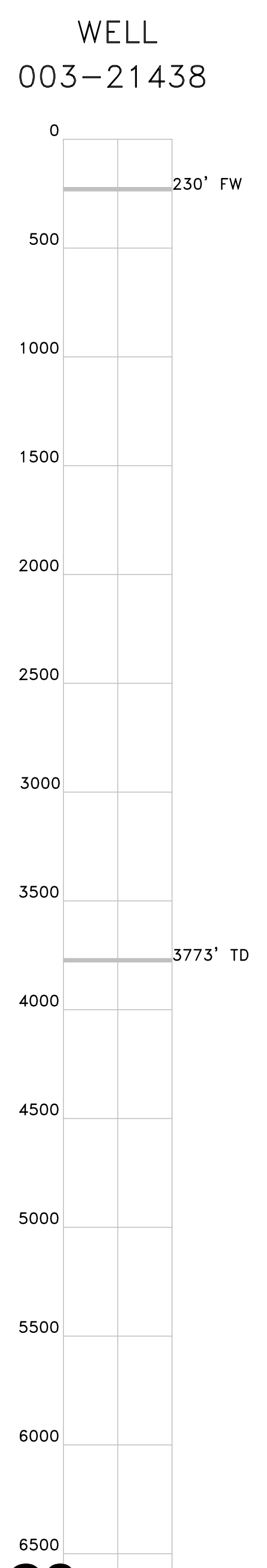
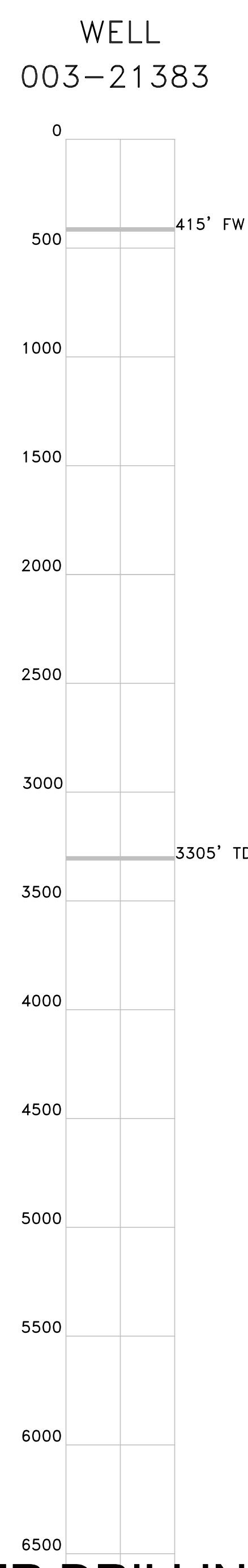
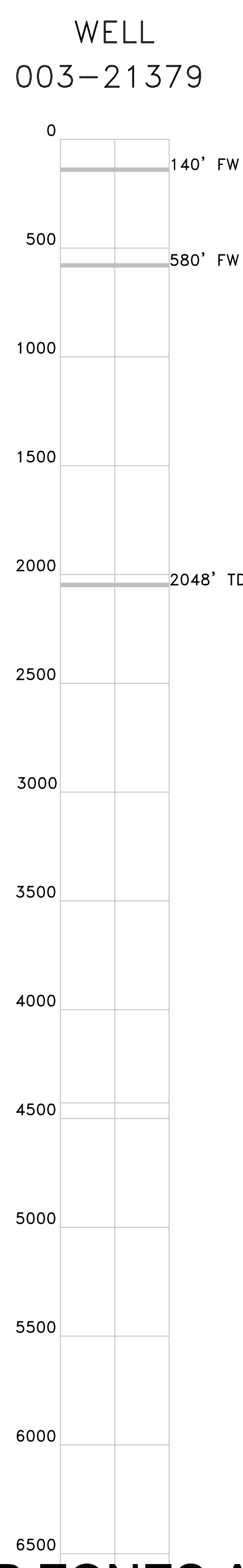
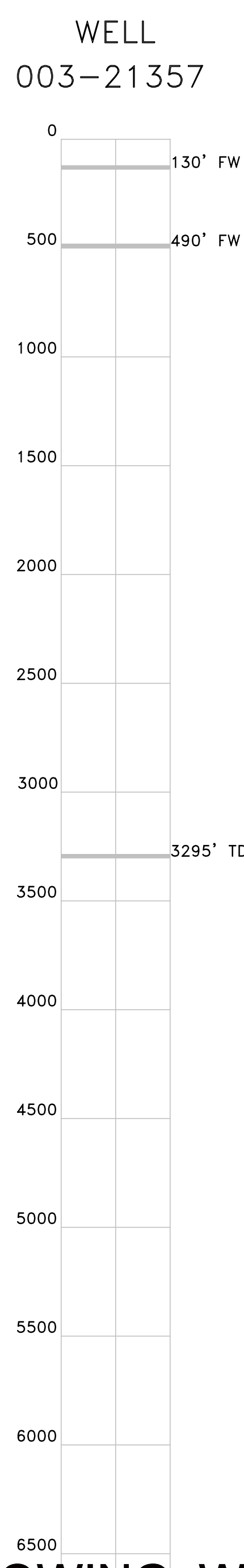
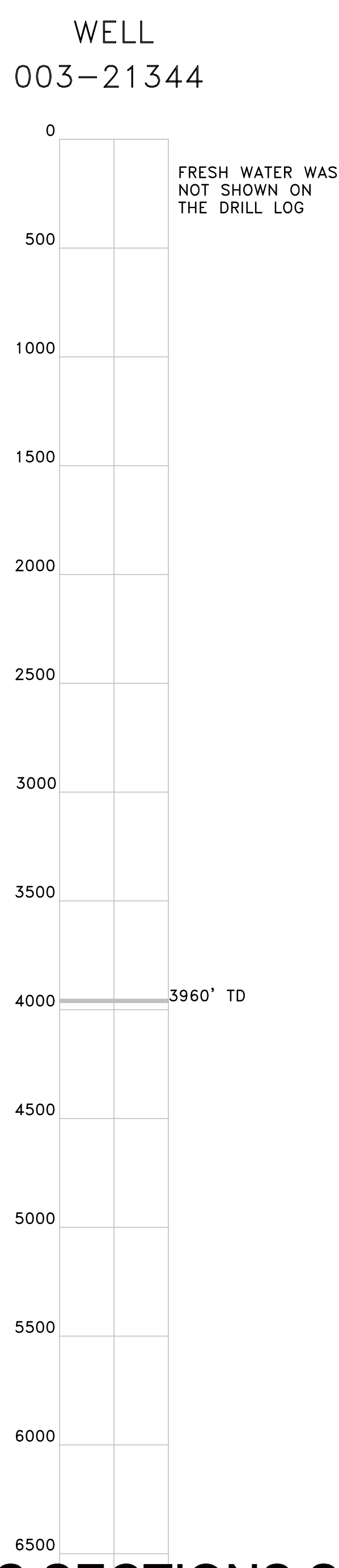
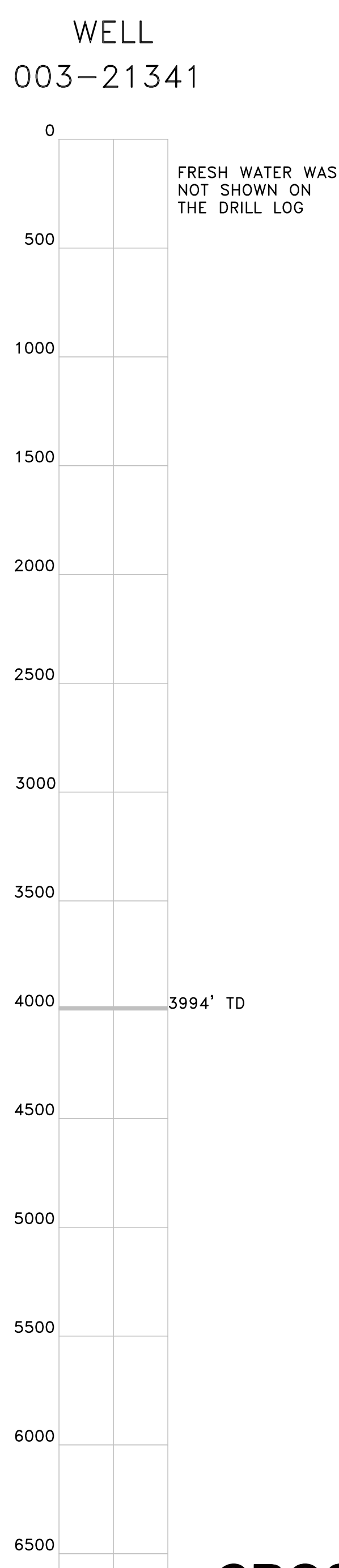
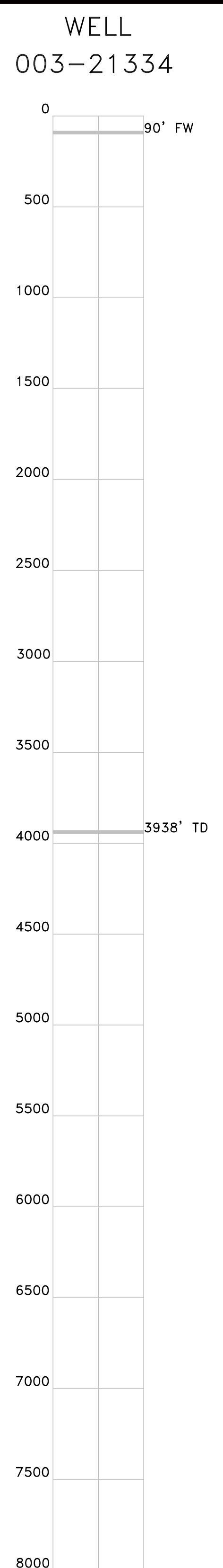
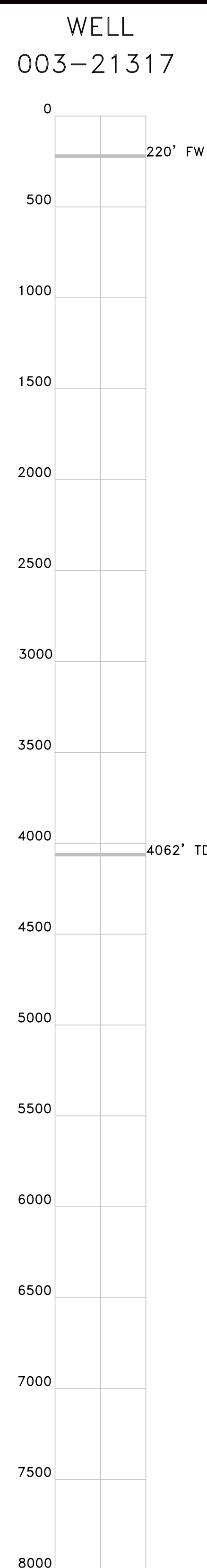
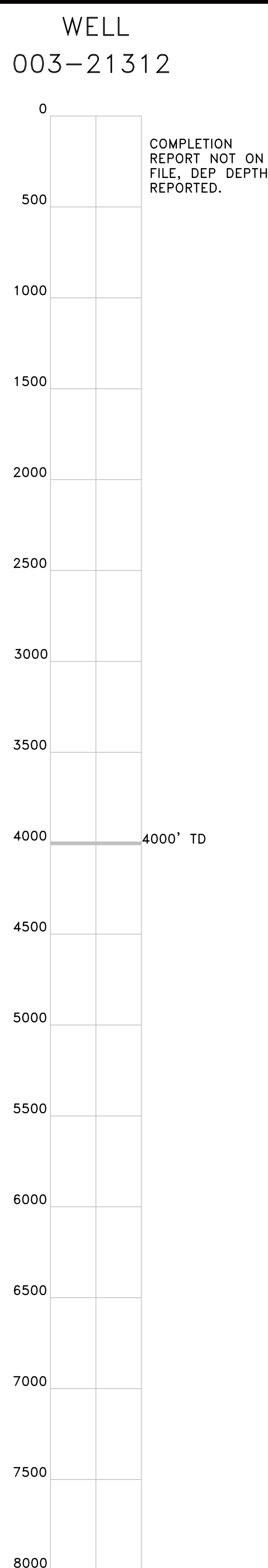
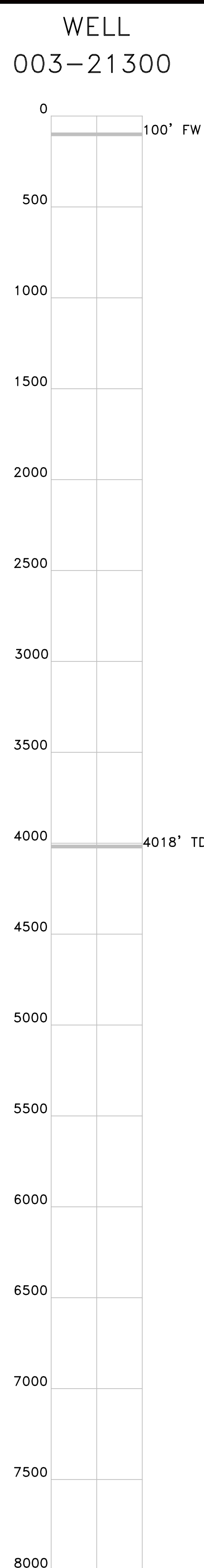
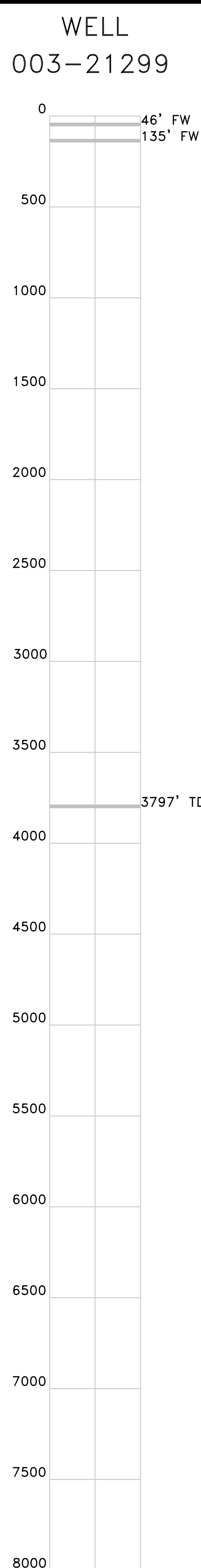
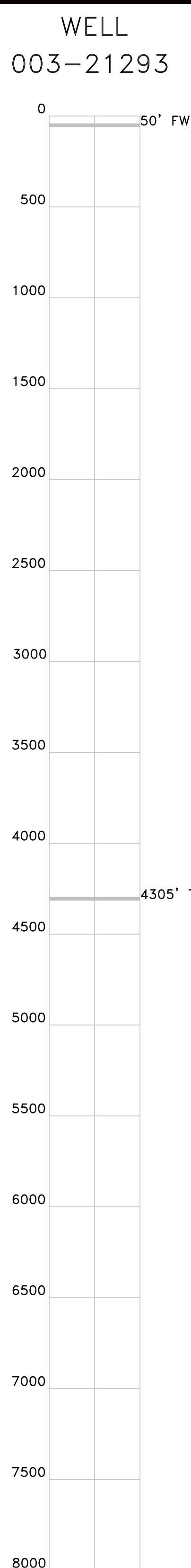


WELL
003-21287



CROSS SECTIONS SHOWING WATER ZONES AS PER DRILLING LOGS

SHEET: 2 OF 6	JOB NO.: 87415_JWO_CROSS-2	FILE: PENNECO-INJECTION	SCALE: HORIZ.: 1" = 200'	VERT.: DATE: FEB. 12, 2016		SEAL	PROPOSED INJECTION WELL FOR PENNECO ENVIRONMENTAL SOLUTIONS, LLC PLUM BOROUGH, ALLEGHENY COUNTY PENNSYLVANIA	FOX & FOX, INC. 58 Timber Bridge Road, Suite 20 Clarion, Pa. 16214 Phone: 814-745-2861 Fax: 814-745-2248 email: ronaldlfox@foxandfoxinc.us web: www.foxandfoxinc.us	REVISIONS		
											DESCRIPTION



CROSS SECTIONS SHOWING WATER ZONES AS PER DRILLING LOGS

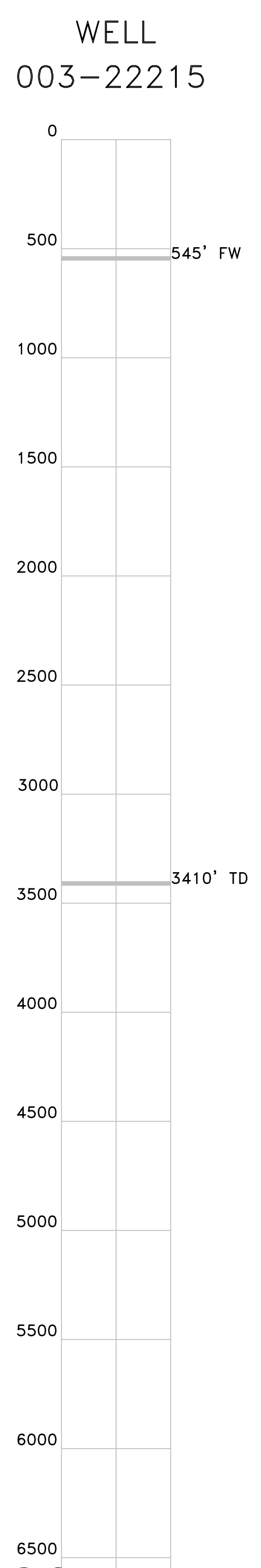
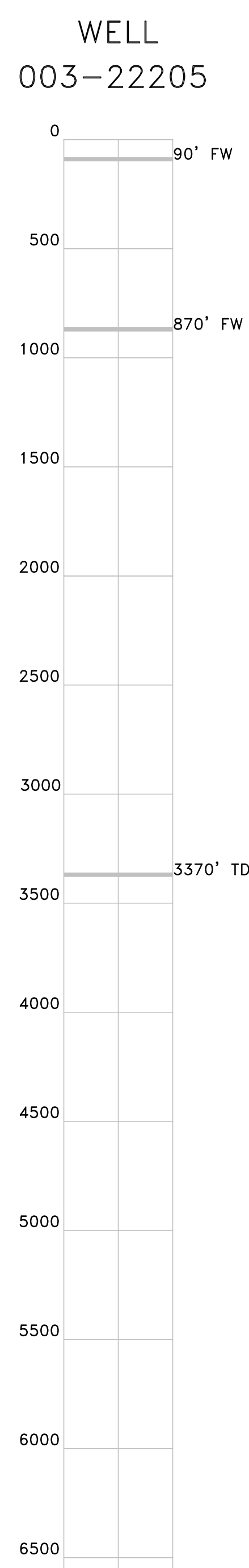
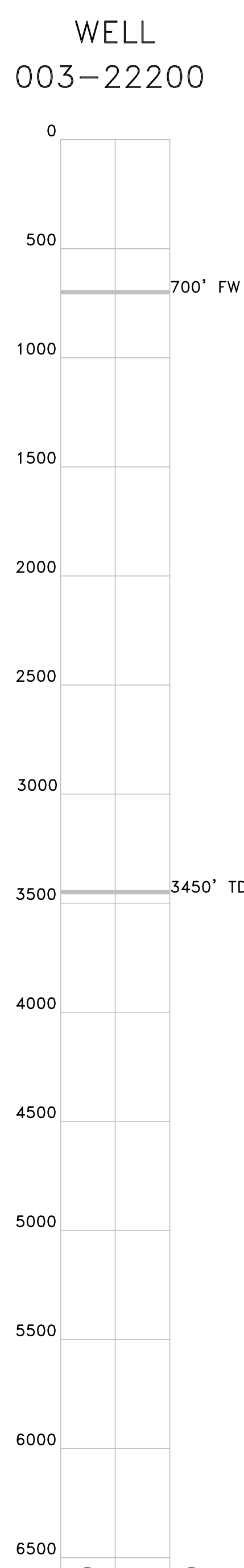
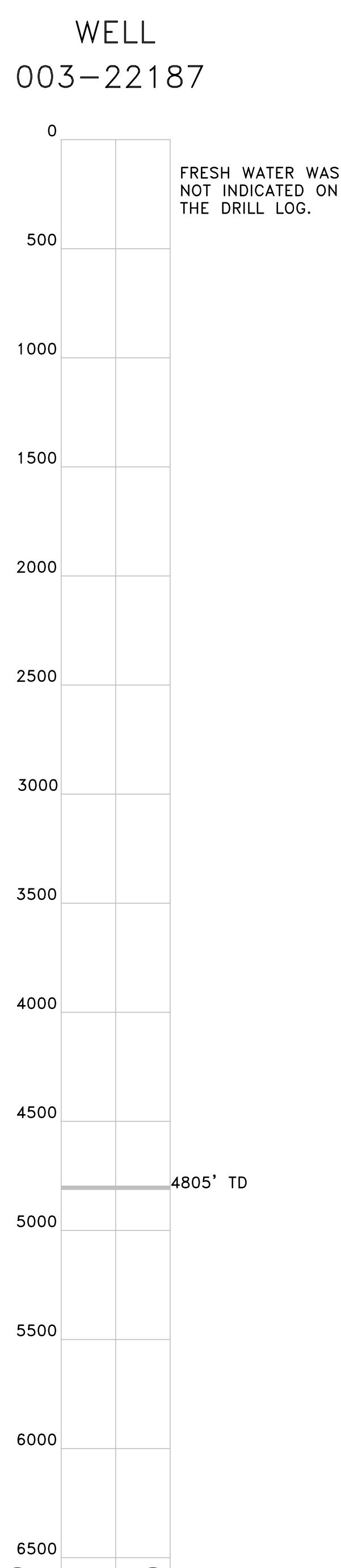
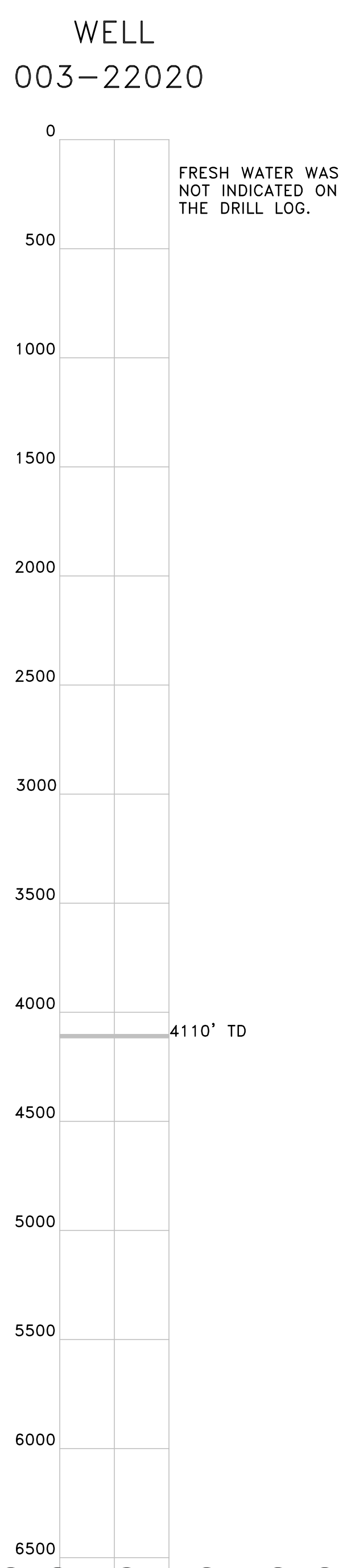
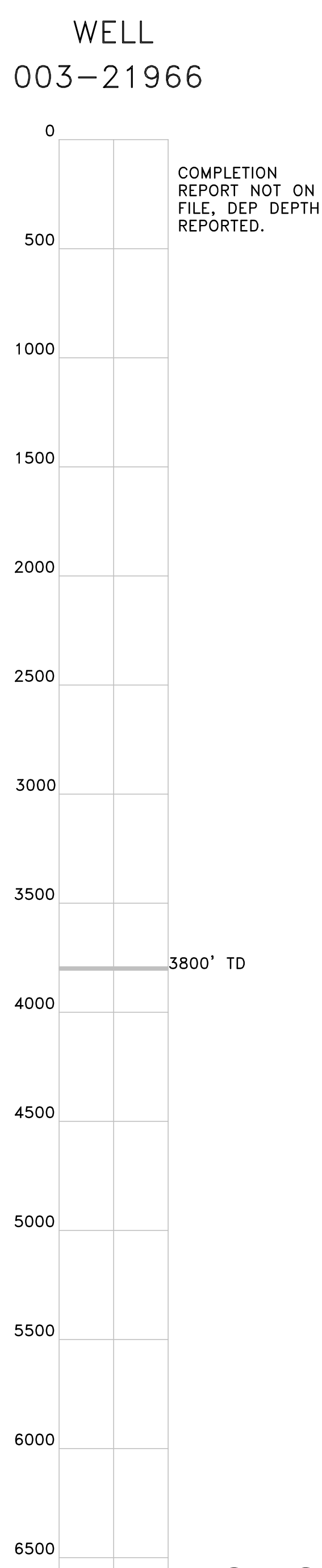
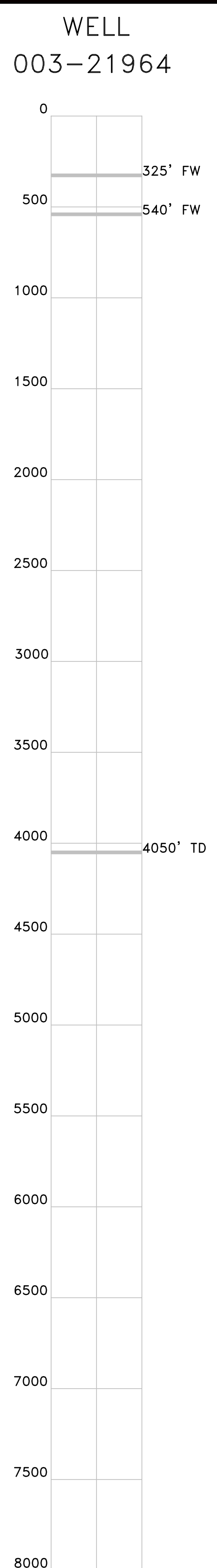
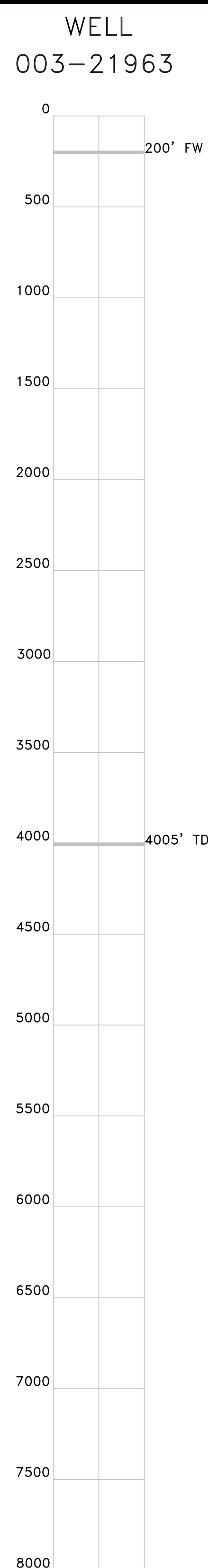
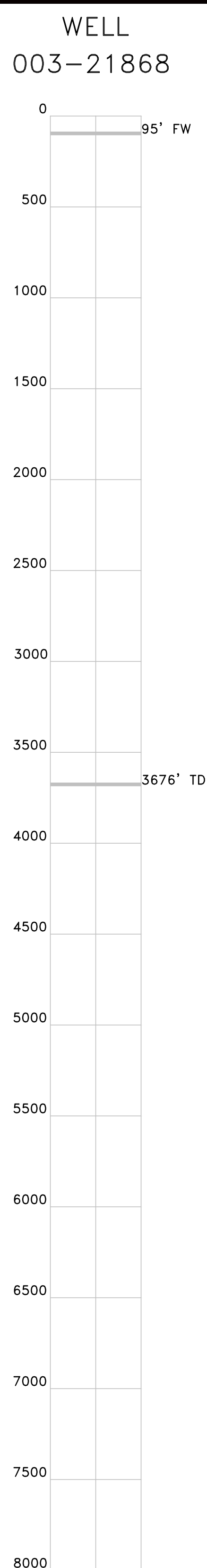
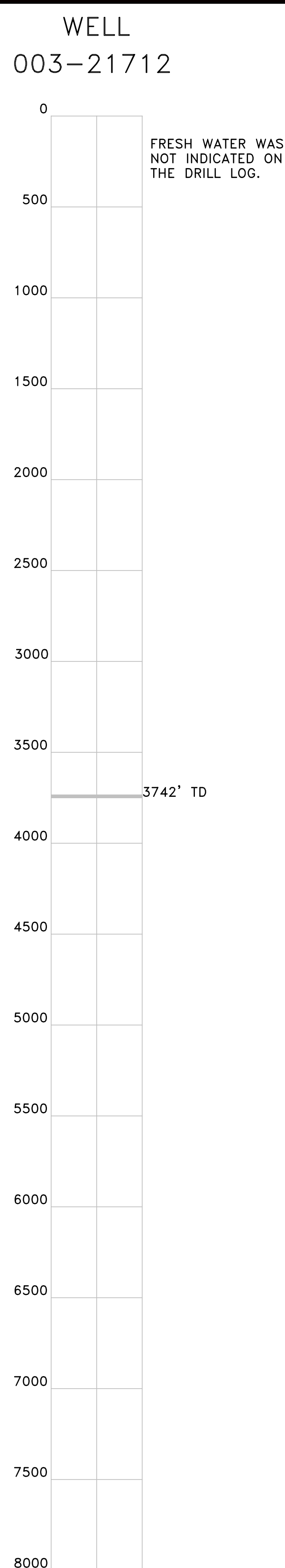
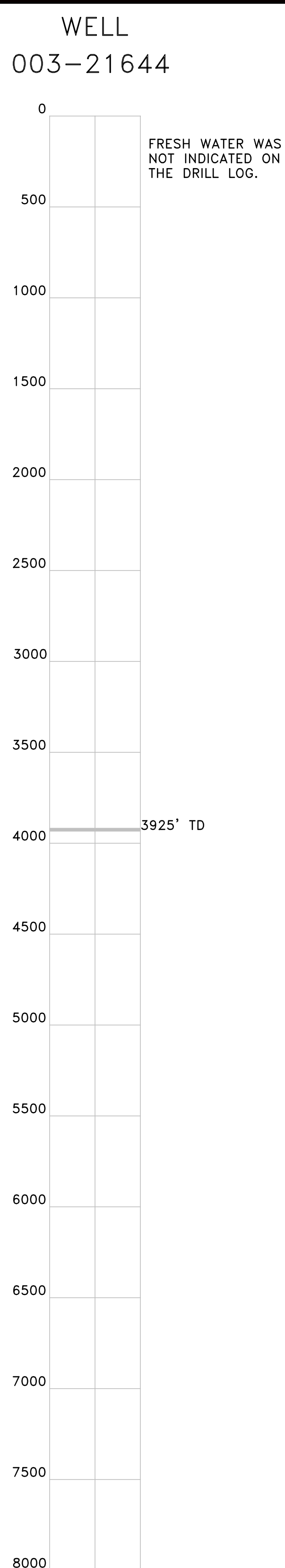
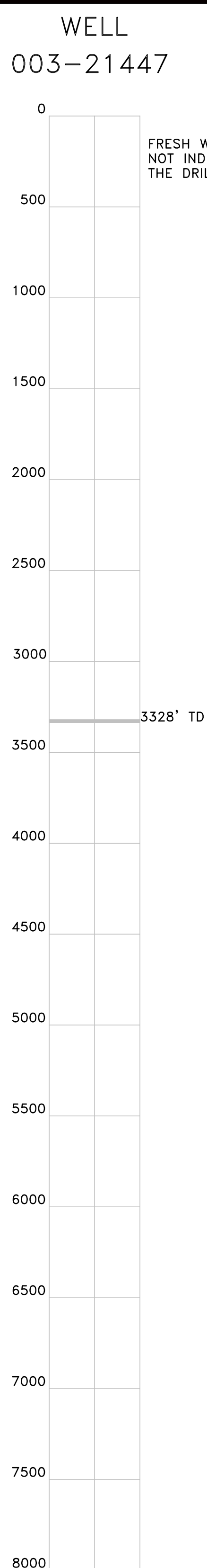


PROPOSED INJECTION WELL
FOR
PENNECO ENVIRONMENTAL SOLUTIONS, LLC
PLUM BOROUGH, ALLEGHENY COUNTY
PENNSYLVANIA

FOX & FOX, INC.

58 Timber Bridge Road, Suite 20
Clarion, Pa. 16214
Phone: 814-745-2861 Fax: 814-745-2248
email: ronaldfox@foxandfoxinc.us
web: www.foxandfoxinc.us

[illegible]



CROSS SECTIONS SHOWING WATER ZONES AS PER DRILLING LOGS



**PROPOSED INJECTION WELL
FOR
PENNECO ENVIRONMENTAL SOLUTIONS, LLC
PLUM BOROUGH, ALLEGHENY COUNTY
PENNSYLVANIA**

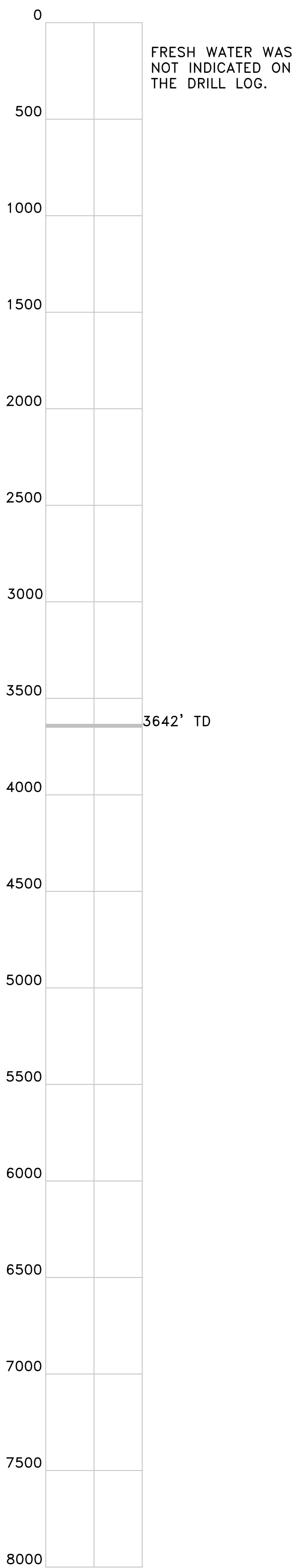
FOX & FOX, INC.

58 Timber Bridge Road, Suite 20
Clarion, Pa. 16214
Phone: 814-745-2861 Fax: 814-745-2248
email: ronaldfox@foxandfoxinc.us
web: www.foxandfoxinc.us

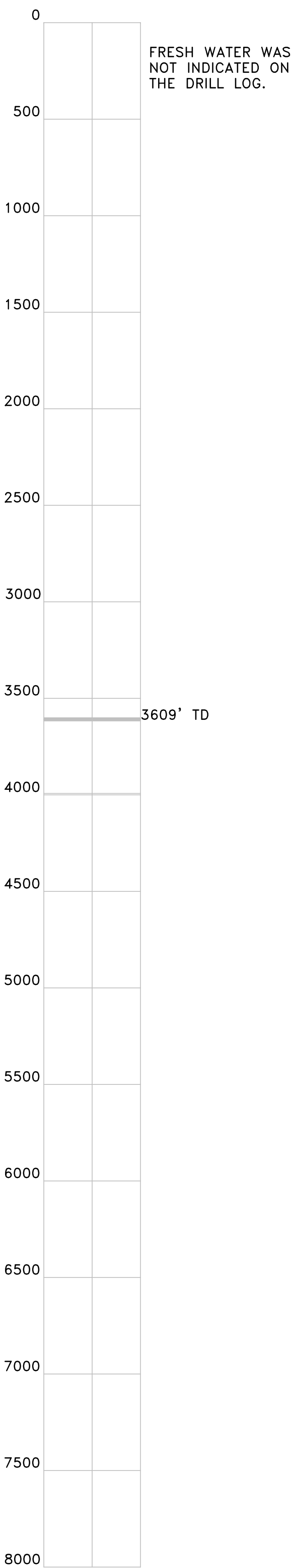
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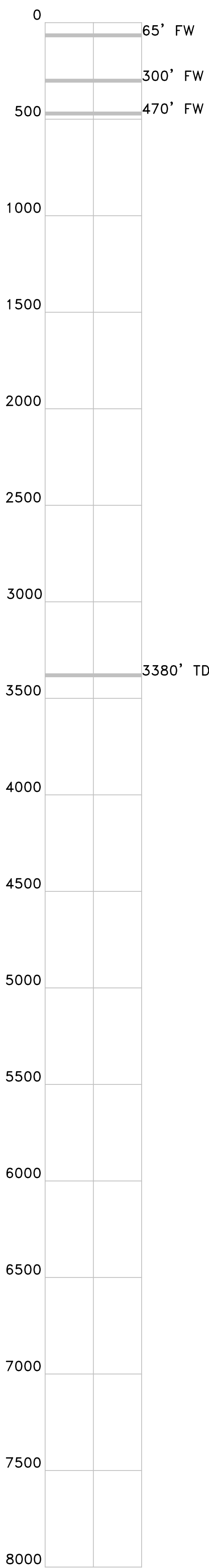
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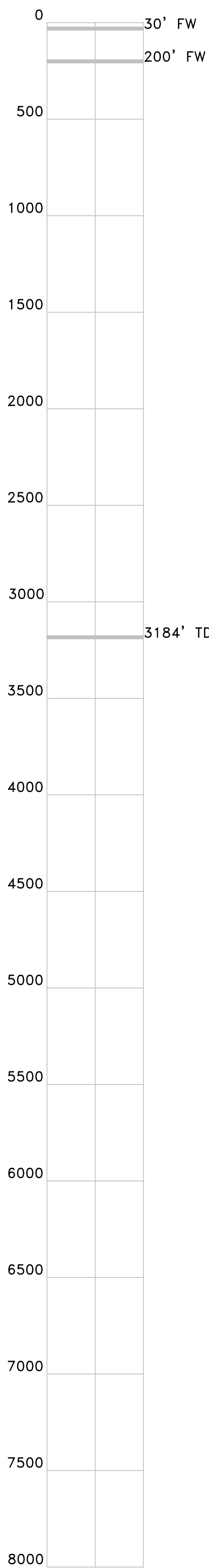
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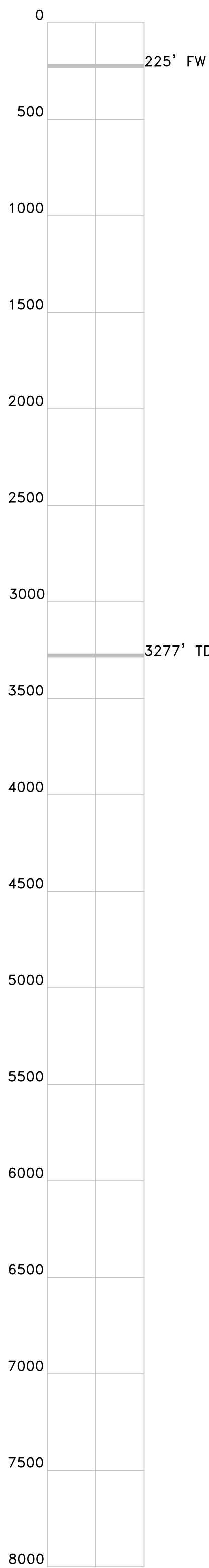
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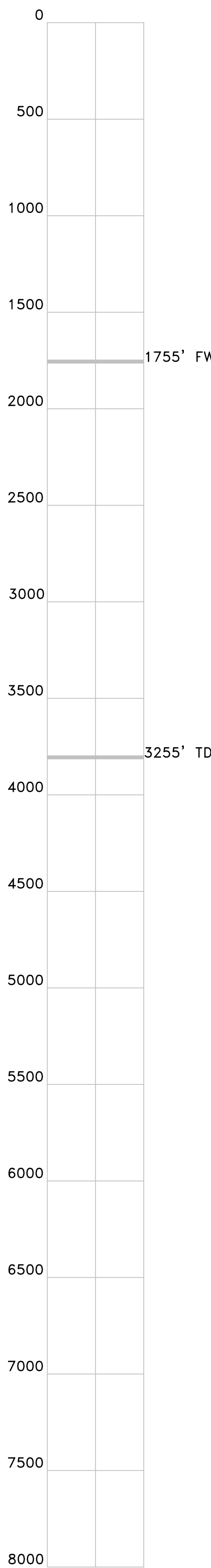
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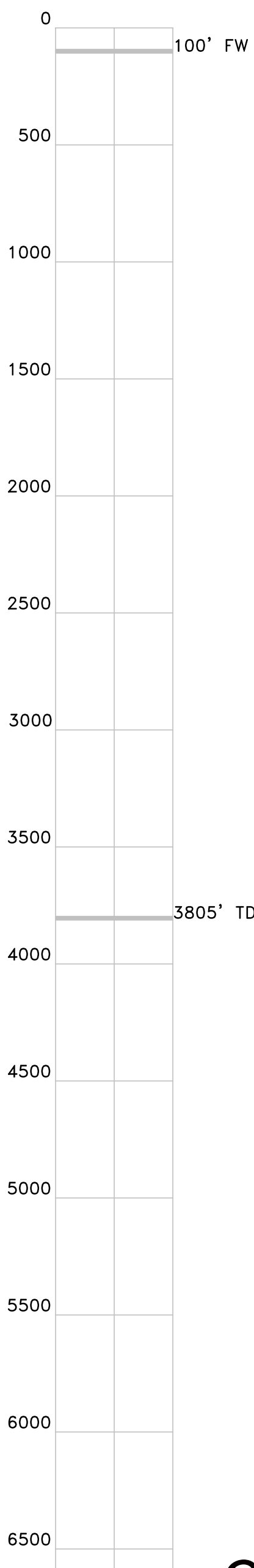
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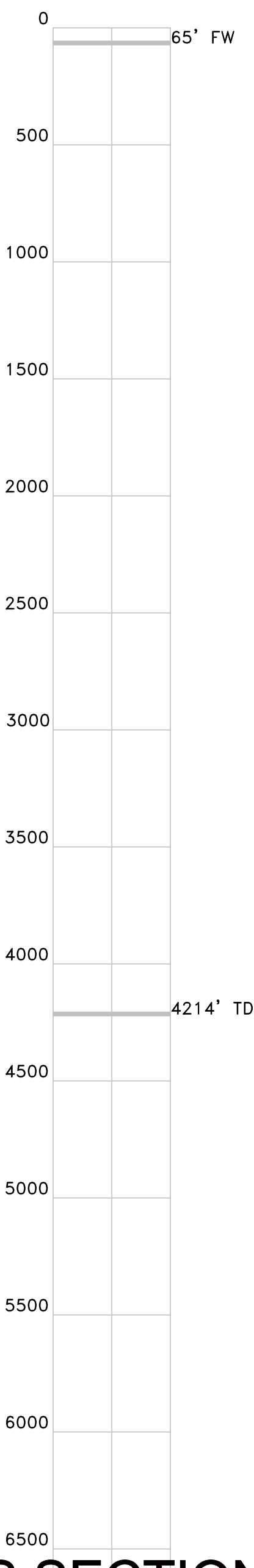
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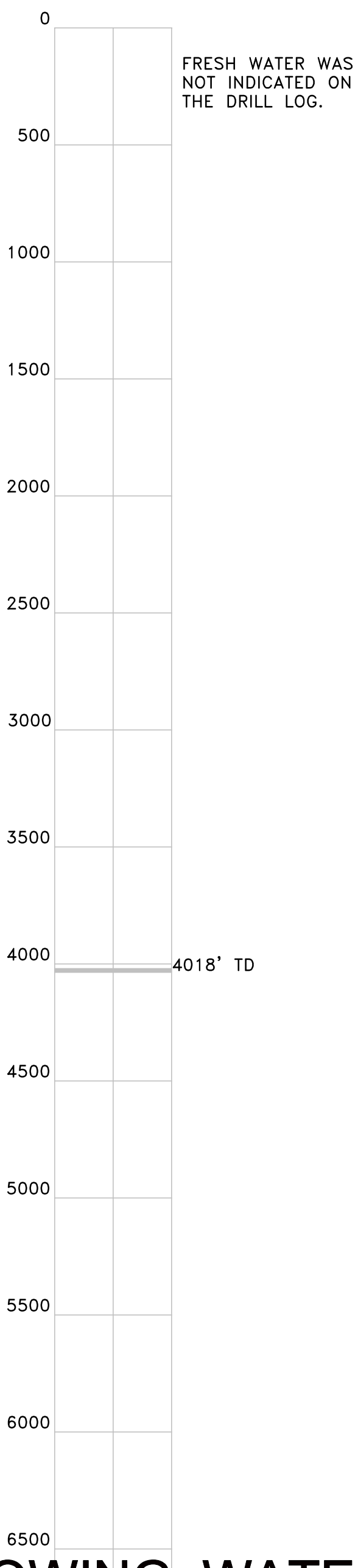
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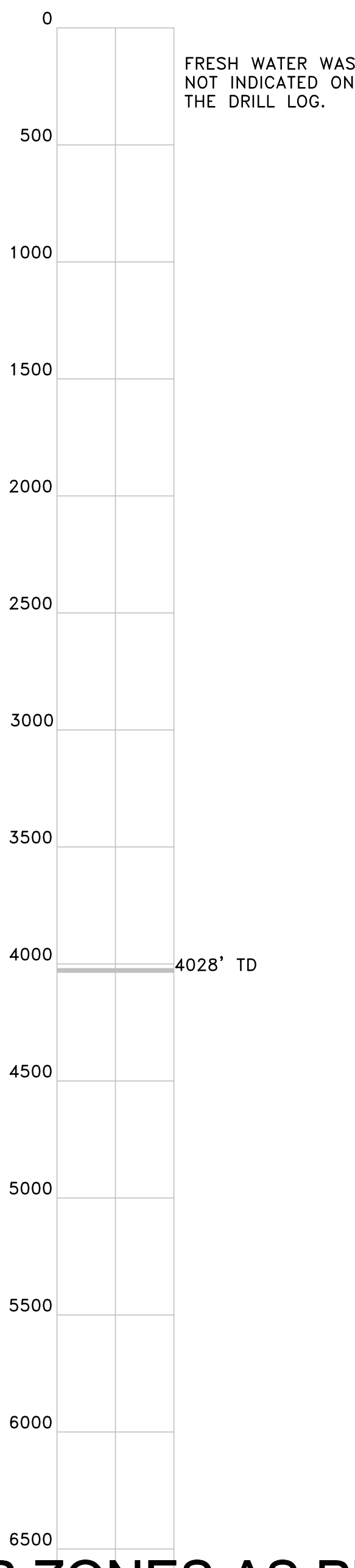
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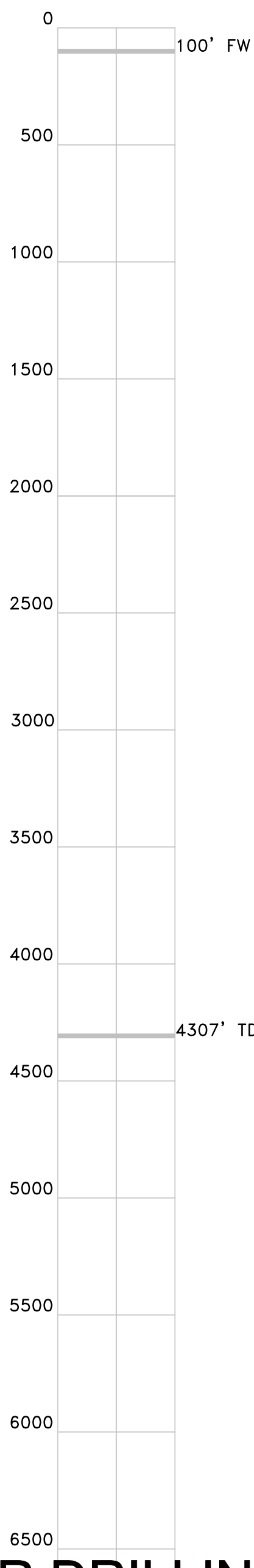
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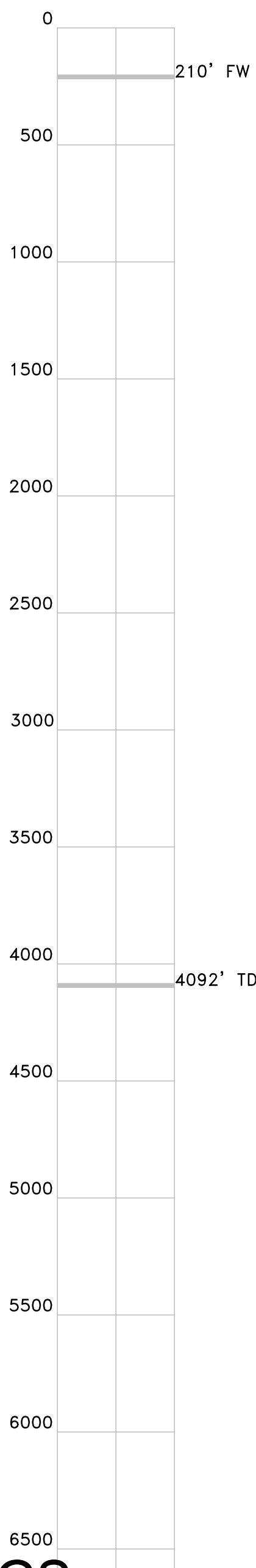
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WELL
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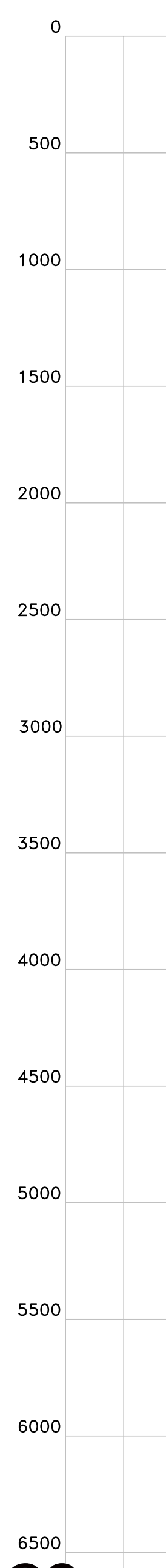
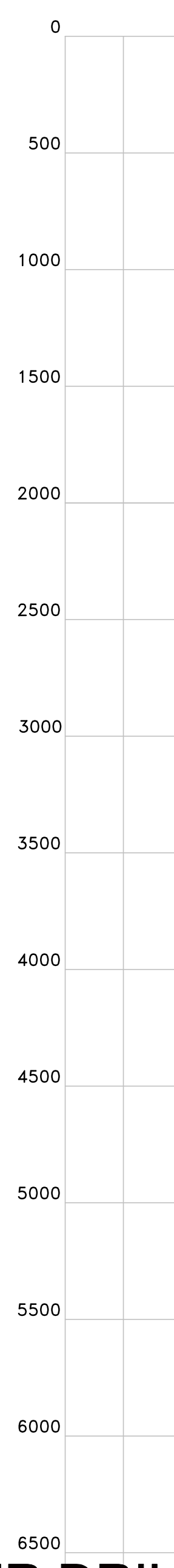
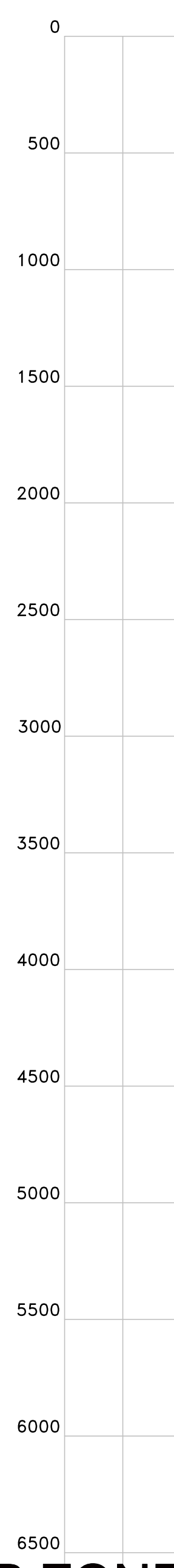
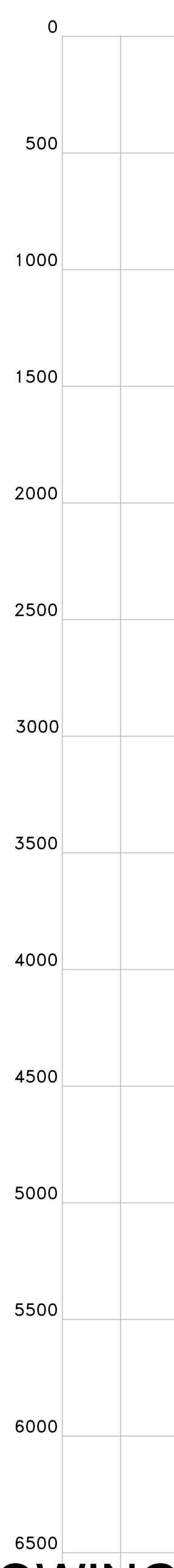
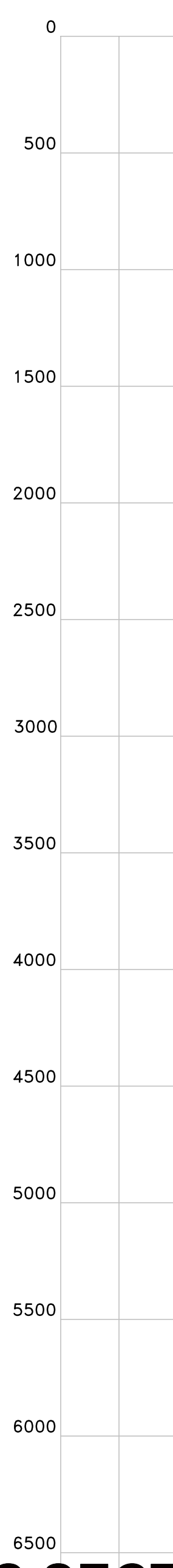
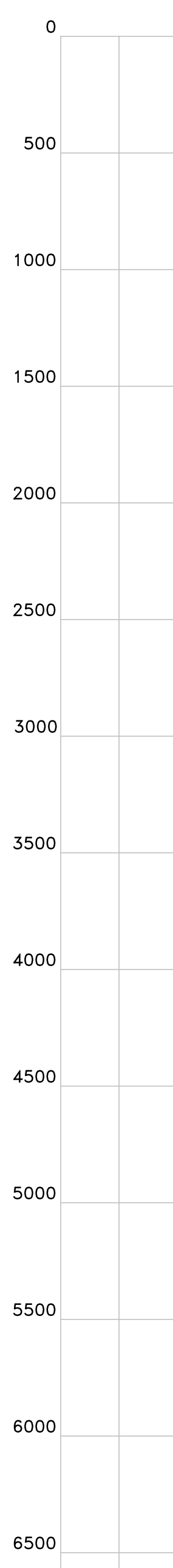
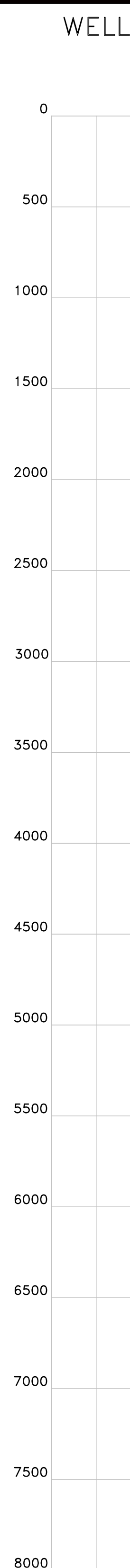
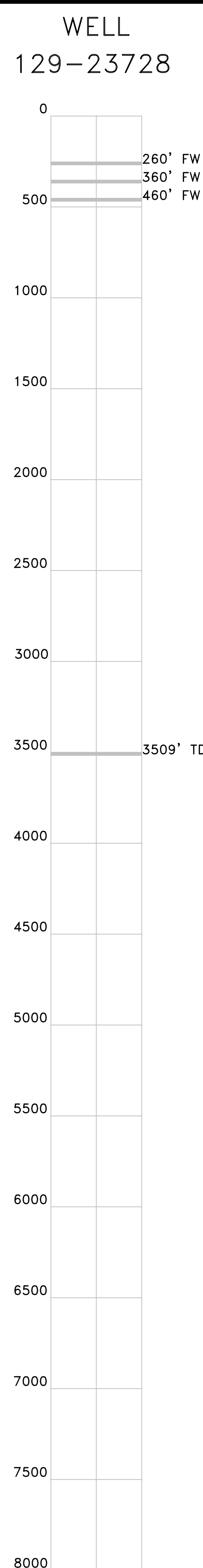
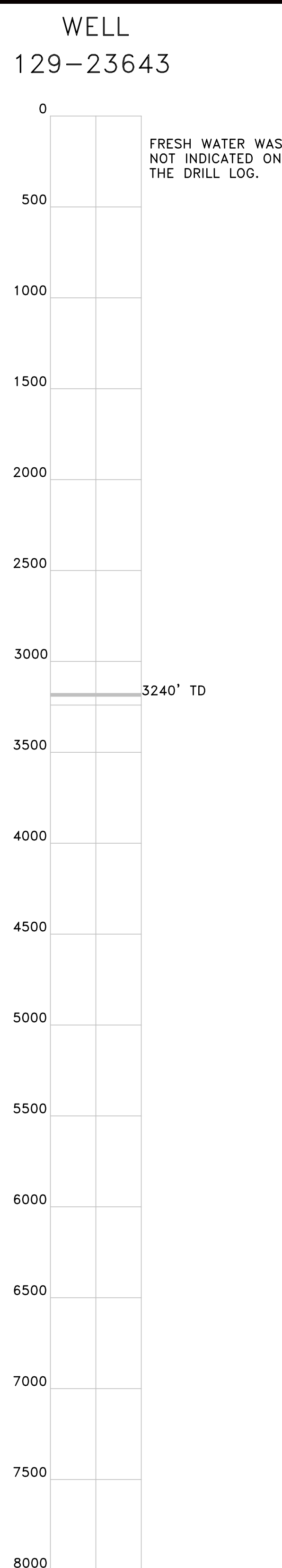
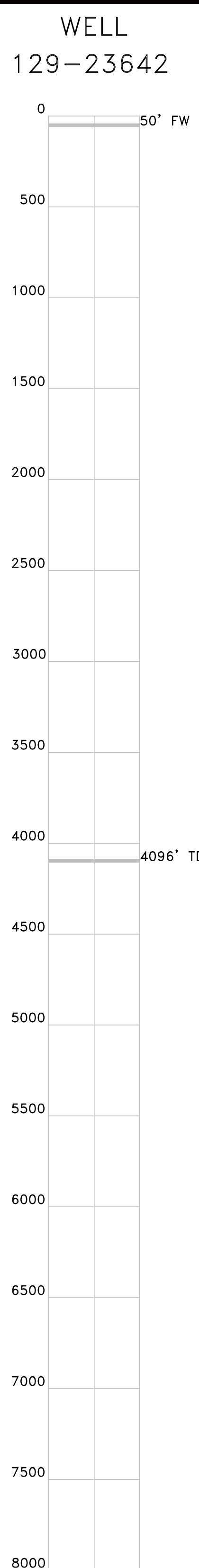
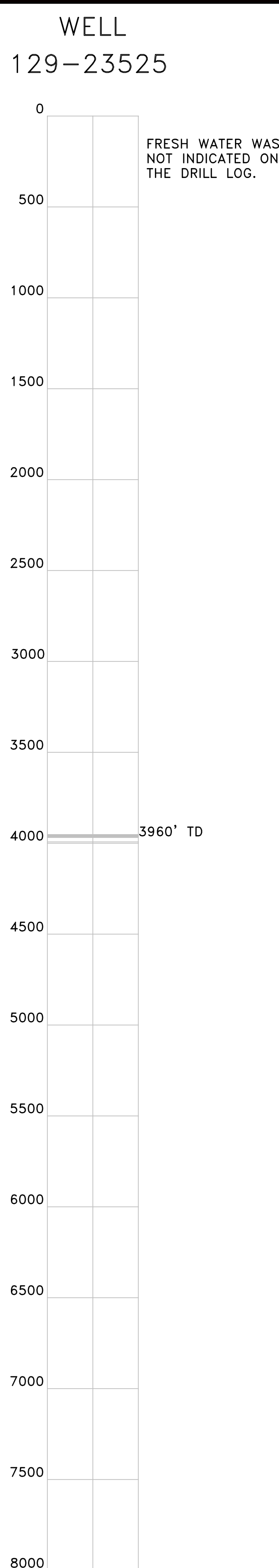
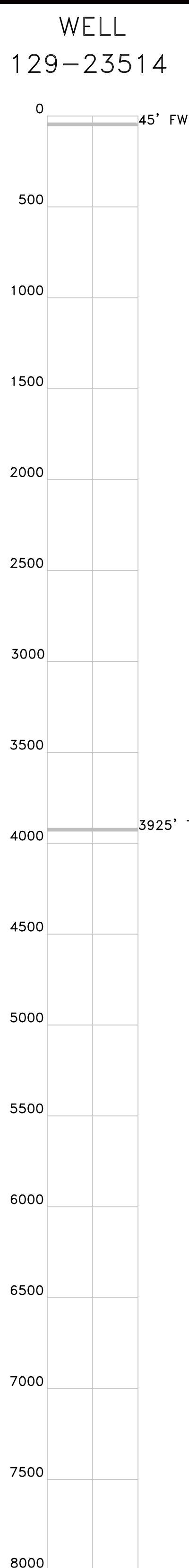


WELL
129-23506



CROSS SECTIONS SHOWING WATER ZONES AS PER DRILLING LOGS

SHEET: 5 OF 6	JOB NO.: 87415, JNO. 06855-5	FILE: PENNECO-INJECTION	SCALE: HORIZ.: 1" = 200'	VERT.: DATE: FEB. 12, 2016		SEAL	PROPOSED INJECTION WELL FOR PENNECO ENVIRONMENTAL SOLUTIONS, LLC MUNICIPALITY OF MURRYSVILLE & UPPER BURRELL TOWNSHIP, WESTMORELAND COUNTY, PENNSYLVANIA	FOX & FOX, INC. 58 Timber Bridge Road, Suite 20 Clarion, Pa. 16214 Phone: 814-745-2861 Fax: 814-745-2248 email: ronaldfox@foxandfoxinc.us web: www.foxandfoxinc.us	REVISIONS	
										DESCRIPTION



CROSS SECTIONS SHOWING WATER ZONES AS PER DRILLING LOGS



PROPOSED INJECTION WELL
FOR
PENNECO ENVIRONMENTAL SOLUTIONS, LLC
MUNICIPALITY OF MURRYSVILLE & UPPER BURRELL TOWNSHIP,
WESTMORELAND COUNTY, PENNSYLVANIA

FOX & FOX, INC.

58 Timber Bridge Road, Suite 20
Clarion, Pa. 16214
Phone: 814-745-2861 Fax: 814-745-2248
email: ronaldfox@foxandfoxinc.us
web: www.foxandfoxinc.us

REVISIONS	DESCRIPTION
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ATTACHMENT “D”
Maps & Cross Sections of USWDs

Attachment D
Maps and Cross Sections of USWDs
Sedat #3A Injection Well

USWDs

A lithologic cross section of the USWDs constructed from the driller's log found on the well completion reports in Attachment B are included in this section along with a cross sections of the injection and confining zones constructed from well logs filed with the PA DEP. The upper confining zone is the Riddlesburg Shale and the bottom confining zone is the Riceville Shale. See the plan view map for location of the cross sections. Also included are picket diagrams showing the vertical depth of fresh water shows from the well completion reports in Attachment B.

Attachment E
USDWs
SEDAT #3A Injection Well

USDWs for Sedat #3A Injection Well

The Sedat #3A AOR is located in the Pittsburgh Low Plateau Section of the Appalachian Plateau physiographic province, refer to map at the end of this attachment. Underlying rock types are shale, siltstone, sandstone, limestone and coal. Aquifers in the AOR are mainly sandstones of the Monongahela Group, Conemaugh Group and the Allegheny Group. The Pottsville Group and the Mauch Chunk Formation, identified as USDWs in some areas of Pennsylvania lie at a depth too deep to serve as aquifers in the AOR. See the table on the following page listing USDWs in Pennsylvania. The thickness of the section from the Monongahela through the Allegheny Group can exceed 1,300 feet depending on surface elevation. A review of the well records show water production in this interval as deep as 890', but does not identify the water as fresh or brackish. However, according to Pennsylvania Geological Survey Water Resource Reports 35 and 37, water quality is extremely poor beyond 500 feet in depth because of moderate to high mineralization of the waters (high dissolved solids).

The Monongahela Group is composed of the Uniontown and Pittsburgh Formations and found only at higher elevations in the Sedat AOR. The formations rocks are limestone, shale, sandstone and coal.

Rock members of the Conemaugh Group predominate at the surface in the AOR; see the section of geologic map of Pennsylvania at end of the attachment. The Casselman and Glenshaw Formations make up the Conemaugh Group, and consist of shale, red shale, sandstone, and coals.

The Allegheny Group consists of shale, sandstone, thin beds of limestone and coals. The Freeport Formation, Kittanning Formation, Vanport Limestone, and Clarion Formation make up the Allegheny Group.

The Pottsville Group is composed of sandstones, thin shale beds and conglomerates. The Pottsville is divided into two formations the Curwensville and Elliott Park.

The Mauch Chunk Formation consists of red, gray or green shale interbedded with limestone and sandstone.

ATTACHMENT “E”
Name and Depth of USWDs

PHYSIOGRAPHIC PROVINCES OF PENNSYLVANIA

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF
CONSERVATION AND NATURAL RESOURCES
BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY
www.dcnr.state.pa.us/topogeo

CENTRAL LOWLANDS PROVINCE
Echam Lake Section
Lake Erie

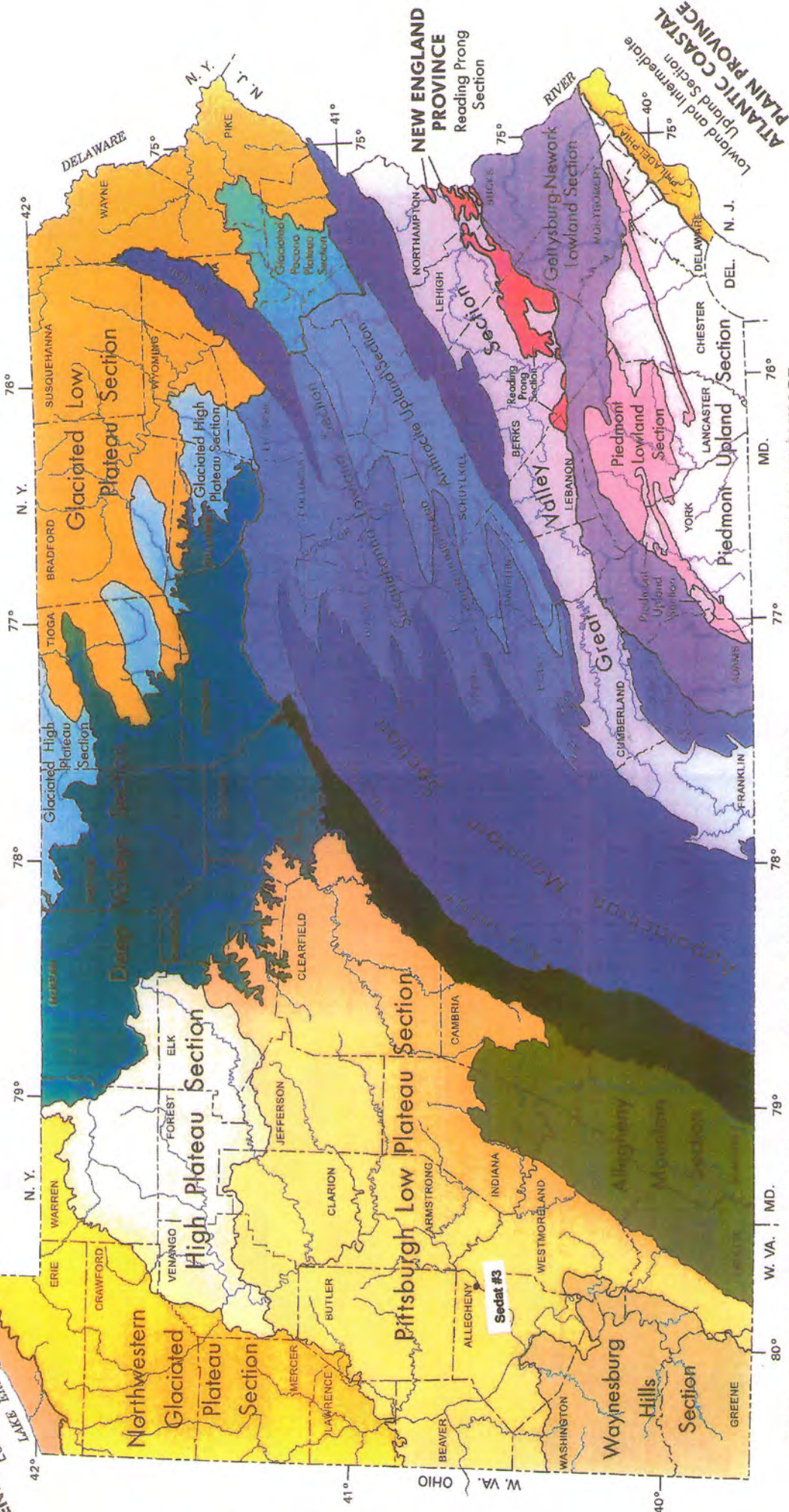
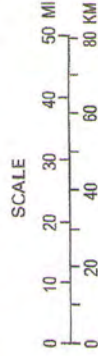


Figure 89. The principal aquifers in the Appalachian Plateaus Province in Segment 11 are sandstones in the geologic units shown in yellow and limestone shown in blue. Where fractured, rocks of the Greenbrier, the Catskill, and the Brallier Formations locally yield water. The gray areas represent missing rocks.

System	Pennsylvania	Maryland	West Virginia	Virginia
Permian	Dunkard Group		Dunkard Group	
Pennsylvanian	Monongahela Group	Monongahela Formation	Monongahela Group	
	Conemaugh Group	Conemaugh Formation	Conemaugh Group	
	Allegheny Group	Allegheny Formation	Allegheny Formation	
	Pottsville Group	Pottsville Formation		
			Pottsville Group	Horizon Formation
Mississippian				Wise Formation
				Norton Formation
				Lee Formation
	Mauch Chunk Formation	Mauch Chunk Formation	Mauch Chunk Group	Bluestone Formation
				Hinton Formation
				Bluestfield Formation
				Greenbrier Limestone
Devonian	Pocono Formation	Pocono Formation	Pocono Group	Mauryville Shale
	Huntley Mountain Formation			Price Formation
	Catskill Formation ¹	Hampshire Formation	Hampshire Formation	Chattanooga Shale
		Chemung Formation	Chemung Formation	
	Timmons Rock Formation	Brallier Formation ¹	Brallier Formation ¹	
	Heral Formation	Heral Shale	Heral Shale	

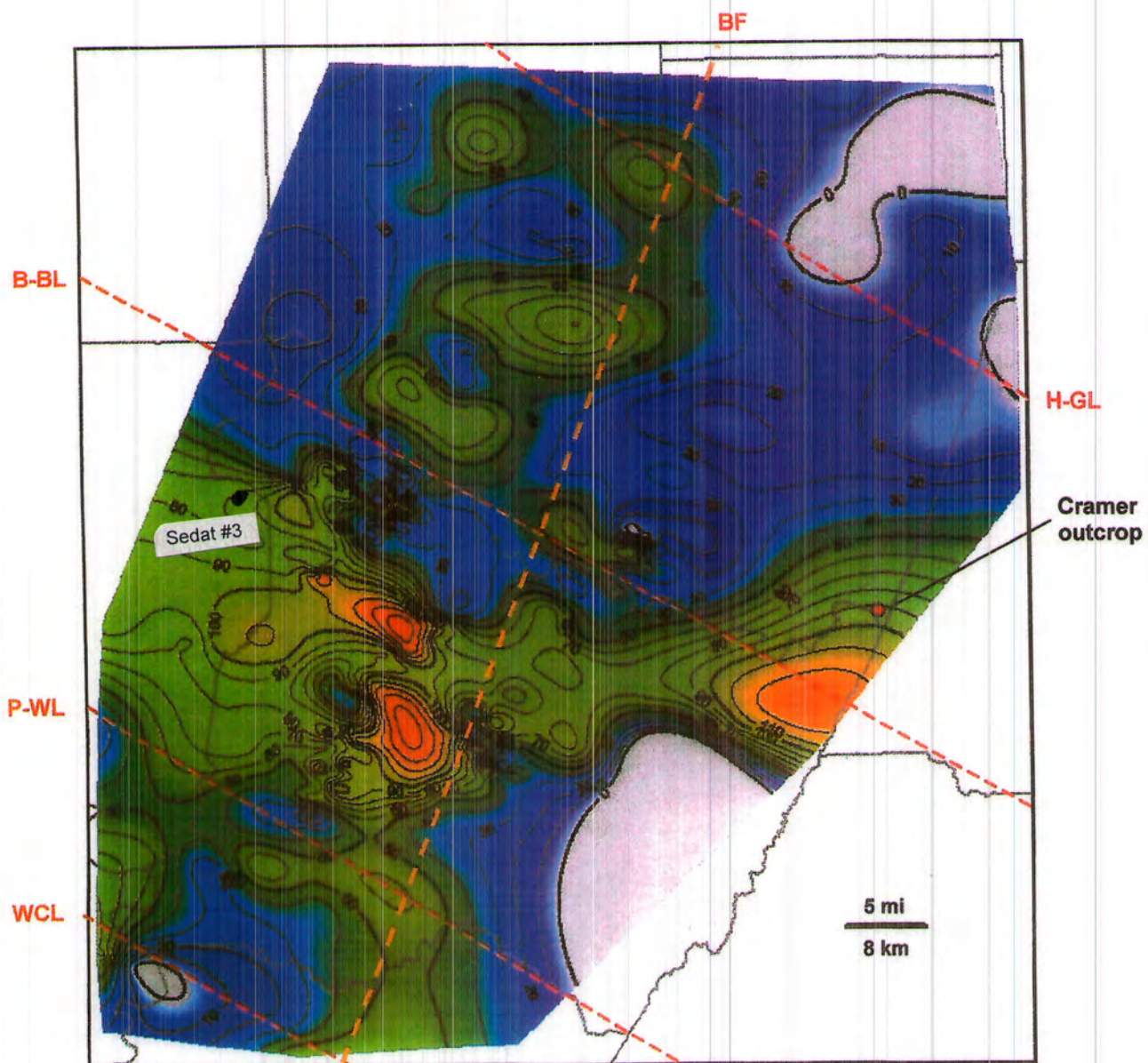
¹Locally water-yielding

Modified from:

Patchen, D.G., and others, 1985a, Correlation of stratigraphic units of North America (COSUNA) Project, southern Appalachian region: American Association of Petroleum Geologists, 1 sheet.

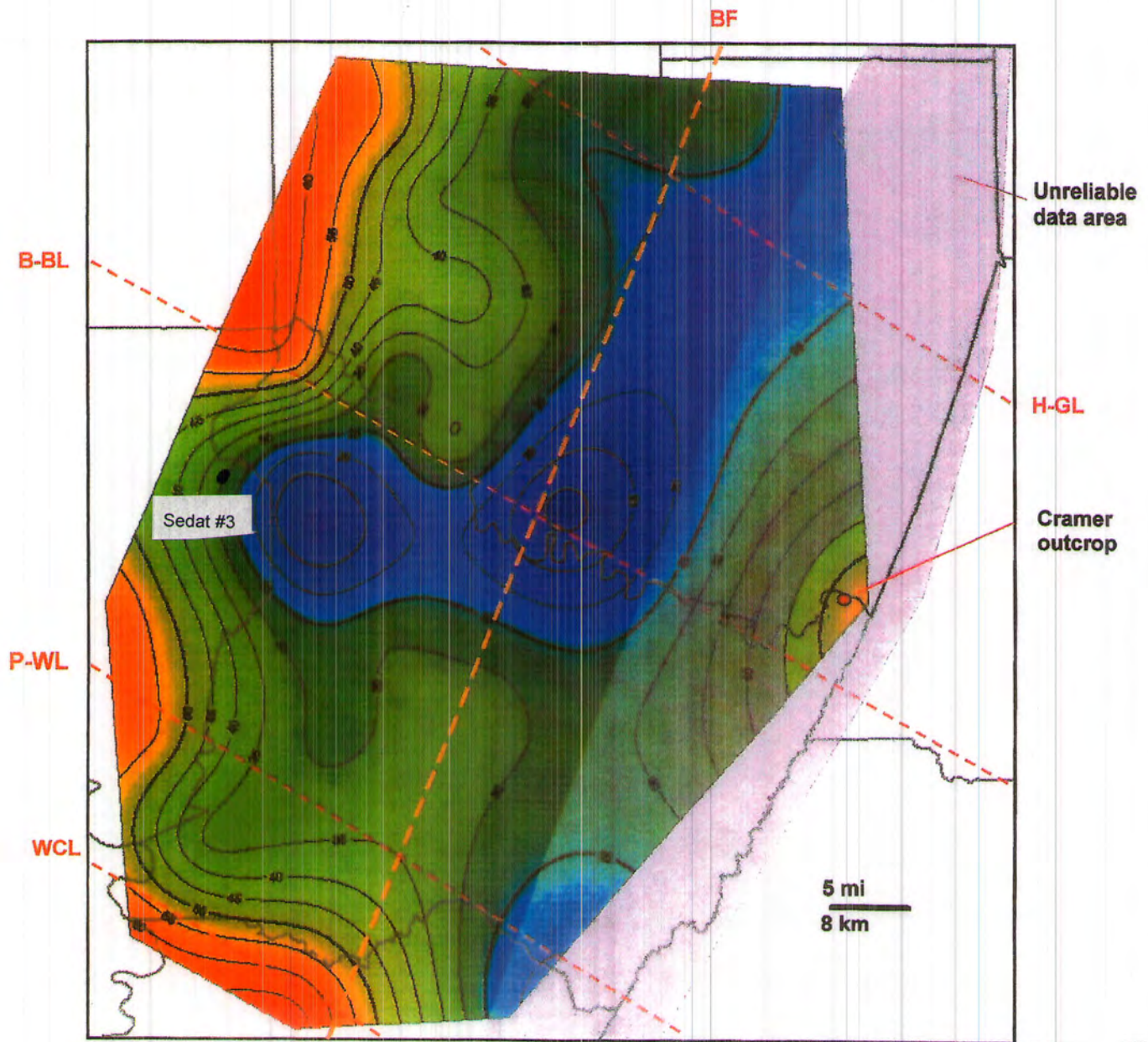
_____, 1985b, Correlation of stratigraphic units of North America (COSUNA) Project, northern Appalachian region: American Association of Petroleum Geologists, 1 sheet.

ATTACHMENT “G”
Geological Data on Injection and Confining Zones



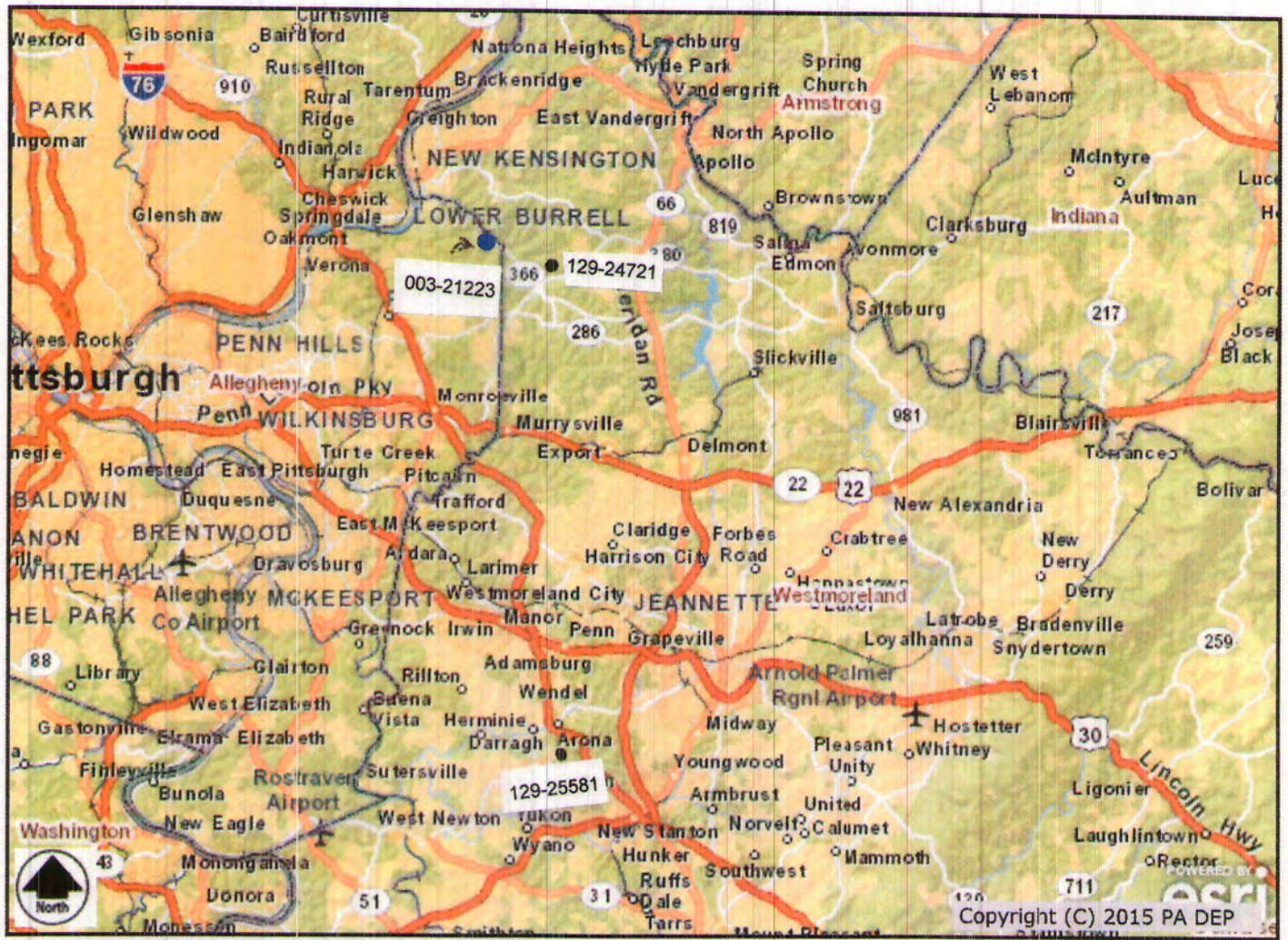
Map 3. Riddlesburg Shale Isopach Map

McDaniel, Bret, 2006. Subsurface Stratigraphy and Depositional Controls on Late Devonian-Early Mississippian Sediments in SW PA



Map 4. Riceville-Oswayo Shale Isopach Map

McDaniel, Bret, 2006. Subsurface Stratigraphy and Depositional Controls on Late Devonian-Early Mississippian Sediments in SW PA.



Legend

Unconventional Wells



Conventional Wells



County Boundaries





SUPERIOR

WELL SERVICES

GAMMA RAY

NEUTRON

DENSITY

DUAL INDUC

PERMIT#37-129-24721

0' WEST LONG: 79° 37' 58.2"

0' SOUTH LAT: 40° 29' 24.5"

LOCATION

SEC. _____ TWP. _____ R. _____

COMPANY PENNECO OIL COMPANY

WELL MARIONDA HOMES #1 (PM-594)

FIELD MURRYSVILLE QUADRANGLE

COUNTY WESTMORELAND STATE PA

PERMANENT DATUM _____ GROUND LEVEL _____ ELEV. 1120 FT. EL

LOG MEASURED FROM TOP OF 7" ABOVE PERMANENT DATUM

DRILLING MEASURED FROM K.B.

DATE 06-14-02

RUN NO. ONE

DEPTH-DRILLER 3550 FT.

DEPTH-LOGGER 3537 FT.

RTM. LOG INTER. 0 FT.

TOP LOG INTER. 1280 FT.

CASING-DRILLER 1280 FT.

CASING-LOGGER 1280 FT.

BIT SIZE 6.25 IN.

FLUID TYPE AIR/GAS

DENS. : VISC. N/A

PH : FLUID LOSS N/A

SOURCE OF SAMPLE N/A

RM P MEAS. TEMP. N/A

RMC P MEAS. TEMP. N/A

SOURCE: RMF/RMC N/A

RM P BHT N/A

TIME SINCE CIRC. N/A

MAX. REC. TEMP. N/A

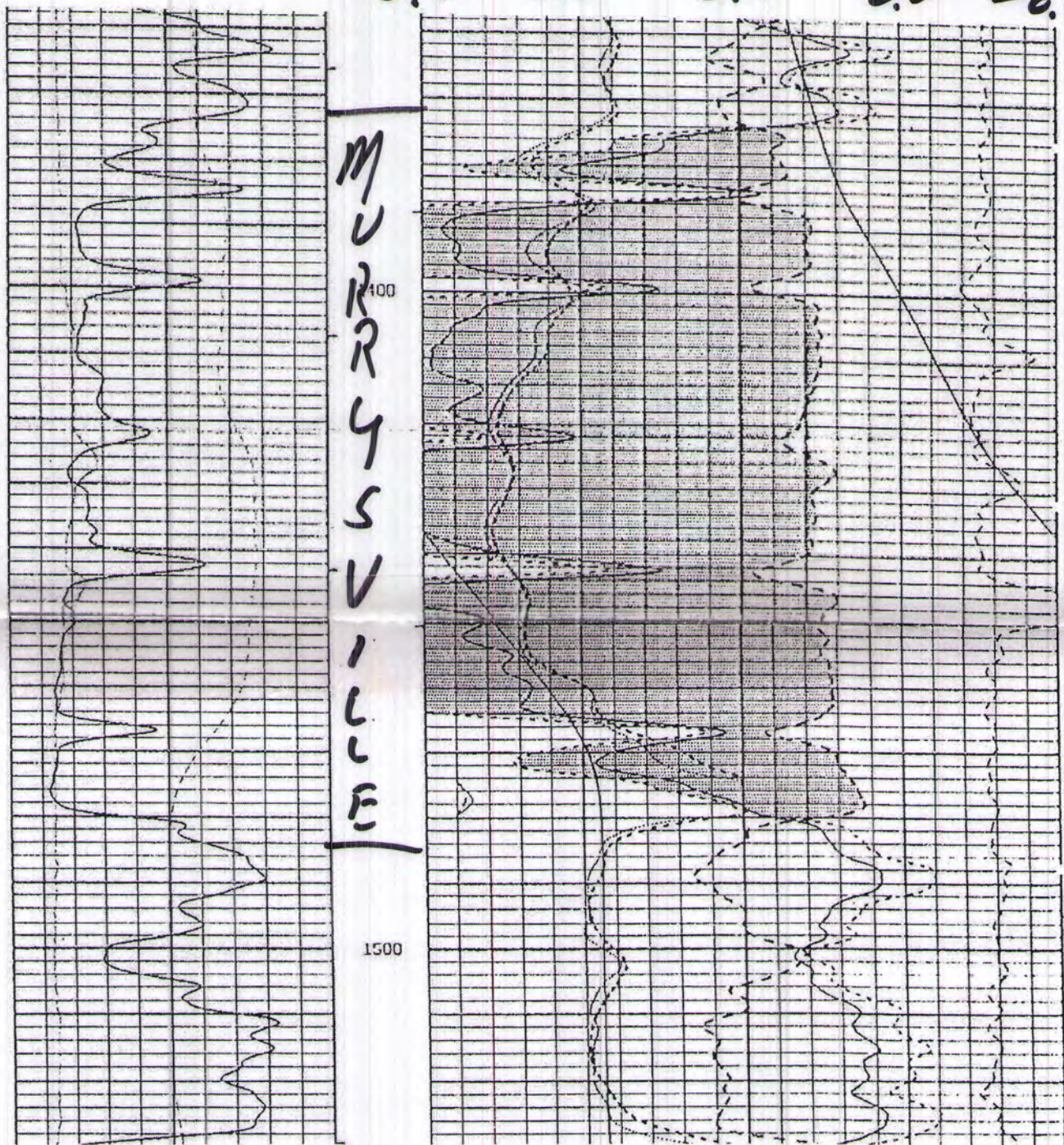
EQUIP.: LOCATION 0058/BLKCK

RECORDED BY JERRY MOORE

WITNESSED BY MR. JACOBS

Dens. T_1 ϕ

0.3 0.2 0.1 0.0 -0.1



1500

LD

Schlumberger

DOMINION EXPLORATION & PRODUCTION, INC.
JACOB SNYDER UNIT #3 (WPA06512)
HEMPFIELD TWP
WESTMORELAND PENNSYLVANIA

LITHO DENSITY
COMPENSATED NEUTRON / GR
ARRAY INDUCTION / TEMPERATURE

COUNTY: WESTMORELAND
Field: HEMPFIELD TWP.
Location: LATITUDE: 40-15-34.2700
Well: JACOB SNYDER UNIT #3 (WP
Company: DOMINION EXPLORATION & PR

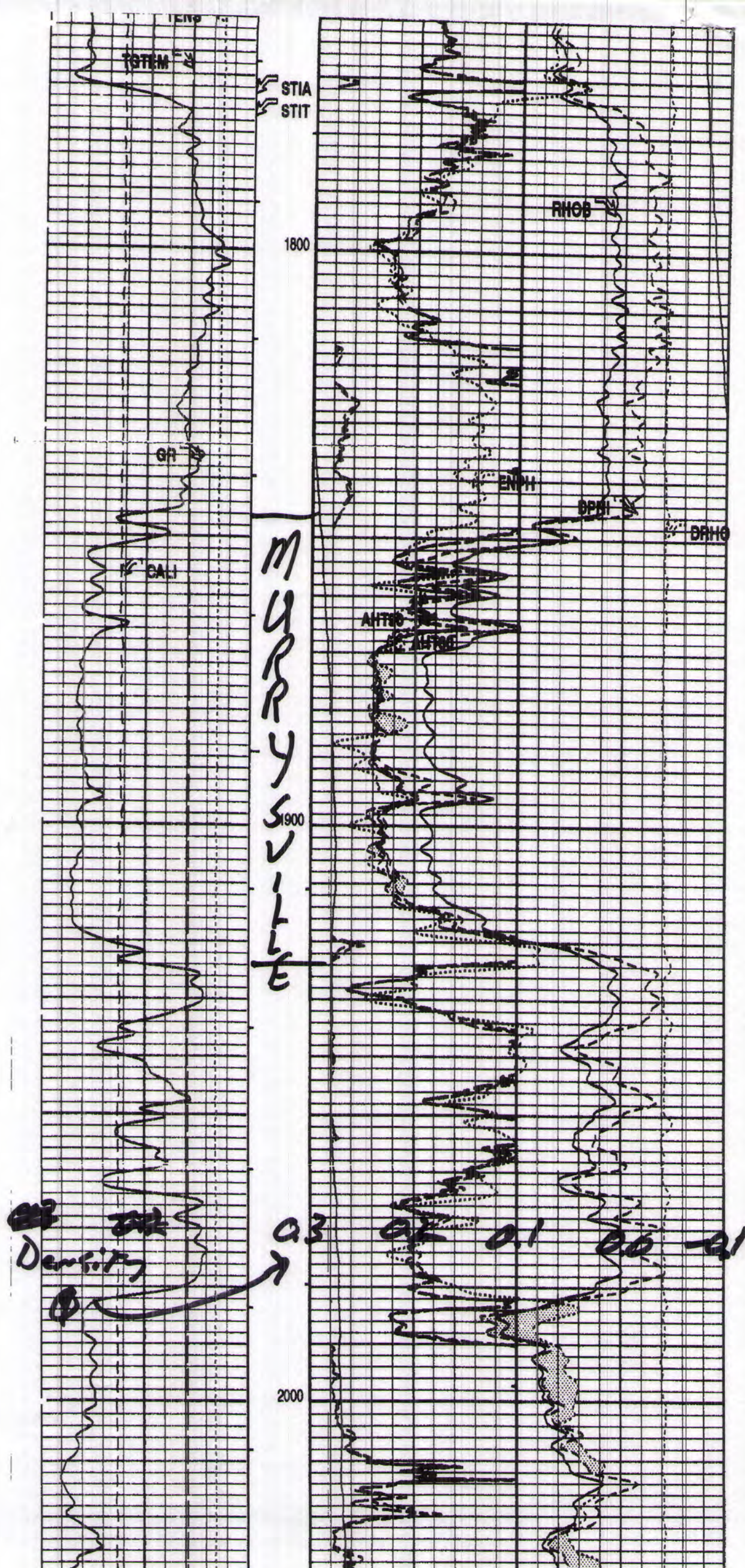
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Elev.: K.B. 1080 ft	G.L. 1080 ft	Elev.: 1080 ft	above Perm. Datum
Log Measured From: KB	Drilling Measured From: KB	MAP SECTION: 8	
API Serial No 37-128-25591-00		TOWNSHIP: HEMPFIELD	QUAD: IRWIN

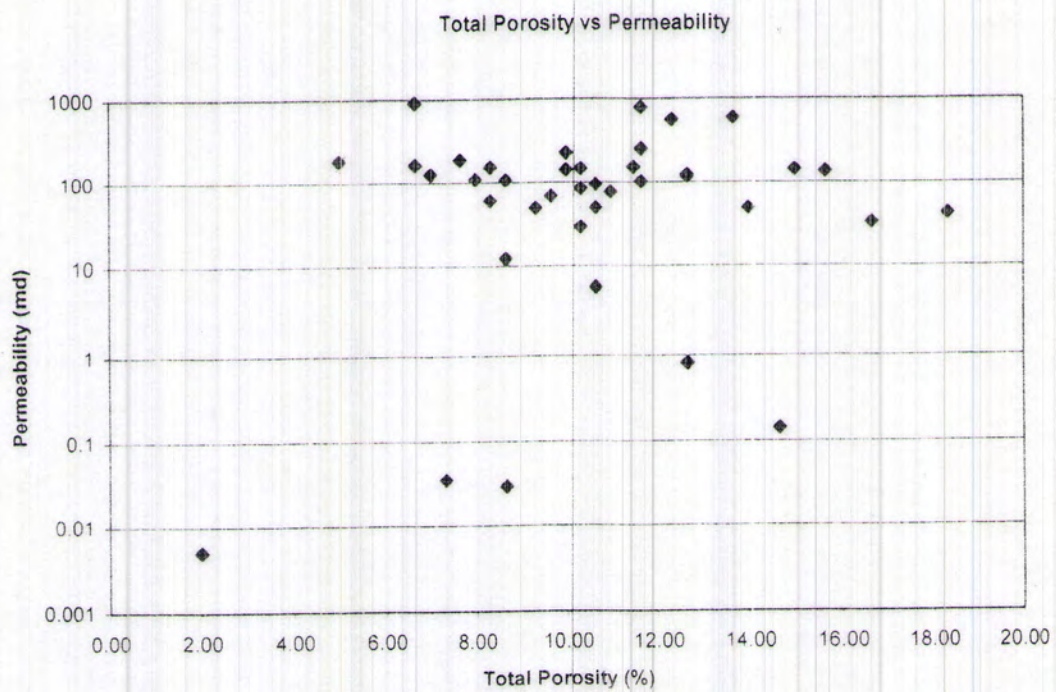
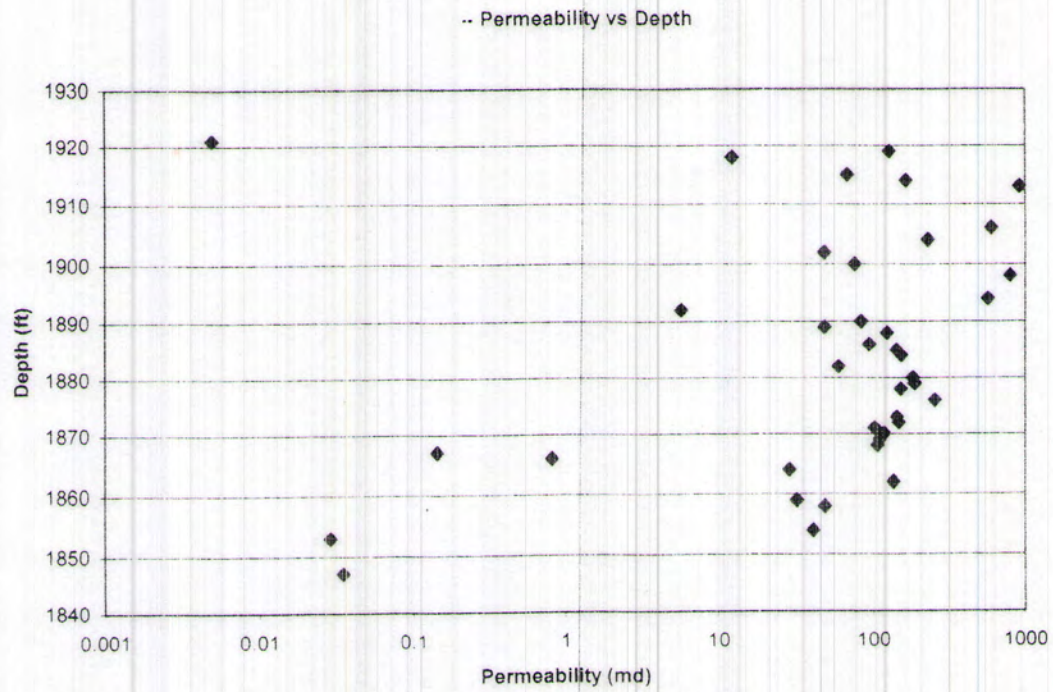
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Run Number	1
Depth Driller	2130 ft
Schlumberger Depth	2135 ft
Bottom Log Interval	2127 ft
Top Log Interval	0 ft
Casing Driller Size @ Depth	9.625 in
Casing Schlumberger	366 ft
Bit Size	8.675 in
Type Fluid In Hole	AIR / GAS / PRODUCED FLUIDS
Density	0 lbm/gal
Viscosity	
PH	
Fluid Loss	
Source Of Sample	
RM @ Measured Temperature	@
RMF @ Measured Temperature	@
RMC @ Measured Temperature	@
Source RMF	@
RM @ MFT	@
RMF @ MFT	@
RMC @ MFT	@
Maximum Recorded Temperatures	@
Circulation Stopped	@
Logger On Bottom	70 degf @ 70
Unit Number	31-Aug-2005
Recorded By	3089 BRADFORD
Witnessed By	18:40
	TIM LYON, MIKE KORNACKI
	NATE ZIMMERMAN, MELISSA THARP

	Run 1	Run 2	Run 3	Run 4
Logging Date				
Run Number				
Depth Driller				
Schlumberger Depth				
Bottom Log Interval				
Top Log Interval				
Casing Driller Size @ Depth				
Casing Schlumberger				
Bit Size				
Type Fluid In Hole				
Density				
Viscosity				
PH				
Fluid Loss				
Source Of Sample				
RM @ Measured Temperature				
RMF @ Measured Temperature				
RMC @ Measured Temperature				
Source RMF				
RM @ MFT				
RMF @ MFT				
RMC @ MFT				
Maximum Recorded Temperatures				
Circulation Stopped				
Logger On Bottom				
Unit Number				
Recorded By				
Witnessed By				

Jacob Snyder Unit #3

129-25501





Attachment G*
Geological Data on Injection and Confining Zones
SEDAT #3A Injection Well

Geological Data for Sedat #3A Injection Well

The Sedat #3A injection well will be a repurposed depleted natural gas well located in the Renton Gas Field in Plum Borough, Allegheny County, Pennsylvania. The injection well will target the Murrysville Sand as the injection zone which is water saturated and located very near the axis of the Duquesne-Fairmount syncline, see the copy of a section of Pittsburgh Region Structure Contour Map (Map 1) included with this attachment. Also included is a Geologic Map of the western part of Allegheny County, PA (Map 2). The immediate area around the well has been striped mined for coal (Pittsburgh Seam) and mined by underground methods for coal (Upper Freeport Seam); see the Area of Review map in Attachment B.

All six (6) wells within the ¼ mile Area of Review (ARO) penetrate the Murrysville sand, the state permit numbers for the wells are:

Permit #	Permit #	Permit #
003-21289	003-21210	003-22200
003-21223	003-21222	003-21644

All six wells were cased and cemented through the Murrysville, the well records can be found in Attachment B. The Sedat #1A permit # 003-21210 will be converted to an observation well by perforating the cemented casing string at the depth of the Murrysville.

The Murrysville Sand is approximately 128' thick, and lies at a depth of 1,822' to 1,950' in the Sedat #3A AOR. The well had an original TD of 4,309' and was plugged back to 1,940' to just below the injection zone. See Attachment M Construction Details for well schematic and cement data. Fluid will be injected into a 40' section of the Murrysville Sand through a 4" injection string set on a packer at approximately 1,890' in 7" casing perforated with 41 holes from 1896' to 1936'. The confining zones are the Riddlesburg Shale (Sunbury Equivalent) which overlays the Murrysville with the Riceville-Oswayo Shale lying underneath as the lower confining zone.

The upper confining zone lying directly on top of the Murrysville is the Riddlesburg Shale. The Riddlesburg is a dark gray to greenish and grayish black laminated shale and siltstone with occasional sandstone and limestone beds. The Riddlesburg is between 80 to 90 feet thick in the Sedat #3A AOR, see the Riddlesburg Isopach map, Map 3 at the end of Attachment G.

The Murrysville is a greenish-yellow to gray sandstone with occasional conglomeratic lenses, with high porosity and permeability. Because of the Murrysville's thickness, high porosity and permeability the formation serves as a gas storage reservoir to the south of

the Sedat. All most all the wells in the AOR including the Sedat #3A were drilled and cased through the Murrysville without running a porosity logs, see the well records in Attachment B. There are two wells for which porosity logs are available that show the average density porosity through the Murrysville Sand to average around 24%, which agrees with published reports of porosity values in the Murrysville. Refer to the log sections and location map at the end of this attachment for wells permit # 129-24721, and well permit #129-25581. Both wells where saturated with brine and did not produce gas.

Penneco conducted several tests to determine the reservoir characteristics of the Murrysville on its leases with the results included at the end of Attachment H. The test provided a breakdown pressure, the pressure needed to initiate a fracture, as 3,115 psi, ISP is estimated as 1,114 psi, with a fracture gradient of 1.23 psi. The reservoir pressure is 232 psi, with an estimated closure pressure of 553 psi.

Formation permeability for the Murrysville was reported by Melissa Sager (Petrologic Study of the Murrysville sandstone in SW PA, 2007) as generally high throughout the formation, with a range of 0.005 to 1,000 millidarcies with an average of around 100 millidarcies. The permeability of the Murrysville in the Sedat #3A is estimated to be 1.8 mD and was determined from a series of tests to determine the reservoir characteristics of the Murrysville sand on Penneco leases conducted by HFrac Consulting Services, LLC, see HFrac report at the end of this attachment. This value falls within the lower range of Sager's study.

The Riceville-Oswayo Shale lying directly beneath the Murrysville serves as the lower confining zone. The Riceville-Oswayo is about 30 feet thick in the AOR; see Map 4, Isopach map of the Oswayo Shale. The Riceville-Oswayo formation consists of dark gray to medium gray shale and siltstones.

Structurally the AOR has a series of northeast-southwest trending anticlines and synclines with the Sedat #3A well lying along the axis of the Duquesne-Fairmount syncline refer to Map 1. While there are some deep seated basement faults associated with the Rome Trough in the AOR there are no apparent faults at shallower depths.



December 7, 2015

Mr. Marc Jacobs, Jr.
Senior Vice President
Penneco
6608 Route 22
Delmont, PA 15626

Re: Sedat #3A (Murrysville) – Reservoir and Fracture Characterization

Dear Marc,

The following summarizes the reservoir and fracture characterization for the Murrysville formation in the Sedat #3A located in Plum Borough, Allegheny County, Pennsylvania.

A series of tests were designed and conducted at the Sedat #3A to gain a better understanding of the reservoir and fracture characteristics of the Murrysville formation which underlies a sizeable portion of Penneco's proximate lease acreage.

The tests were comprised of (1) formation breakdown, (2) DFIT (diagnostic fluid injection test) to determine closure stress, reservoir pressure, and reservoir transmissibility (kH/mu), (3) Step Rate to determine the fracture extension pressure, and (4) Rate Stepdown to determine the near wellbore friction which includes perforation friction and friction caused by near wellbore tortuosity.

Table 1 shows the timeline of the work performed on the Sedat #3A.

Several high level observations from the work performed was that (1) the well goes on vacuum very quickly after injection stops (i.e., pressure goes to zero on the surface) and (2) the surface treating pressures were excessively high given the depth of the well and the closure stress.

On September 1, 2015 a DFIT was pumped to determine the closure stress, reservoir pressure, and reservoir transmissibility (kH/mu). The DFIT was pumped at 4 bpm for 1500 gals. Bottomhole pressure was recorded with a bottomhole gauge set 1910 ft. The results from the DFIT using the Nolte G function gave a bottomhole closure stress of 553 psi which gives a closure stress gradient of 0.29 psi/ft.

The pressure decline data after closure (ACA) was analyzed with the Nolte FR function to determine reservoir transmissibility. Based on the pressure response it appears that pseudoradial flow was reached. The reservoir transmissibility was 88 mD-ft/cP assuming a reservoir fluid viscosity of 1 cP. The actual results will vary based on the actual reservoir fluid viscosity. The formation capacity (kH) was 88 mD-ft. Assuming a height of 50 ft gives a reservoir permeability of 1.8 mD.

Following the DFIT, an attempt was made on September 29, 2015 to breakdown additional perforations with 500 gals of 15 percent HCL acid and small concentrations of sand pumped in a 20 lb/1000 gal linear gel. The surface pressure was reduced when the acid entered the perforations but quickly increased as low concentration (0.25 lb/gal) of 40/70 sand entered the perforations. The sand was cut and the well flushed.

On October 1, 2015 a Step Rate was pumped to determine the fracture extension pressure. The initial rate was 0.25 bpm and increased to 1.0 bpm in increments of 0.25 bpm. The rate was then increased to 4 bpm in increments of 0.50 bpm. The injection time for each rate was four hours.

The results from the Step Rate gave a fracture extension pressure of 1.70 psi/ft which is abnormally high and cannot be used for formation evaluation. The cause of the excessively high fracture extension pressure was near wellbore friction comprised of perforation friction and friction caused by tortuosity (i.e., a poor connection between the wellbore and the created hydraulic fracture).

Based on the results from the Step Rate another attempt was made to reduce the near wellbore friction with additional acid and higher injection rates. On November 17, 2015 several injections were performed to reduce near wellbore friction. The first injection consisted of 1500 gals 7.5 percent HCl acid and the second injection used 750 gals 15 percent HCl acid. Following the second acid injection the injection rate was 26 bpm and the surface pressure was 2980 psi.

A Stepdown was performed after the second acid injection to quantify the amount of near wellbore friction and break out the perforation friction and friction caused by tortuosity. Perforation friction varies with the flow rate squared and tortuosity varies with the square root of the flow rate. The results from the Stepdown show a total near wellbore friction of 2011 psi at 26 bpm of which 1300 psi is perforation friction and 711 psi is friction caused by tortuosity. The number of open perforations was 5 assuming a discharge coefficient of 0.60.

The perforation efficiency is very low with only 5 out of 41 perforations open.

The ISIP at the end of the last injection was 1446 psi giving a F.G (fracture gradient) of 1.23 psi/ft suggesting a possible horizontal component to the created fracture. The high fracture gradient could also be the result of near to mid-field fracture complexity. As with the other injections the surface pressure quickly fell to zero. This rapid pressure decrease following the rate shutdown is a common response for mid-field fracture complexity (i.e., restriction away from the wellbore).

The results from the tests on the Sedat #3A are shown in **Table 2**.

In summary the Murrys ville formation in the Sedat #3A is characterized by low reservoir pressure, 232 psi, low closure stress, 0.29 psi/ft., and higher than anticipated pumping pressures because of complex near or mid-field fracture complexity. Low perforation efficiency also contributed to the higher than expected pumping pressures.

Thank you for the opportunity to work on the Sedat #3A project with Penneco. If you have any questions or comments let me know.

Sincerely,

Henry Jacot
H-Frac Consulting Services, LLC

Table 1 – Timeline

Activity	Date
Perforate	August 7, 2015
Spot Acid and Pull Tubing	August 28, 2015
Break Formation and Pump DFIT	September 1, 2015
Perforation Cleanup	September 29, 2015
Step Rate	October 1, 2015
Perforation Breakdown	November 17, 2015

Table 2 - Results

Parameter	Value
Breakdown Pressure	3115 psi
Bottomhole Closure Stress	553 psi
Closure Stress Gradient	0.29 psi/ft
Surface ISIP	1446 psi
Fracture Gradient	1.23 psi/ft
Reservoir Pressure	232 psi
Reservoir Transmissibility (kH/mu)	88 mD-ft/cP
Formation Capacity (kH)	88 mD-ft
Reservoir Permeability	1.8 mD
Fracture Extension Pressure	N/A

PENNECO
SEDAT #3A
PLUM BOROUGH
ALLEGHENY COUNTY, PA

December 7, 2015



TEST OBJECTIVES

- ✓ Formation Breakdown Pressure
- ✓ Closure Stress
- ✓ Fracture Gradient (F.G.)
- ✓ Reservoir Pressure
- ✓ Reservoir Transmissibility (kH/mu)
- ~~x Fracture Extension Pressure~~



TIME LINE

Activity	Date
Perforate	August 7, 2015
Spot Acid and Pull Tubing	August 28, 2015
Break Formation/Pump DFIT	September 1, 2015
Perforation Cleanup	September 29, 2015
Step Rate	October 1, 2015
Perforation Breakdown	November 17, 2015



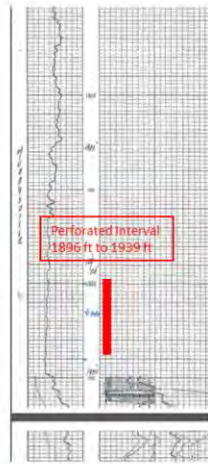
TEST RESULTS

Parameter	Value
Breakdown Pressure	3115 psi
Closure Stress	553 psi
Closure Stress Gradient	0.29 psi/ft
ISIP	1446 psi
Fracture Gradient	1.23 psi/ft
Reservoir Pressure	232 psi
Reservoir Transmissibility (kH/mu)	88 mD-ft/cP
Formation Capacity (kH)	88 mD-ft
Reservoir Permeability	1.8 mD
Fracture Extension Pressure	N/A

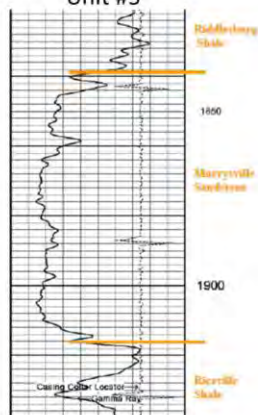


MURRYSVILLE LOGS

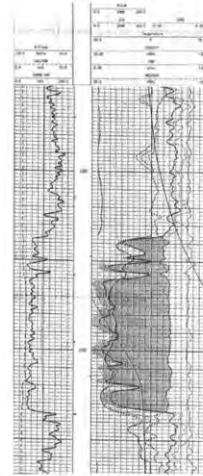
Sedat #3A



Snyder
Unit #3

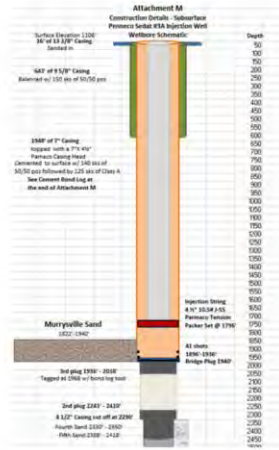


Watt #3



Murrysville type logs.

SEDAT #3A **WELLBORE SCHEMATIC**



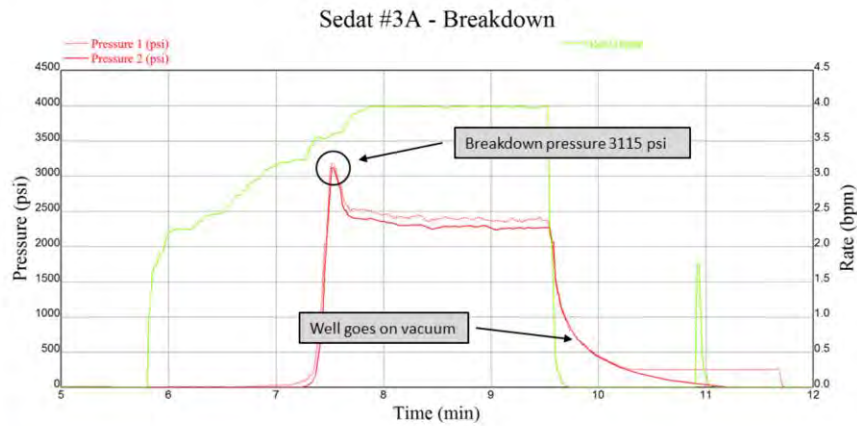
PERFORATION DATA

Description	Value
Entry Hole Diameter	0.58"
Phasing	60 degree
Type	EHC
Charge	25 grams
Depth	1896 ft to 1939 ft
Perforations	41 ea



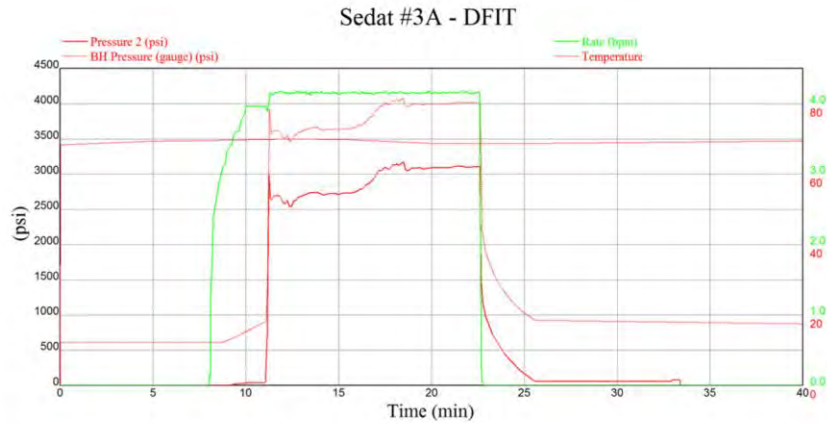
The Sedat #3A was perforated in the Murrysville from 1896 ft to 1939 ft with 41 0.58 in entry hole perforations. Perforation phasing was 60 degrees and the charge was 25 grams.

SEDAT #3A BREAKDOWN



The Murrysville formation in the Sedat #3A was broke down on September 1, 2015. The breakdown pressure was 3115 psi. Following the breakdown the acid was displaced at 4 bpm The well was on vacuum after shutdown with the pressure decreasing to zero in less than two minutes.

SEDAT #3A DFIT DATA

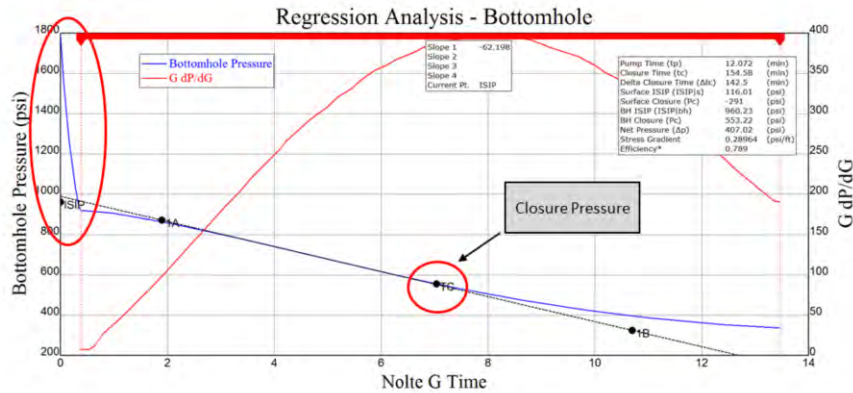


Following the formation breakdown a DFIT (diagnostic fluid injection test) was pumped in the Murrys ville to determine closure stress, reservoir pressure, and reservoir transmissibility (kh/mu). Prior to starting the DFIT the whole was loaded with water. After the hole was loaded 1500 gals of water was pumped at 4.1 bpm. The average surface treating pressure was 2902 psi and the average bottomhole treating pressure was 3816 psi.

During the injection the surface pressure increased from 2700 psi to 3100 psi with a constant rate indication some type of restriction.

After the rate went to zero the surface pressure declined rapidly and went to zero. The bottomhole pressure was recorded with a bottomhole pressure gauge at 1910 ft.

SEDAT #3A NOLTE G FUNCTION



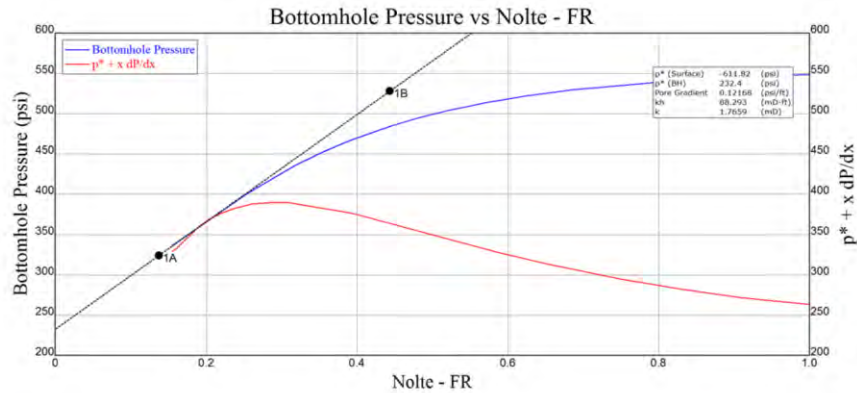
The bottomhole pressure from the DFIT was analyzed with the Nolte G function to determine the closure pressure and closure stress gradient.

Following the injection the pressure declined rapidly. The rapid pressure decline is most likely caused by fracture complexity and low closure stress and not leakoff into the formation.

The estimated bottomhole ISIP is 960 psi resulting in a fracture gradient of 0.50 psi/ft.

Closure occurred at a Nolte G time of 7.2 giving a bottomhole closure of 553 psi. The closure stress gradient is 0.29 psi. The net pressure was 407 psi and the fluid efficiency was 79 percent.

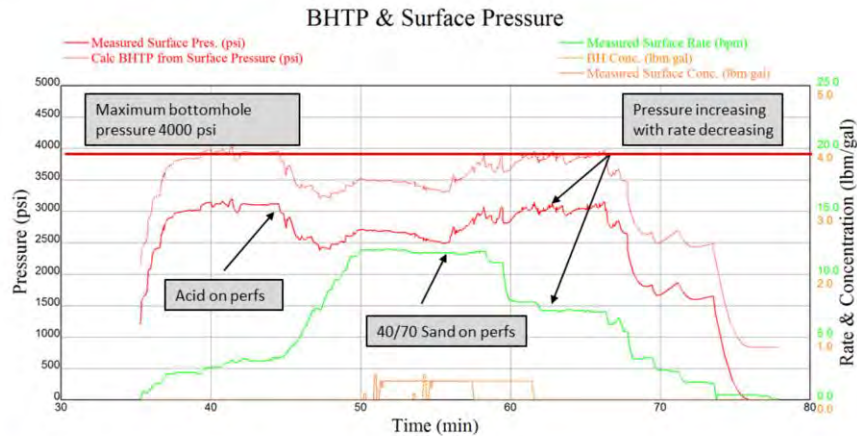
SEDAT #3A AFTER CLOSURE ANALYSIS



The bottomhole pressure after closure was analyzed using the Nolte FR function. If the late time data reaches pseudoradial flow estimates of reservoir transmissibility (kh/ μ) and reservoir pressure can be determined.

The results from the Nolte FR function show that pseudoradial flow was reached. P^* was 232 psi. The formation capacity (kh) was 88 mD-ft assuming a reservoir fluid viscosity of 1 cP. Using a formation height of 50 ft the reservoir permeability is 1.8 mD.

SEDAT #3A PERFORATION CLEANUP



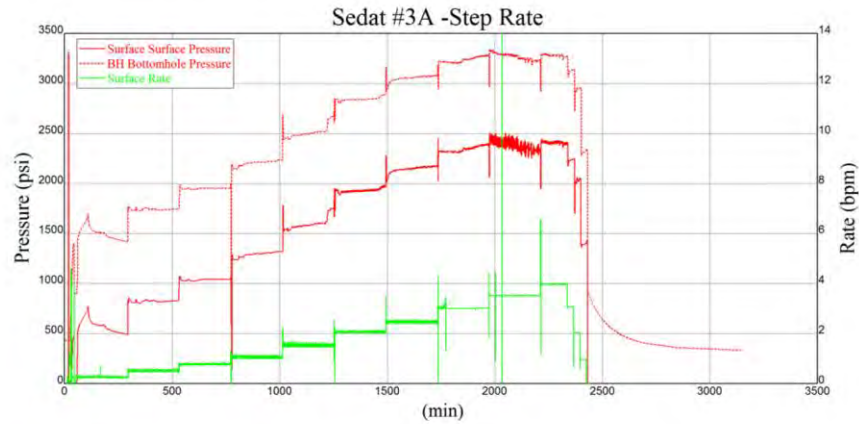
On September 29, 2015 an attempt was made to remove excess friction seen on the DFIT. 500 gals of 15% HCL was pumped. A decrease on the surface treating pressure was seen when the acid was on the perforations. The surface pressure decreased and the injection rate was increased to 12 bpm. The surface pressure continued to decrease to 2500 psi.

Low concentration (0.25 lb/gal) of 40/70 sand was pumped in an effort to remove the excess friction. The surface pressure initially decreased with the 40/70 sand on the perforations but increased rapidly to over 3000 psi on the surface. The maximum pressure on the packer was 4000 psi so the injection was decreased to 11 bpm then to 7 bpm.

The calculated bottomhole pressure remained close to 4000 psi and was erratic.

The rate was reduced and the pressure declined to zero in less than two minutes.

SEDAT #3A STEP RATE TEST

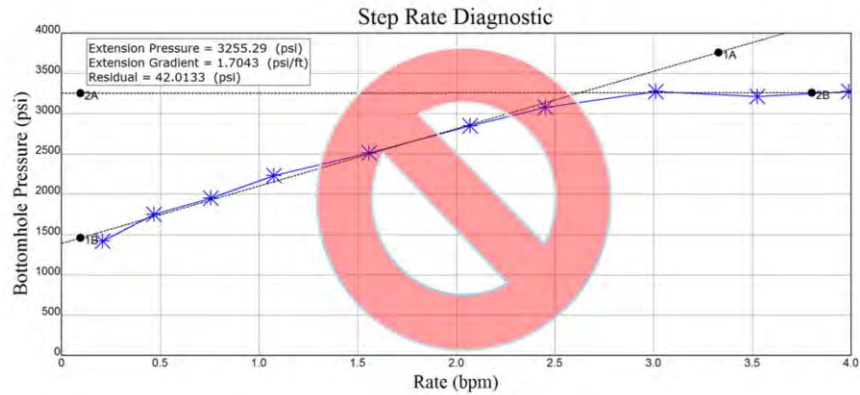


A Step Rate Test was pumped on October 1, 2015 to determine the fracture extension pressure. The initial rate was 0.25 bpm and increased in 0.25 bpm increments until 1 bpm where it was increased to 4 bpm in 0.5 bpm increments. Injection period for each rate stage was 4 hours.

Following the rate increases the rate was decreased from 4 bpm in 1 bpm increments until the rate reached zero.

Total injected volume was 4292 bbls.

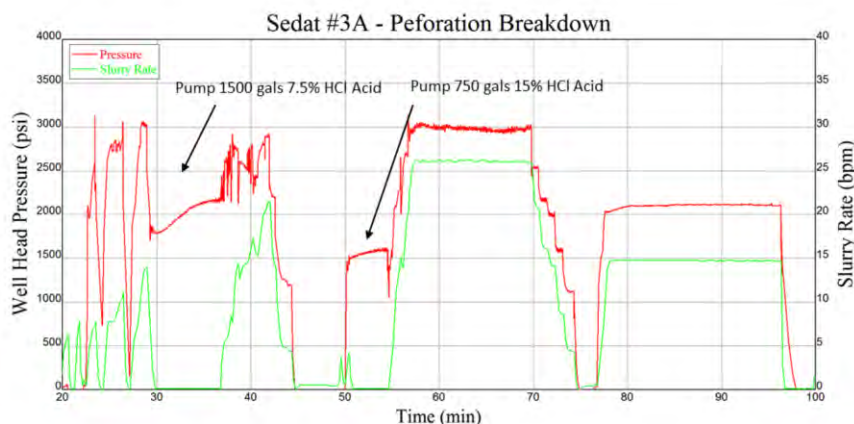
SEDAT #3A STEP RATE



Analysis of the Step Rate gave a fracture extension pressure of 3255 psi and fracture extension gradient of 1.70 psi/ft. This high of extension pressure gradient is unrealistic and cannot be used.

The high fracture extension pressure gradient is a result of excess near wellbore friction as evidenced by the sudden pressure increase with each rate increase (slide 13).

SEDAT #3A PERFORATION BREAKDOWN



On November 17, 2015 additional acid was pumped in an attempt to breakdown additional perforations and remove excess near wellbore friction to establish better communication between the wellbore and created hydraulic fracture.

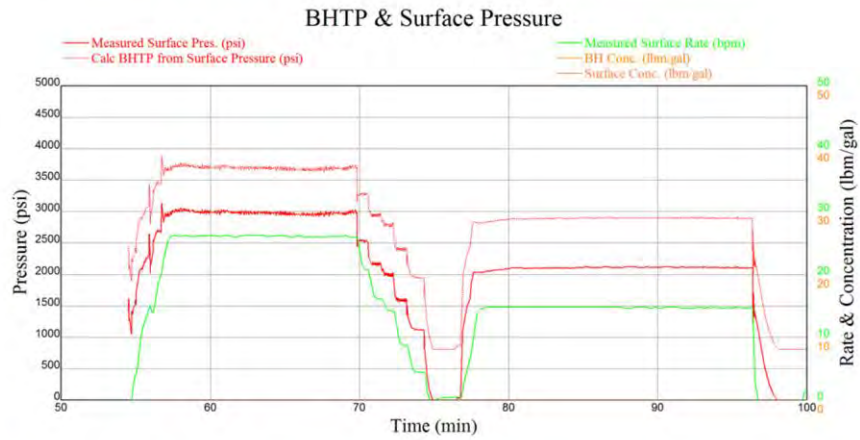
The first acid injection consisted of 1500 gals 7.5% HCl and the second acid injection was 750 gals 15% HCl acid.

Following the acid injections the maximum rate was 26 bpm at an average surface pressure of 2980 psi.

A rate stepdown was performed at the end of the acid breakdown. An additional injection was pumped at 15 bpm to establish an ISIP.

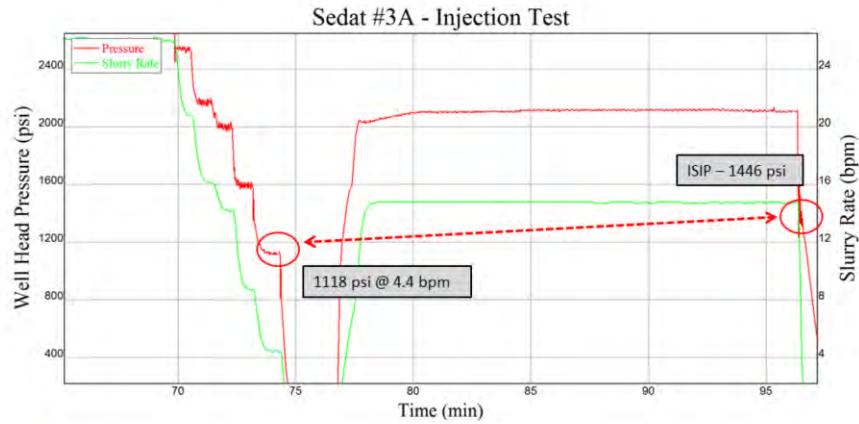
The ISIP was 1441 psi.

SEDAT #3A SURFACE & CALC'D BH PRESSURE



This plot shows the calculated bottomhole pressure from the acid breakdown.

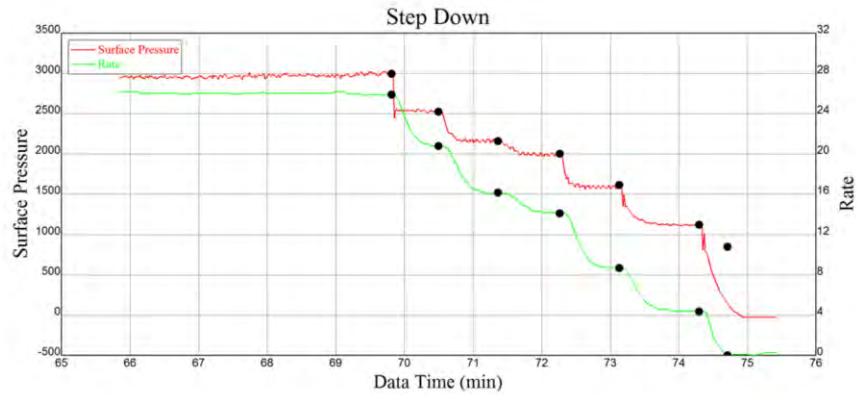
SEDAT #3A INJECTION TEST (ZOOMED)



This plot zooms in on the rate stepdown and final injection. The final rate on the stepdown was 4.4 bpm and the pressure was 1118 psi. The final ISIP was 1446 psi giving a fracture gradient of 1.23 psi/ft

This high of fracture gradient may be caused by either a horizontal fracture or excess fracture complexity.

SEDAT #3A STEPDOWN POINT SELECTION



A Stepdown Analysis was conducted to determine the cause of the excess near wellbore friction.

SEDAT #3A STEPDOWN TABLE

MinFrac - C:\Users\Henry\Documents\H-Frac Consulting\Penneco\Sedat #3A Acid Breakdown.minfrac - [Analysis Wizard - Enter ΔP Fric and ΔP Frac]

File Data Analysis Plot Output Units Tools Window Help

Regression Surface Nolte G Time | Regression Surface Sqrt Delta Time | Step Down Surface

Property	Value	Unit
Alpha	0.632424	
Specific Gravity of Fluid	1	
Number of perforations	5	
Perforation Discharge Coefficient	0.6	
Perforation Diameter	0.58	in.

	Time (min)	Rate (bpm)	Surface Pressure (psi)	Delta Pressure (psi)	ΔP Fric (psi)	ΔP Frac (psi)	Change ΔP Fric + ΔP Frac (psi)	ΔP Total HW (psi)	ΔP Perf Ideal (psi)	ΔP HW Only (psi)	Apparent Number of Perfs
1	74.7107	0	844	0	0	0	0	0	0	0	0
2	74.3	4.33	1118.95	274.95	8.84769	0	8.84769	266.102	36.7936	229.709	1.84909
3	73.1333	8.65	1609.53	765.53	25.3579	0	25.3579	740.172	145.238	594.934	2.21465
4	72.2667	14.06	1999.53	1155.53	52.7592	0	52.7592	1102.77	383.724	719.046	2.94942
5	71.3667	16.12	2154.54	1310.54	64.6456	0	64.6456	1245.89	504.404	741.49	3.1814
6	70.5	20.74	2522.71	1678.71	95.66	0	95.66	1583.05	834.961	748.089	3.63125
7	69.8167	25.86	2969.91	2145.91	134.216	0	134.216	2011.69	1298.09	713.6	4.01645

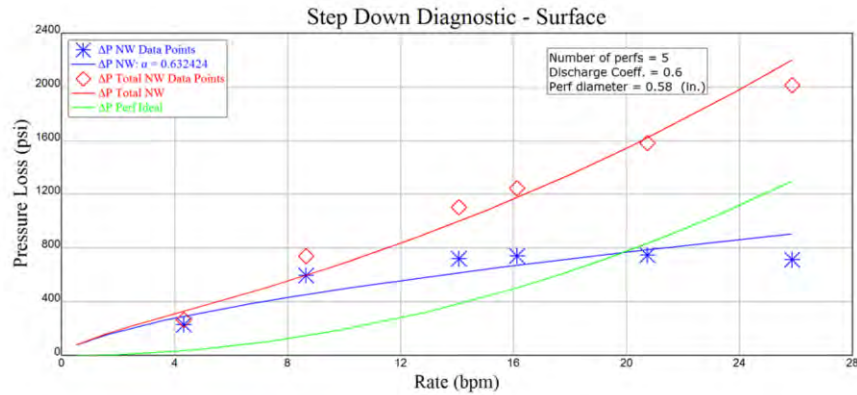
☒ Hide Description

< Back Next > Select Analyses



Stepdown Table showing the point selection and friction values.

SEDAT #3A STEPDOWN ANALYSIS



The Stepdown Analysis gives a total near wellbore friction of 2011 psi at 26 bpm. Of which 1300 psi is perforation friction and 711 is near wellbore tortuosity. The resulting number of perforations is 5 assuming a discharge coefficient of 0.60.

SEDAT #3A

SUMMARY

- A series of injections were pumped on the Sedat #3A to determine closure stress, fracture gradient, reservoir pressure, reservoir transmissibility (permeability), and breakdown pressure.
- During the injection tests excess friction existed either because of limited number of perforations open or near wellbore fracture complexity.
- Attempts were made to reduce the excess friction with acid, higher rates, and low concentrations of 40/70 sand. Acid and higher injection rates removed some of the excess friction but the high excess pressures still existed.
- The rate stepdown analysis showed total near wellbore friction of 2000 psi comprised of 1300 psi of perforation friction and 700 psi of near wellbore tortuosity of fracture complexity.



SEDAT #3A SUMMARY (CONT.)

- The rate stepdown shows only 5 perforations open out of 41 perforations.
- After each injection the pressure quickly fell to zero at the surface because of the low closure stress of the Murrysville.
- The closure stress determined from the DFIT was 553 psi giving a closure stress gradient of 0.29 psi/ft. The Murrysville in the Sedat #3A cannot support a column of water.
- The DFIT reached pseudoradial flow. The After Closure Analysis with the Nolte FR function gave a reservoir transmissibility (kH/ μ) of 88 mD-ft/cP assuming a reservoir fluid viscosity of 1 cP. Assuming a height of 50 ft the reservoir permeability is 1.76 mD.



SEDAT #3A

SUMMARY (CONT.)

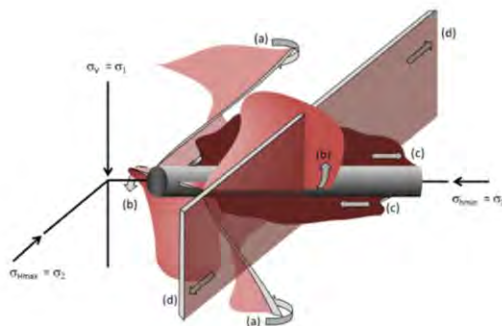
- The ISIP at the end of the last injection was 1446 psi giving a fracture gradient of 1.23 psi/ft suggesting a possible horizontal fracture. The high fracture gradient could also be the result of near or mid-field fracture complexity.



APPENDIX



COMPLEX FRACTURE PROPAGATION HORIZONTAL WELLBORE



Lucas W. Bazan - SPE 176919-MS



AFTER CLOSURE ANALYSIS

- The reservoir transmissiblity (kh/μ) can be calculated by analyzing the pressure decline data after closure; if the late time pressure data reaches pseudo-radial flow.
- Similar to a Horner analysis with the reservoir transmissibility calculated from the slope of the late time data.
- The pressure data when plotted on log-log scale will exhibit a slope of unity when pseudo-radial flow has developed.



RADIAL FLOW TIME FUNCTION

$$F_R(t, t_c) = \frac{1}{4} \ln \left(1 + \frac{\chi t_c}{t - t_c} \right)$$

where

$$\chi = 16 / \pi^2$$

t_c = time to closure, min

t = time, min

F_R = radial flow function

K.G. Nolte – SPE 38676



AFTER CLOSURE ANALYSIS

$$kh / \mu = 251,000 \left(\frac{V_i}{m_R t_c} \right)$$

where

k = reservoir permeability, mD

h = net pay, ft

μ = reservoir fluid viscosity, cP

V_i = volume injected, bbl

m_R = slope

t_c = time to closure, min

K.G. Nolte – SPE 38676



TREATMENT SUMMARY

AUGUST 28, 2015

Universal
 Universal
 Universal

General Slurry Information									
Slurry Type	Slurry Name	Slurry ID	Slurry Batch	Slurry Date	Slurry Time	Slurry Location	Slurry Operator	Slurry Status	Slurry Notes

Wellbore Information									
Well Name	Well ID	Well Depth	Well Diameter	Well Completion	Well Status	Well Location	Well Operator	Well Notes	Well Date

Pumping Summary									
Pump Name	Pump ID	Pump Type	Pump Capacity	Pump Status	Pump Location	Pump Operator	Pump Notes	Pump Date	Pump Time

Slurry on Stage Breakdown									
Slurry Name	Slurry ID	Slurry Batch	Slurry Date	Slurry Time	Slurry Location	Slurry Operator	Slurry Status	Slurry Notes	Slurry Date



TREATMENT SUMMARY

SEPTEMBER 29, 2015

[illegible]

[illegible]

TREATMENT SUMMARY

NOVEMBER 17, 2015

[illegible]

WATER ANALYSIS



CWM Environmental
11931 State Route 85
Kilbuck, Pennsylvania 15231
724.643.3011
Lab # 10-467

Lab Analysis Report

Sample Number: 09100056

Customer:	Farmco Oil Co., Inc.	Collection Date:	08/29/15 09:00
Site:	Seaford #10	Removal Date:	02/04/16 16:17
Monitoring PC:	Formation Water	Matrix:	Non Potable Water (NFW)
Source Type:	Discharge	Collection Method:	Grab

09100056	Result	Reporting Limit	Method	Analysis Date	Analyst
Gravimetric Solids	1000 g/m ³	g/m ³	A1701.2.1-08	08/19/15	24/24
Total Dissolved Solids	2472 mg/L	mg/L	504.2401.1	08/19/15	MR
pH	7.33 (25)	pH	5040101-04B	08/19/15	JRD

Sample Comments:

pH: The pH result measured @ temperature of 25 deg C (pH). The pH was analyzed inside of the 15 minutes holding time.

Signatures

Ryan D. Smith, Vice President of Operations

Analysis Reference: 05-021 - 0 & C Laboratory

Results are in text and table under the heading of current MCL/LCL level of protection.

Printed: 01/14/2016 1:07:22 PM

Confidential

Page 1 of 1



WATER ANALYSIS



CWM Environmental
11031 State Route 95
Kittanning, Pennsylvania 15201
724-643-3011
Lab # 616467

Lab Analysis Report

Sample Number: 391100617

Customer: Phoenix CR Co., Inc.	Collection Date: 05/28/15 10:00
Site: Tunnel #104	Received Date: 05/28/15 10:17
Measuring Pt: Tank Water	Matrix: Raw Potable Water (RPAW)
Sample Type: Discharge	Collection Method: Grab

00159057	Result	Reporting Limit	Method	Analysis Date	Analyst
Specific Gravity	1.000 g/mL	0 g/mL	ASTM D-153	06/01/15	JD
pH	4.82 TCU	2.0	25400D (4-B)	06/01/15	JD
Total Dissolved Solids	154178 mg/L	1 mg/L	184.2042 (C)	06/01/15	JD

Sample Comments:

pH: The pH result measured @ temperature of 25 mg C. pH The pH was dropped outside of the 15 minutes testing time.

Regina C. Blanton

Regina C. Blanton, Vice President of Operations

Accreditation: ISO 9001:2015 & ISO 14001:2015

Proved: 04/02/2015 - 12/31/2016

Confidential

Page 1 of 1



WATER ANALYSIS

Universal Well Services, Inc.
Chemical Technology
13445 E. Montross Road
Minnetonka, PA
822-373-2107



Laboratory Water Analysis

Sample Information

Company:	Person:
Wall Name:	Index To:
Sample ID:	File Name:
Formation:	
Date Sampled:	@ 25/2001
Date Analyzed:	@ 25/2001
Analyst:	Result:

Analysis Results

	Sample 1	Sample 2
pH	6.8	6.1
Temperature	4.4	78.2
Dissolved Carbon	1.1	1.12
Total Dissolved	9.26	9.442
Aluminum (ppm)	100.00	120.00
Total Dissolved Solids	210.50	373.00
Total Suspended Solids	52.3	40.4
Apparent Total Percentage	24.8	10.8
Ammonia	40.00	40.00
Cu Hardness	40.00	30.00
Cu*	27.25	14.00
Mg Hardness	4.00	10.00
Mg	—	2.42
Total Iron (ppm)	90	11.0
Iron	38	10.0
Hydroxide Alkalinity as CaCO ₃	—	0.00
Carbonate Alkalinity as CaCO ₃	—	0.00
Hydroxide Alkalinity as CaCO ₃	—	0.00
Total Alkalinity as CaCO ₃	—	0.00
Ammonia Nitrogen	9.0	10.0
Ammonia Nitrogen (%)	—	7.0
Specific Conductivity	177.00	490.00



**Attachment H
Operating Data
Sedat #3A Injection Well**

Injection Rates and Volumes

- 1) The proposed average injection rate is 1,800 BBLs of water per day and the maximum rate should be no greater than 2,000 BBLs of water per day or 54,000 BBLs per month.

Injection Pressures

- 2) Injection pressure is expected to be below 1,420 psi, the calculated maximum injection pressure at the well head, without accounting for any friction through the perforations through the 7" casing and the pipe friction through the 4 ½" injection string. The bottom hole pressure/reservoir pressure as measured with a bottom hole pressure gage is 232 psi.

The maximum injection pressure of 1,420 psi, was calculated using the formula published in 40 CFR 147.1953, $P_m = [(FG - (0.433)(S_g))D]$, for a column of water. The fracture gradient of 1.23 from the Reservoir and Characterization study found at the end of Attachment G was used. The S_g used was 1.11, the S_g of the produced brine water used in the formation study and a depth of 1,896' the top perforation in the Sedat #3A. $[P_m = (1.23 - 0.433 (1.11))1896]$; $P_m = 1,420\#$.

Annulus Fluid

- 3) Fresh water will be placed in the 4 ½" by 7" annulus, mixed with a chemical such as ALPHA 3207 which acts as a corrosion inhibitor and bacteria growth preventer. One (1) gallon of ALPHA 3207 will be mixed with approximately every 1,000 gallons of fresh water placed in the annulus. The MSD sheet for the chemical mixture ALPHA 3201 listing ingredients and physical data is included in this section. Positive pressure will be maintained on the annulus to monitor mechanical integrity.

Source and Analysis of Injection Fluid

- 4) The source of the injection fluid will be produced water from oil and gas wells and flow back fluid from oil and gas well stimulation activities. Representative sample analyses from two wells are included with this attachment. Before injection the produced fluid will be analyzed for the parameters required by the permit. The produced fluid and flow back water will be subjected to treatment and passed through a filter to remove large particles and suspended solids from the fluid before injection. The solids removed will be transported to an appropriate waste disposal site.

ATTACHMENT “H”
Operating Data

Corrplex 300



Chemplex, Ltd.
506 CR 137
Snyder, TX 79549
(325) 573-7298

DATE PREPARED:.....07/16/2003
REVISION DATE:..... 10/10/2011
EMERGENCY NUMBER:....**800-633-8253**
PRODUCT NUMBER:..... 01201

SECTION I – IDENTIFICATION

PRODUCT NAME: Corrplex 300
CHEMICAL FAMILY: Amine Salt
PRODUCT USE: Petrochemical industry:
Preparing Oil Well Packer Fluids.



SECTION II – HAZARDOUS INGREDIENTS

HAZ INGREDIENT	PERCENT	CAS NUMBER	PEL
FATTY ALKYL AMINE SALT	3-7 %	61790-85-0	Not Available
Ammonium Bisulfite	<10%	10192-30-0	Not Available
Methanol	15%	67-56-1	Not Available

SECTION III – PHYSICAL DATA

APPEARANCE: Amber Liquid
ODOR: Sulfite-like
BOILING POINT: ND
FLASHPOINT: 71°F Closed Cup
VAPOR DENSITY (AIR=1): ND
SPECIFIC GRAVITY (WATER=1): 0.98
pH (1% SOLN/WATER): 5
Density: 8.16 # per gallon

SECTION IV – FIRE AND EXPLOSION DATA

FLASHPOINT: 71°F Closed Cup
FLAMMABLE HAZARDS: When heated to decomposition, it emits acrid smoke and irritating fumes.

Corrplex 300

FIRE FIGHTING PROCEDURES:**SMALL FIRE:** Use DRY chemical, CO2 alcohol foam or water spray, as appropriate for surrounding materials.
LARGE FIRE: Use water spray, fog or foam. Cool containing vessels with water jet in order to prevent pressure build-up, auto ignition or explosion.

SECTION V – REACTIVITY DATA

STABILITY: This product is stable.
CORROSIVITY: ND
REACTIVITY: Highly reactive with oxidizing agents.
 Slightly reactive to reactive with reducing agents, alkalis.
 Very slightly to slightly reactive with organic materials, metals, acids.

SECTION VI A - HEALTH HAZARD DATA

ROUTE OF ENTRY: Ingestion. Skin Contact. Inhalation.
CHRONIC EFFECTS ON HUMANS: ... May cause nervous system depression, headaches, dizziness or confusion. The substance may be toxic to the nervous system.

SECTION VI B - FIRST AID

INHALATION:**SLIGHT INHALATION:** Allow the victim to rest in a well ventilated area. Seek immediate medical attention.
HAZARDOUS INHALATION: Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

INGESTION:**SLIGHT INGESTION:** Do not induce vomiting. Have conscious person drink several glasses of water or milk. Seek immediate medical attention.
HAZARDOUS INGESTION: Do NOT induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waist band. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

EYE CONTACT: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

SKIN CONTACT: If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible,

Corrplex 300

protecting your own hands and body. Place the victim under a deluge shower. If the chemical touches the victims exposed skin, such as the hands: Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. COLD water may be used. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

SECTION VII – SPILL, STORAGE AND DISPOSAL DATA

- SPILL:** **SMALL SPILL:** Absorb with an inert material and put the spilled material in an appropriate waste disposal.
LARGE SPILL: Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources.
- WASTE DISPOSAL:** Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.
- HANDLING:** Normal industrial hygiene procedures are appropriate. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, alkalis.
- STORAGE:** Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

SECTION VIII – PROTECTIVE CLOTHING

RESPIRATORY PROTECTION: Use MSHA/NIOSH approved respirator or equivalent
PROTECTIVE CLOTHING/EQUIPMENT: Splash goggles, lab coat/apron, gloves

Corrplex 300

SECTION IX – TRANSPORTATION DATA

PROPER SHIPPING NAME: Flammable liquid, n.o.s.(contains Methanol)
HAZARD CLASS: 3
UN NUMBER: UN 1993
PACKAGING GROUP: II
RQ: 612 gallons (Methanol)
DOT SHIPPING: Flammable liquid, n.o.s.(contains Methanol)

SECTION X – OTHER REGULATORY INFORMATION

TSCA STATUS: All components of this product are listed on the TSCA inventory.
NFPA HEALTH: 1
NFPA FLAMMABILITY: 3
NFPA REACTIVITY: 0

SECTION XI - ADDITIONAL INFORMATION

PREPARED BY: Edward F. Vinson

EMERGENCY RESPONSE NUMBER: **800-633-8253**

1803 Philadelphia Street
Indiana, PA 15701

Page 1 of 1

(724) 463-TEST
FAX (724) 465-4209

THE UNDERSIGNED PURCHASER HEREBY AGREES TO PAY SERVICE CHARGES ON ACCOUNTS OVER 31 DAYS OLD.

1. THESE SERVICE CHARGES WILL ACCRUE AT THE RATE OF 1 1/2% PER MONTH (18% PER ANNUM OR THE MAXIMUM ALLOWED BY LAW.)

2. THE UNDERSIGNED PURCHASER AGREES TO PAY, IN THE EVENT HIS ACCOUNT BECOMES DELINQUENT AND IS TURNED OVER TO ANY ATTORNEY FOR COLLECTION, REASONABLE ATTORNEY'S FEES PLUS ALL COURT AND DELINQUENT COLLECTION COSTS.

Received By: (Signature) Date/ Time

Fax: PWISD#

PRESERVATION (Y) / N CONTAINER (Y) / N TEMP $\leq 4^{\circ}\text{C}$ (Y) / N / NA

Sample Received in 5 Gallon Plastic Container



Report of Analysis

Name: EOG Resources
 Attn: Bill Burket
 400 Southpointe Blvd, Southpointe Plaza 1
 Canonsburg, PA 15317-8548
Sample Start Date: 6/23/2011 12:09 PM
Receipt Date: 6/23/2011 1:18 PM
Report Date: 7/18/2011

Sample ID#: 11 24158
Sample Type: Water
Sample Source: Grab
Sampler: CLIENT (Client)
Client Sample ID: PHC26H

Analyte	Analyst	Analysis Date	Analysis Time	Sample Result	Units	Data Qualifier	Method	RPL
Acidity to pH=8.3	BF	06/24	n/a	345	mg/l as CaCO ₃	n/a	SM2310B	2
Alkalinity to pH=4.5	SR	06/27	n/a	ND	mg/l as CaCO ₃	n/a	SM2320B	20
Biological Oxygen Demand 05	BF	06/23	12:00 PM	10.3	mg/l	n/a	SM5210B	2.0
Chemical Oxygen Demand	AJD	07/11	n/a	1167.5	mg/l	n/a	SM5220 D	500.0
Ammonia as N / Distilled	ZTR	07/11	n/a	174.52	mg/l	D	SM4500NH3B & D	10.45
Bromide	AJD	07/01	n/a	2150.00	mg/l	D	D1246-99	100.00
Chloride	BF	07/06	n/a	101569.1	mg/l	n/a	SM4500ClC	5.0
Kjeldahl Nitrogen as N	AJD	07/08	n/a	ND	mg/l	n/a	SM4500Norg-C,D	5.6
pH (SM)	SR	06/27	n/a	4.90	SU	n/a	SM 4500H-B	0.01
Sulfate ASTM	ZTR	07/15	n/a	ND	mg/l	n/a	D516-02	5
Total Nitrate + Nitrite as N	SR	07/13	n/a	ND	mg/l	n/a	SM4500NO3E	0.05
Aluminum - ICP	DRM	07/05	n/a	ND	mg/l	D	200.7/6010	1.000
Arsenic-ICP	DRM	07/05	n/a	ND	mg/l	D	200.7/6010	1.000
Barium - ICP	DRM	07/05	n/a	45.700	mg/l	D	200.7/6010	0.500
Beryllium - ICP	GJT	07/06	n/a	ND	mg/l	D	200.7/6010	0.500
Boron	ZTR	06/28	n/a	30.0	mg/l	D	SM 4500B-B	12.5
Cadmium - ICP	DRM	07/05	n/a	ND	mg/l	D	200.7/6010	0.500
Calcium - ICP	DRM	07/05	n/a	16706.700	mg/l	D	200.7/6010	50.000
Chromium - ICP	DRM	07/05	n/a	ND	mg/l	D	200.7/6010	0.500
Cobalt - ICP	GJT	07/06	n/a	ND	mg/l	D	200.7/6010	0.500

ND=Not Detected

Note: DEP Certification #s 32-00382
 D - Indicates an identified compound in an analysis that has been diluted

Approved By: _____

Laboratory Supervisor



Report of Analysis

Name: EOG Resources
 Attn: Bill Burket
 400 Southpointe Blvd, Southpointe Plaza 1
 Canonsburg, PA 15317-8548
Sample Start Date: 6/23/2011 12:09 PM
Receipt Date: 6/23/2011 1:18 PM
Report Date: 7/18/2011

Sample ID#: 11 24158
Sample Type: Water
Sample Source: Grab
Sampler: CLIENT (Client)
Client Sample ID: PHC26H

Analyte	Analyst	Analysis Date	Analysis Time	Sample Result	Units	Data Qualifier	Method	RPL
Copper - ICP	DRM	07/05	n/a	ND	mg/l	D	200.7/6010	0.500
Hardness	DRM	07/05	n/a	48118	mg/l	n/a	SM2340B	5
Iron - ICP	DRM	07/05	n/a	78.400	mg/l	D	200.7/6010	1.000
Iron, Dissolved-ICP	DRM	07/07	n/a	57.800	mg/l	D	200.7/6010	1.000
Lead-ICP	DRM	07/05	n/a	ND	mg/l	D	200.7/6010	0.500
Lithium - ICP	DRM	07/05	n/a	133.400	mg/l	D	200.7/6010	50.000
Magnesium-ICP	DRM	07/05	n/a	1554.600	mg/l	D	200.7/6010	50.000
Manganese - ICP	DRM	07/05	n/a	4.800	mg/l	D	200.7/6010	0.500
Mercury	WHM	07/01	n/a	ND	mg/l	n/a	245.1	0.0002
Molybdenum - ICP	DRM	07/05	n/a	ND	mg/l	D	200.7/6010	0.500
Nickel - ICP	DRM	07/05	n/a	ND	mg/l	D	200.7/6010	0.500
Selenium-ICP	DRM	07/05	n/a	ND	mg/l	D	200.7/6010	1.000
Silver-ICP	DRM	07/05	n/a	ND	mg/l	D	200.7/6010	0.500
Sodium - ICP	GJT	07/06	n/a	35397.000	mg/l	D	200.7/6010	500.000
Strontium - ICP	GJT	07/06	n/a	2015.800	mg/l	D	200.7/6010	1.000
Zinc - ICP	DRM	07/05	n/a	ND	mg/l	D	200.7/6010	0.500
Specific Gravity	LAW	06/27	n/a	1.1284	none	n/a	SM2710F	0.0000
Detergents, MBAS	LAW	06/24	11:15 AM	ND	mg/l	n/a	SM5540C	0.200
Ethylene Glycol	CL	06/27	n/a	ND	ug/L	n/a	SW846 8015B	50
Oil and Grease - HEM	LAW	06/28	n/a	ND	mg/l	n/a	1664A	5.0

ND=Not Detected

Note: DEP Certification #s 32-00382
 D - Indicates an identified compound in an analysis that has been diluted

Approved By: _____

Laboratory Supervisor



Report of Analysis

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Attn: Bill Burket
400 Southpointe Blvd, Southpointe Plaza 1
Canonsburg, PA 15317-8548
Sample Start Date: 6/23/2011 12:09 PM
Receipt Date: 6/23/2011 1:18 PM
Report Date: 7/18/2011

Sample ID#: 11 24158
Sample Type: Water
Sample Source: Grab
Sampler: CLIENT (Client)
Client Sample ID: PHC26H

Analyte	Analyst	Analysis Date	Analysis Time	Sample Result	Units	Data Qualifier	Method	RPL
Phenolics, as Phenol	AJD	07/11	n/a	ND	mg/l	n/a	420.1	0.500
Specific Conductance	SR	06/27	n/a	187236	uS/cm	n/a	SM 2510B	1
Total Dissolved Solids (TDS)	LMB	06/27	n/a	209300	mg/l	n/a	SM2540C	25
Total Suspended Solids	RLG	06/24	n/a	69	mg/l	n/a	SM2540D	5
1) Benzene	JG	06/24	n/a	ND	ug/L	n/a	624/8260B	1.00
47) Toluene	JG	06/24	n/a	ND	ug/L	n/a	624/8260B	1.00

Comments:

ND=Not Detected

Note:

DEP Certification #s 32-00382

D - Indicates an identified compound in an analysis that has been diluted

Approved By: _____

Laboratory Supervisor



Report of Analysis

Name: EOG Resources
Attn: Bill Burket
400 Southpointe Blvd, Southpointe Plaza 1
Canonsburg, PA 15317-8548
Sample Start Date: 6/23/2011 12:09 PM
Receipt Date: 6/24/2011 9:55 AM
Report Date: 7/19/2011

Sample ID#: 11 24279
Sample Type: Water
Sample Source: Grab
Sampler: CLIENT (Client)
Client Sample ID: PHC26H

Analyte	Analyst	Analysis Date	Analysis Time	Sample Result	Units	Data Qualifier	Method	RPL
Radium 226	Bnchmrk	07/14	n/a	*	pCi/L	n/a	RAD-CTDHS	0.000
Radium 228	Bnchmrk	07/07	n/a	*	pCi/L	n/a	RAD-CTDHS	0.000

Comments: Radiologicals done by Benchmark Analytical, PADEP Lab ID: 39-00401

ND=Not Detected

Note: DEP Certification #s 32-00382

Approved By:

Laboratory Supervisor

LAB ID: 39-00401 *CV

BENCHMARK ANALYTICS, INC.
4777 Saucon Creek Road
Center Valley, PA 18034-9004

PHONE (610) 974-8100
FAX (610) 974-8104

SEND DATA TO:

NAME: Kathy Brown
COMPANY: Environmental Service Laboratories, Inc
ADDRESS: 1803 Philadelphia St
Indiana, PA 15701

WO#: 11064840

PAGE: 1 of 6

PO#:

PWS ID#

PHONE: (724) 463-8378
FAX: (724) 465-4209

TEST REPORT

11 24279-24476-24479-24492-24489-24490

RECEIVED FOR LAB BY: MAK

DATE: 06/28/2011 9:30

Page 1 of 6

SAMPLE: 11 24279

Lab ID: 11064840-001A Grab

SAMPLED BY: Client

Sample Time 06/23/2011 12:09

Test	Result	Uncert.	MDA	Units	Method	MCL	Analysis Start	Analysis End	Analyst *
Radium-226	1576	± 75.31	184.40	pCi/L	EPA 903.0		06/28/11 11:00	07/14/11	BH-CV
Radium, Combined (Ra226 + Ra228)	1691			pCi/L	Calculation		07/19/11 10:59		BH-CV

SAMPLE: 11 24279

Lab ID: 11064840-001B Grab

SAMPLED BY: Client

Sample Time 06/23/2011 12:09

Test	Result	Uncert.	MDA	Units	Method	MCL	Analysis Start	Analysis End	Analyst *
Radium-228	114.6	± 67.09	140.00	pCi/L	EPA 904.0		06/29/11 19:10	07/07/11	MJS-CV

REMARKS:

Where the analytical method has been performed under NELAP certification, the analysis has met all of the requirements of the NELAC standard unless otherwise noted on the Analytical Report.

* CV = Benchmark Analytics, Inc. Center Valley, PA; SA = Benchmark Analytics, Inc. Sayre, PA

MANAGER

Chameli

DATE: 7/19/2011



CLEARWATER
Engineered Chemistry

Material Safety Data Sheet
ALPHA 3207

HEALTH	2
FLAMMABILITY	4
REACTIVITY	0
PERSONAL PROTECTION	G

24 hr. Emergency Contact (CHEMTREC) US Tel: 1- 800 - 424-9300 - Int'l. Tel. 703 - 527 - 3887

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

SUPPLIER: CLEARWATER INTERNATIONAL L.L.C.
515 POST OAK BLVD., SUITE 600
HOUSTON, TX 77027

MANUFACTURER: CLEARWATER INTERNATIONAL L.L.C.
4420 SOUTH FLORES RD
ELMENDORF, TEXAS 78112

PRODUCT NAME: ALPHA 3207
PRODUCT CODE: XFP0477B
PRODUCT USE/CLASS: CORROSION INHIBITOR

MSDS REVISION DATE: 06/15/04

PREPARER: MJW

PHONE: 724-318-1050

2. COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT	EXPOSURE LIMITS	CAS#	% BY WEIGHT
ISOPROPANOL	ACGIH TLV - 400 ppm TWA, 500 ppm STEL OSHA PEL - 400 ppm TWA,	67-63-0	10-30 %

3. HAZARD IDENTIFICATION

EYE: Liquid, aerosols and vapors of this product may be irritating and can cause pain, tearing, reddening and swelling accompanied by a stinging sensation and/or a feeling like that of fine dust in the eyes.

SKIN: May cause skin irritation. Allergic reactions are possible.

INGESTION: This material may be harmful if swallowed. May be irritating to mouth, throat, and stomach.

INHALATION: Prolonged inhalation may be harmful and can cause headaches, dizziness, nausea, anesthesia, narcosis, decreased blood pressure, changes in heart rate and cyanosis. May be irritating to mucous membranes and lung tissue.

CHRONIC INFORMATION: None Known

PRIMARY ROUTE(S) OF ENTRY: Inhalation, Ingestion

4. FIRST AID MEASURES

EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes while holding eyelids open. Get medical attention, if irritation persists.

SKIN CONTACT: Wash with soap and water. Get medical attention if irritation develops or persist.

INHALATION: Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get immediate medical attention.

INGESTION: Place victim on left side with head down to prevent aspiration into lungs. Induce vomiting as directed by medical personnel. Never give anything by mouth to an unconscious person. Call a physician or poison control center immediately.

5. FIRE FIGHTING MEASURES

FLASH POINT: 70 F
(TAGLIABUE CLOSED CUP)

LOWER EXPLOSIVE LIMIT: N.D.
UPPER EXPLOSIVE LIMIT: N.D.

Material Safety Data Sheet

ALPHA 3207

AUTOIGNITION TEMPERATURE: N.D.

EXTINGUISHING MEDIA: ALCOHOL FOAM CO2 DRY CHEMICAL

UNUSUAL FIRE AND EXPLOSION HAZARDS: Can release vapors that form explosive mixtures at temperatures at or above the flash point. Empty containers retain product residue (liquid and/or vapor) and can be dangerous.

SPECIAL FIRE FIGHTING PROCEDURES: Containers can build up pressure if exposed to heat (fire). As in any fire, wear a self-contained breathing apparatus pressure-demand (MSHA/NIOSH approved or equivalent) and full protective gear. Apply alcohol-type foam or all purpose foam by manufacturers recommended techniques for large fires. Use carbon dioxide or dry chemical for small fires. Use water spray to keep containers cool.

5. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Extinguish any possible ignition source until the area is determined to be free from fire or explosion hazard. Absorb spill with inert material (e.g. dry sand or earth), then place in a chemical waste container. (See exposure controls / personal protection section) Spilled material should be disposed of according to applicable regulations.

7. HANDLING AND STORAGE

HANDLING: Handle all chemicals with care. Ground and bond containers when transferring materials.

STORAGE: Keep away from heat, sparks, and flames. Keep container closed when not in use. Store in a cool, dry, well ventilated place away from incompatible materials.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS: Local exhaust ventilation may be necessary to control any air contaminants to within their exposure limits.

RESPIRATORY PROTECTION: No protection needed under normal use and conditions. Use a NIOSH/MSHA approved air purifying respirator with an organic vapor cartridge when airborne concentrations are expected to exceed exposure limits. Protection by air purifying respirators is limited.

SKIN PROTECTION: When contact is likely wear chemical resistant gloves and boots.

EYE PROTECTION: Wear safety glasses with side shields or goggles.

OTHER PROTECTIVE EQUIPMENT: Emergency eye wash stations and deluge showers should be available in the work area.

HYGIENIC PRACTICES: Wash hands before eating. Use only with adequate ventilation. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Dark amber

ODOR: Sl alcohol

BOILING POINT (RANGE): N.D.

FREEZE POINT: N.D.

VAPOR DENSITY: Heavier than air

VAPOR PRESSURE: N.D.

PHYSICAL STATE: Liquid

SOLUBILITY IN WATER: Soluble

PH (AS IS): 4.5-6.0

SPECIFIC GRAVITY: 0.94-1.00

10. STABILITY AND REACTIVITY DATA

CONDITIONS TO AVOID: Avoid temperature extremes. Excessive heat causes the vapor pressure to increase rapidly.

Material Safety Data Sheet

ALPHA 3207

INCOMPATIBILITY: Avoid contact with strong oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS: Oxides of carbon and nitrogen.

HAZARDOUS POLYMERIZATION: Will not occur under normal use and storage conditions.

CHEMICAL STABILITY: This product is stable under normal storage conditions.

11. TOXICOLOGICAL INFORMATION

ORAL: No product information is available.

DERMAL: No product information is available.

INHALATION: No product information is available.

12. ECOLOGICAL INFORMATION

ECOTOXICITY: No product information is available.

CHEMICAL FATE INFORMATION: No product information is available.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Consult local, state, or federal regulatory agencies for acceptable disposal procedures and disposal locations. Disposal in streams or sewers may be prohibited by federal, state, and local regulations.

RCRA STATUS: D001 –Characteristic of ignitability

14. TRANSPORTATION INFORMATION

(NON-BULK SHIPMENTS)

D.O.T. PROPER SHIPPING NAME: Isopropanol Solution

D.O.T. TECHNICAL NAME:

D.O.T. HAZARD CLASS: 3

HAZARD SUBCLASS: N/A

D.O.T. UN NUMBER: UN1219

PACKING GROUP: II

RESP. GUIDE PAGE: 129

(BULK SHIPMENTS)

D.O.T. PROPER SHIPPING NAME: Isopropanol Solution

D.O.T. TECHNICAL NAME:

D.O.T. HAZARD CLASS: 3

HAZARD SUBCLASS: N/A

D.O.T. UN NUMBER: UN1219

PACKING GROUP: II

RESP. GUIDE PAGE: 129

T.D.G. PROPER SHIPPING NAME: Isopropanol Solution

T.D.G. TECHNICAL NAME:

T.D.G. HAZARD CLASS: 3

HAZARD SUBCLASS: N/A

T.D.G. UN NUMBER: UN1219

PACKING GROUP: II

RESP. GUIDE PAGE: 129

IMDG PROPER SHIPPING NAME: Isopropanol Solution

IMDG TECHNICAL NAME:

IMDG HAZARD CLASS: 3.2

HAZARD SUBCLASS: N/A

IMDG UN NUMBER: UN1219

PACKING GROUP: II

EmS No: F-E, S-C

15. REGULATORY INFORMATION

CERCLA – SARA HAZARD CATEGORY:

Material Safety Data Sheet

ALPHA 3207

SECTION 311/312: This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311 and 312 of the Superfund Amendments and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

IMMEDIATE HEALTH HAZARD FIRE HAZARD

SARA SECTION 313: This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372:

COMPONENT	CAS#	% BY WEIGHT
-----------	------	-------------

TSCA STATUS:

All components of this product are listed on the Toxic Substance Control Act Inventory or are excluded from the listing requirements.

INTERNATIONAL REGULATIONS:

CANADIAN WHMIS: This MSDS has been prepared in compliance with Controlled Product Regulations except for the use of the 16 headings.

CANADIAN WHMIS CLASS: B-2, D-2B

CANADIAN ENVIRONMENTAL PROTECTION ACT:

All components of this product are listed on the Canadian Domestic Substance List (DSL).

16. OTHER INFORMATION

HMIS RATING – HEALTH: 2 FLAMMABILITY: 4 REACTIVITY: 0 PERSONAL PROTECTIVE RATING: G

LEGEND: N.A. – NOT APPLICABLE, N.E. - NOT ESTABLISHED, N.D. – NOT DETERMINED

THIS PRODUCT'S HEALTH AND SAFETY INFORMATION IS PROVIDED TO ASSIST OUR CUSTOMERS IN ASSESSING COMPLIANCE WITH HEALTH, SAFETY AND ENVIRONMENTAL REGULATIONS. THE INFORMATION CONTAINED HEREIN IS BASED ON DATA AVAILABLE TO US, AND IS BELIEVED TO BE ACCURATE, ALTHOUGH NO GUARANTEE OR WARRANTY IS PROVIDED OR IMPLIED BY THE COMPANY IN THIS RESPECT. SINCE THE USE OF THIS PRODUCT IS WITHIN THE EXCLUSIVE CONTROL OF THE USER, IT IS THE USER'S RESPONSIBILITY TO DETERMINE THE CONDITIONS OF SAFE USE. SUCH CONDITIONS MUST COMPLY WITH ALL GOVERNMENTAL REGULATIONS.



1803 Philadelphia St.
Indiana, PA 15701
P: (724) 463-TEST
F: (724) 465-4209
PADEP: 32-00382

1276 Bentleyville Rd.
Van Voorhis, PA 15366
P: (724) 258-TEST
F: (724) 258-8376
PADEP: 63-04247

1200 River Avenue
Williamsport, PA 17701
P: (570) 321-9002
F: (570) 321-1957
PADEP: 41-04880

21 January 2016

Penneco Oil Company
Attn: David Smail
6608 Route 22
Delmont, PA 15626

Work Order: 5123132
Project: Water

Report of Analysis

Client Sample ID	Lab Sample ID	Matrix	Date Sampled	Date Received	Sample Notes
Sedat # 3A Brine Water	5123132-01	Water	12/31/2015 11:00	12/31/2015 16:35	

Report Narrative

The results contained in this report are only representative of the samples received. Environmental Service Laboratories, Inc. is not responsible for use or interpretation of the data included herein.

Definitions

R Received out of recommended hold time.
D The reported value is from a dilution.
RL Reporting Limit
CFU Colony Forming Units

Certifications

Analyses performed by Environmental Service Laboratories, Inc., Indiana PA unless otherwise specified.

Environmental Service Laboratories, Inc., Indiana, PA/TNI Certification #32-00382

Z = Environmental Service Laboratories, Inc., Indiana, PA is not accredited for analysis in the specified matrix.

Approved By

Gabe Taylor
Laboratory Director





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Penneco Oil Company
6608 Route 22
Delmont, PA 15626

Reported: 01/21/2016 14:23

Lab Sample ID#: 5123132-01
Sample Type: Water
Sample Source: Grab
Sampler: Client
Client Sample ID: Sedat # 3A Brine Water

Sample Date: 12/31/2015 11:00
Receipt Date: 12/31/2015 16:35

Analyte	Sample Result	Units	Data Qualifier	RL	Analyst/ Certification	Prep Date/Time	Analysis Date/Time
Field Analysis	Analytical Method: HACH				Prep Method: No Prep		
Hydrogen Sulfide	0.0	ppm			BPL	12/31/15 11:00	12/31/15 11:00
General Chemistry	Analytical Method: -				Prep Method: No Prep - WetChem		
Specific Gravity	1.10				CAL/Z	01/04/16 10:24	01/04/16 10:25
General Chemistry	Analytical Method: SM2320 B-97				Prep Method: No Prep - WetChem		
Alkalinity to pH 4.5	243	mg CaCO ₃ /L		20.0	TSS	01/12/16 15:30	01/12/16 15:37
General Chemistry	Analytical Method: SM2510 B-97				Prep Method: No Prep - WetChem		
Specific Conductance	176300	umhos/cm		1.0	TSS	01/15/16 10:20	01/15/16 10:20
General Chemistry	Analytical Method: SM2540 C-97				Prep Method: No Prep - WetChem		
Total Dissolved Solids	176000	mg/L		25	LMB	01/04/16 08:30	01/04/16 09:30
General Chemistry	Analytical Method: SM4500-Cl D-97				Prep Method: Chloride Automated		
Chloride	91400	mg/L	D	5.00	TSS	01/14/16 15:12	01/14/16 15:16
General Chemistry	Analytical Method: SM4500-H B-00				Prep Method: No Prep - WetChem		
pH	5.59	S.U.	R	1.00	TSS	01/12/16 15:27	01/12/16 15:35
General Chemistry	Analytical Method: SM4500-O G-01				Prep Method: No Prep - WetChem		
Dissolved Oxygen	0.10	mg/L	R		WWS	12/31/15 17:09	12/31/15 17:09
General Chemistry	Analytical Method: SM5310 C-00				Prep Method: No Prep - WetChem		
Total Organic Carbon	519	mg/L	D	50.0	RLG	01/06/16 11:15	01/06/16 11:15



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Penneco Oil Company
6608 Route 22
Delmont, PA 15626

Reported: 01/21/2016 14:23

Lab Sample ID#: 5123132-01
Sample Type: Water
Sample Source: Grab
Sampler: Client
Client Sample ID: Sedat # 3A Brine Water

Sample Date: 12/31/2015 11:00
Receipt Date: 12/31/2015 16:35

Analyte	Sample Result	Units	Data Qualifier	RL	Analyst/ Certification	Prep Date/Time	Analysis Date/Time
Total Metals							
Analytical Method: EPA200.7 4.4				Prep Method: EPA 200.7 4.4			
Barium	14.6	mg/L	D	0.500	SFS	01/07/16 08:49	01/11/16 15:03
Calcium	14900	mg/L	D	50.0	SFS	01/07/16 08:49	01/11/16 15:03
Iron	215	mg/L	D	2.00	SFS	01/07/16 08:49	01/11/16 15:03
Magnesium	1920	mg/L	D	50.0	SFS	01/07/16 08:49	01/11/16 15:03
Manganese	28.8	mg/L	D	0.500	SFS	01/11/16 16:56	01/12/16 13:01
Sodium	41200	mg/L	D	250	SFS	01/07/16 08:49	01/11/16 17:33
Total Metals							
Analytical Method: SM2340 B-97				Prep Method: [CALC]			
Hardness	45000	mg/L		125	SFS	01/07/16 08:49	01/11/16 15:03

Attachment J
Stimulation Program
Sedat #3A Injection Well

Stimulation Program for Sedat #3A Injection Well

There are currently no plans to stimulate the Sedat #3A Injection Well.

3/2/2015

ATTACHMENT “J”
Stimulation Program

Attachment K
Injection Procedures
Sedat #3A Well

Injection Procedures:

Injection fluid will be brought in by trucks and a sample taken from each load prior to unloading. Company personnel will measure the specific gravity of the sample with a hydrometer or some other appropriate method, along with pH and conductivity. If the measured specific gravity of the injection fluid is above the value set by permit the specific gravity will be adjusted by adding diluting fluid consisting of produced fluid to the injection fluid until the specific gravity is less than the value set by permit. The produced fluids will then be unloaded through a discharge manifold into storage tanks. The fluid will then be treated with an oxygen scavenging agent and corrosion control additives.

The fluid will be pulled from the off loading tanks through a 20 micron filter to remove large suspended solids and transported through connecting pipes to additional tanks to hold the filter fluid until injection. From the tanks holding the filtered water the fluid will be transported by pipeline to high pressure pumps for transportation to the injection point where the rate of injection and pressure will be monitored and regulated so as not to exceed the maximum injection pressure and rate stated in the permit. The fluids will be pumped through a checkvalve at the wellhead down the 4 ½" injection string to the Murrys ville injection zone.

The specific gravity will be continuously monitored by a recording meter. Should the specific gravity exceed the value set by permit at the well head P-max will be automatically adjusted to a lower P-max by installed logic controls to compensate for the change in specific gravity or if unable to compensate for the change in specific gravity, automatically shut in the injection well until the specific gravity of the fluid can be adjusted or the P-max is adjusted manually.

Surface casing and the injection string casing annulus pressures will be monitored and recorded by a 2 pen recorder. A minimum of 100 psi of positive pressure, or the pressure required by permit, will be maintained on the annulus. Installed logic controls connected to the recorder will automatically shut in the injection well if a 15% increase in annular pressure is detected.

Fluid levels will be checked in all monitoring wells on a quarterly schedule or more frequently if required by permit by either running a bailer from a service rig or a wireline with a float/bobber on the end. Results will be reported to the EPA quarterly or as required by permit.

ATTACHMENT “K”
Injection Procedures

Attachment L
Casing and Cement Data
Penneco Sedat #3A Injection Well

Casing	Size Inches	Type	Weight Lbs/Ft	Grade	Set Depth Feet	Internal Yield Pressure PSI	Collapse Pressure PSI	Joint Yield Lbs	Body Yield Lbs
Conductor	13 3/8		48	H-40	16	1730	740	322000	541000
Surface	9 5/8	ST&C	32	H-40	643	2270	1370	254000	365000
Long String	7	LT&C	20	J-55	1948	3740	2270	257000	316000
Injection String	4 ½	LT&C	10.5	J-55	1792	4790	4010	203000	166000

Cement Data

Casing	Size Inches	Class	Amount Sacks	Volume BBLs	Top of Cement
Conductor	13 3/8	Sanded in			
Surface	9 5/8	50/50 Pozmix	150	26.7	Surface
Long String	7	A	265	47.2	Surface*
Injection String	4 ½				

*See cement bond log included in Attachment M

Attachment L
Construction Procedures
Sedat #3A Injection Well

Construction Details For:

Well Name: Sedat #3A
Location: Plum Boro, Allegheny Co, PA
(See AOR Map for Well Location)

Drilling Program:

The Sedat #3A injection well will be a repurposed depleted natural gas well that was drilled through the Upper Devonian Bradford Sands to a total depth of 4,320' and after depletion plugged back to 1,940' to just below the Murrysville injection zone.

The Sedat #3A was rotary air drilled with drilling operations starting on 1/25/1989 and finishing on 2/1/1989 on reaching a Total Depth of 4,350'. The company installed 16' of 13 3/8" casing as conductor pipe which was sanded in, 643' of 9 5/8" casing cemented to surface, 1,948' of 7 " casing cemented to surface, and 3,903' of 4 1/2" casing cemented to 2,310'. Three sand formations were hydrofracked and the well was produced until 2015 through the 4 1/2" casing when the well was taken out of service because of low production. The company plugged back the Sedat #3 to a depth of 1940' in accordance with Pennsylvania Department of Environmental Protection regulations. The uncemented portion of the 4 1/2" casing was removed, three cement plugs were then placed through and above the fracked sands and a 7" cast iron solid bridge plug was set at 1,940' in the 7" casing just below the Murrysville injection zone. The injection string will be made up of 4 1/2" 10.5# J55 casing set on a Parmaco Standard Upside Down Pressure Packer at 1,792' See original well record and completion report, wellbore diagram showing the wellbore configuration, and the casing cement data chart at the end of this Attachment.

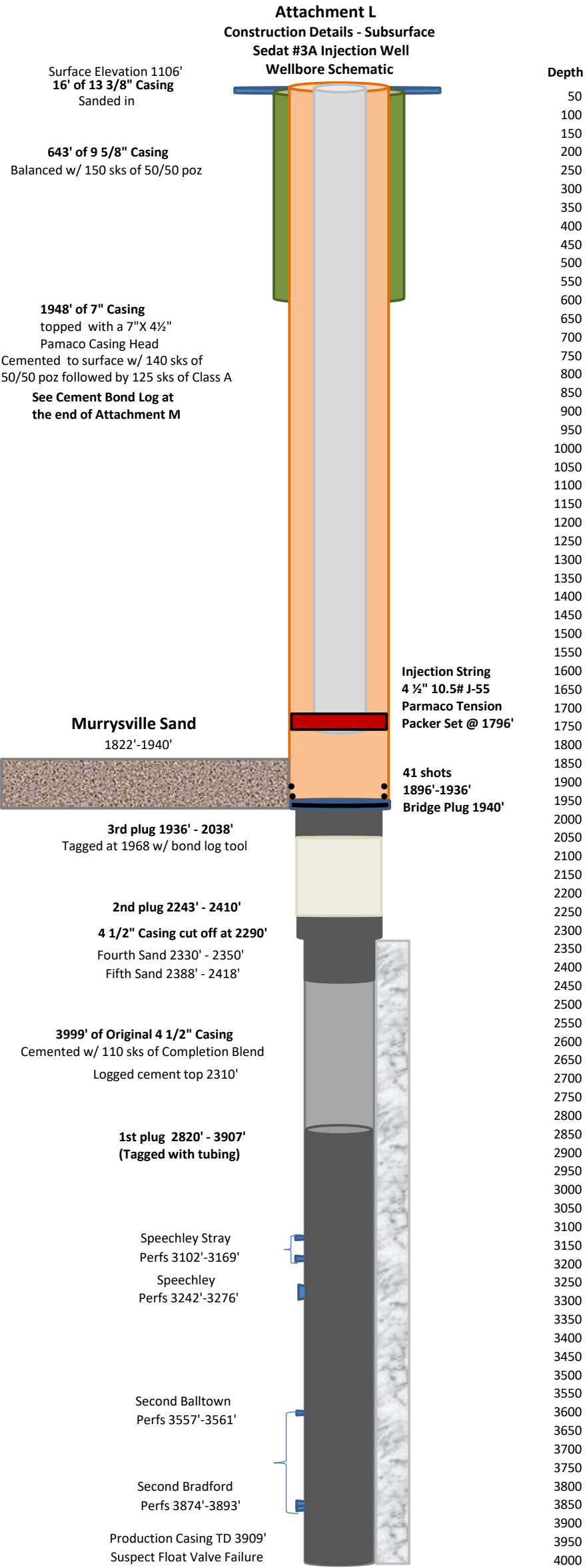
The annulus between the 4 1/2" injection string and the 7" casing will be filled with fresh water mixed with a small amount of corrosion inhibitor and bacteria growth preventer.

Logging Program:

The following open hole well logs were run: Gamma Ray, Compensated Density, Neutron, Dual Induction, Temperature and Caliper. The logs were run from TD to the bottom of the 7" with the Gamma Ray run to surface.

A cement bond log was run on the 7" casing showing a good cement bond to surface and is included with Attachment M.

ATTACHMENT “L”
Construction Procedures



Packers

Parmaco Packers

Parmaco Packers are made of the highest quality American made materials. Our packers are made with 1026 hot rolled and J55ERW steel tubing. All machining is done in house to insure the quality of our product. The element is also made in house from 65-70 durometer neoprene rubber. Parmaco's various packers are all made with the same materials and attention to detail.

We stock our packers in many different sizes and styles. We can also custom make almost any size packer you may need. Our packers are available with some of the following options- Threaded shoe, weld on connection, swab attachment, shear pins, cast iron disk, different element lengths, and many different thread options.

Our hookwall and tension packers all have slips that are made from 1026 hot rolled tubing that has been heat treated to 45 Rockwell.

Not all of our Packers are listed, [contact us](#) for more info.



Standard Upside Down Pressure Packer: Figure (C-301)

- TENSION SET PACKER
- MATERIAL- 1026 HOT ROLL SEAMLESS TUBING
- MANDREL MATERIAL- J55 ERW
- SLIPS HARDENED TO 45 ROCKWELL
- ELEMENT MATERIAL- NEOPRENE RUBBER
- ELEMENT DUROMETER- 65-70
- ELEMENT LENGTH- 16"

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS REGULATION
PITTSBURGH, PENNSYLVANIA 15206-2988

WELL RECORD

NEW KENSINGTON EAST

003-21223

Office Use Only

PERMIT NO.

37-003-21223-00

PROJECT NO.

TYPE OF WELL

Gas and Oil

WELL OPERATOR **OIL CO. INC.**
Penneco Energy Corporation

CORRECTION MADE BY 111000
AUDREY W. MURPHY, PENNSYLVANIA
4-20-89

TELEPHONE NO.
412-468-8232

ADDRESS
200 Route 22, Delmont, PA

ZIP
15626

FARM NAME
Sedat #3A

FARM NO.

SERIAL NO.
PS-46

ACRES
70

TOWNSHIP
Plum Borough

COUNTY
Allegheny

DRILLING COMMENCED
1-25-89

DRILLING COMPLETED
2-1-89

ELEVATION
1,106'

QUADRANGLE
NEW KENSINGTON EAST ☒ 7 1/2' ☐ 15'

CASING AND TUBING RECORD

PIPE SIZE	AMOUNT IN WELL	MATERIAL BEHIND PIPE		PACKER			DATE RUN
		CEMENT (SKS.)	GEL (SKS.)	TYPE	SIZE	DEPTH	
13-3/8"	16-1/2	Cuttings	None	N/A	N/A	16-1/2	1-25-89
9-5/8"	643	150	3	Float Shoe	9-5/8"	653	1-26-89
7"	1,948	265	8	Float Shoe	7"	1,958	1-28-89
4-1/2"	3,999	110	4	Float Shoe	4-1/2"	4,009	2-1-89
1-1/2"	3,270	N/A	N/A	N/A	N/A	3,270	2-10-89

PERFORATION RECORD

STIMULATION RECORD

DATE	INTERVAL PERFORATED FROM TO		DATE	INTERVAL TREATED	AMOUNT FLUID	AMOUNT SAND	INJECTION RATE
2-8-89	3890	3893	2-8-89	3557-3893	14,500	14,000#	17.0BPM
2-8-89	3874	3878	2-8-89	3342-3276	31,000	33,600#	30.0BPM
2-8-89	3557	3561	2-8-89	3102-3169	10,500	9,200#	28.0BPM
2-8-89	3242	3276					
2-8-89	3102	3104					
2-8-89	3166	3169					

T.D.	D.D.	D.P.I.	Class	O	G	Lease
4320		3893	2	1	1	

NATURAL OPEN FLOW	29 MCF	NATURAL ROCK PRESSURE	Not Taken	HRS. DAYS
AFTER TREATMENT OPEN FLOW	287 MCF	AFTER TREATMENT ROCK PRESSURE	720#	89 HRS. DAYS

REMARKS:

Good cement returned to surface after setting 9-5/8" casing and 7" casing. No water encountered in Renton Mine.

PROP. FM -

Bradford

FM TD - BRALLIER

CEILING 82 68
4003-810

(FORMER SIDE)

JUN 2 1989

PA GEOLOGICAL SURVEY
(OHIO & GAS GEOLOGY DIVISION)

W. NP
4-20-89

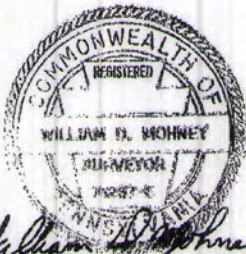
FORMATIONS							
NAME	TOP	BOTTOM	GAS AT	OIL AT	WATER AT (FRESH OR SALT WATER)	SOURCE OF DATA	
Fill	0	6				Driller's Log	
Shale	6	14					
Sand	14	16					
Sand and Shale	16	48			Hole damp @ 48'		
Sand and Shale	48	475			1" @ 220 ft.		
Shale	475	669					
Sand and Shale	669	760					
Shale	760	890					
Sand	890	960					
Shale	960	1105					
Sandy Shale	1105	1190					
Sand and Shale	1190	1550					
Sand and Shale	1550	1900			1" @ 1860 ft.		
Sand	1900	1934					
Red Rock	1934	1938					
Sand	1938	2000					
Sand	2000	2032					
Sand and Shale	2032	2571	2360-2390				
Sand and Shale	2571	3030					
Shale and Sand	3030	3630	3240-50				
Shale	3630	4320	3560-70'				
T.D.	4320		3880-3900				
BRUHER							
GEOPHYSICAL LOG DATA							
Speechley Stray				3099-3172			
Speechley				3240-3280			
2nd Balltown				3556-3562			
2nd Bradford				3868-3892			
0001 0001 0001 0001 0001 0001							

March 17, 1989
DATE 21
APPROVED BY _____
Vice-President
TITLE _____

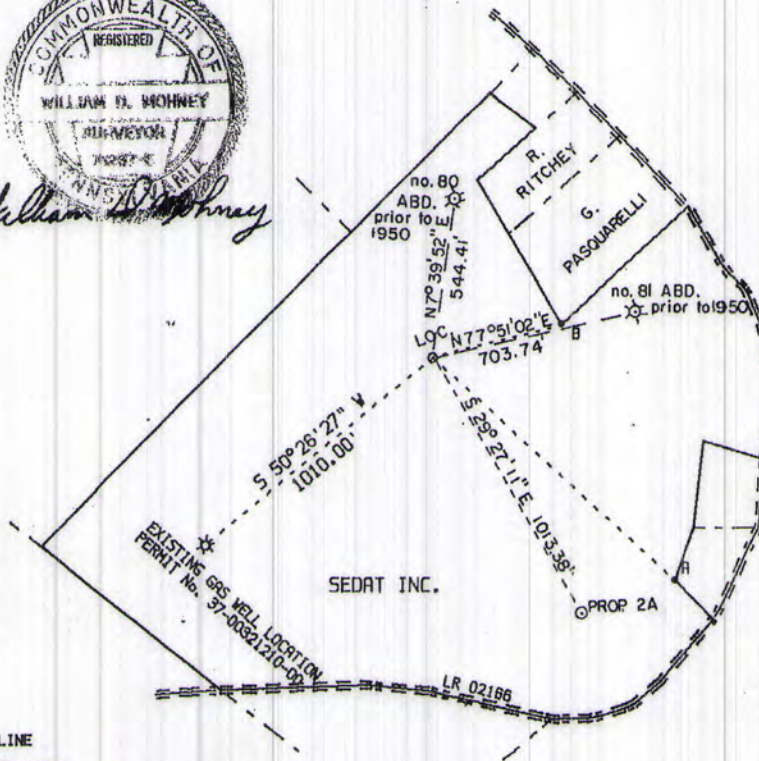
WELL LOCATION PLAT

Well is located on topo map 5210 feet south of LATITUDE 40 0 32 30 "

NOTE: The locations of the abandoned gas wells No. 80, 81, 86 and 87 have been located on the maps from the old Renton Mine maps due to the absence of any evidence in the field.



William D. Mohney



- LEASE LINE
- - - PROPERTY LINE
- NEW GAS WELL LOCATION
- ✱ EXISTING GAS WELL LOCATION

*A and B ARE PROPERTY CORNERS
 LOC - A = S 47° 22' 09" E 1126.9'
 LOC - B = N 75° 45' 07" E 452.4'

Include description of the property and courses and distances of the well(s) locations to two or more permanent identifiable points or land marks, all buildings and water supplies within 200', all springs, bodies of water and streams within 100' identified on the most current 7 1/2 topographic map and wetlands within 100'.
 Reference to buildings, springs, bodies of water wetlands and water supplies within 1,000 is not required for well plugging

Denotes location of well on 7 1/2" topo map Permit No. 37-003-21223-00 Project No.

9-2-88
 Department Use Only

--	--

PENNCO OIL COMPANY, INC.		Revision	☐	W. D. MOHNEY
Well Permittee/Registrant		Alteration	☐	Surveyor/Engineer 16237-E
200 U.S. ROUTE 22		Storage Recondition	☐	5 - 3A
Address		New Location	☒	Drawing Number
DELMONT, PA 15628		Drill Deeper	☐	7-12-88, 8-29-88
SEDAT INC.		Abandonment	☐	Date
Surface Owner		Registration	☐	1" = 500'
N/A		Plugging	☐	Scale
Surface Lessee (if any)		Surface landowner and water purveyor with water supply within 1,000'		Approximate course and distance to water supply
SEDAT				RECEIVED
Form Name	PS - 46	NONE		SEP 26 1988
Well No.	69.5			
Tract	1106			
Acres	NONE			
Ground Elevation	3350'			
Angle of Deviation (Drilling)	Anticipated TD			
ALLEGHENY	PLUM BORO			
County	Municipality			
NEW KENSINGTON EAST	G 7			
Topo Quadrangle	Section			

Commonwealth of Pennsylvania
 Department of Environmental Resources
 Bureau of Oil and Gas Management

Well is located on topo map 1500 feet west of LONGITUDE 79 0 42 30 "

L25 40° 31' 38.524"
 L95 - 79° 42' 48.5424"

PA GEOLOGICAL SURVEY

(Oil & Gas Geology Division)
 Workable Coal Seams None of Seem

Owner/Operator/Lessee	UPPER FREEPORT
VILLA COAL COMPANY	ALL OTHERS
SEDAT INC.	UPPER FREEPORT?
CONSOLIDATION COAL CO.	



GAMMA RAY \ CCL CEMENT BOND LOG

Company PENNECO OIL COMPANY
Well SEDAT #3A
Field PLUM BORO
County ALLEGHENY
State PA
Country U.S.A.

Location: API # : 37-003-21223 Other Services

SEC	TWP	RGE	Elevation
Permanent Datum	G.L.		1106'
Log Measured From	TOP OF 7" CASING		K.B. 1113'
Drilling Measured From	G.L.		D.F. 1113'
			G.L. 1106'

Date 8-7-15 PERFORATIONS 1896-1936 (20)

Run Number	ONE	
Depth Driller	NA	
Depth Logger	1965'	
Bottom Logged Interval	1965'	
Top Log Interval	SURFACE	
Open Hole Size	NA	
Type Fluid	WATER	
Density / Viscosity	NA	
Max. Recorded Temp.	NA	
Estimated Cement Top	SURFACE	
Time Well Ready	NA	
Time Logger on Bottom	NA	
Equipment Number	201	
Location	KITTANNING	
Recorded By	R. WEISS	J. SIMMONS
Witnessed By	MR. JACOBS	C. HARKLEROAD

Borehole Record			Tubing Record		
Run Number	Bit	From	To	Size	Weight
					From
					To

Casing Record	Size	Mgt/ft	Top	Bottom
Surface String				
Prot. String				
Production String				
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.

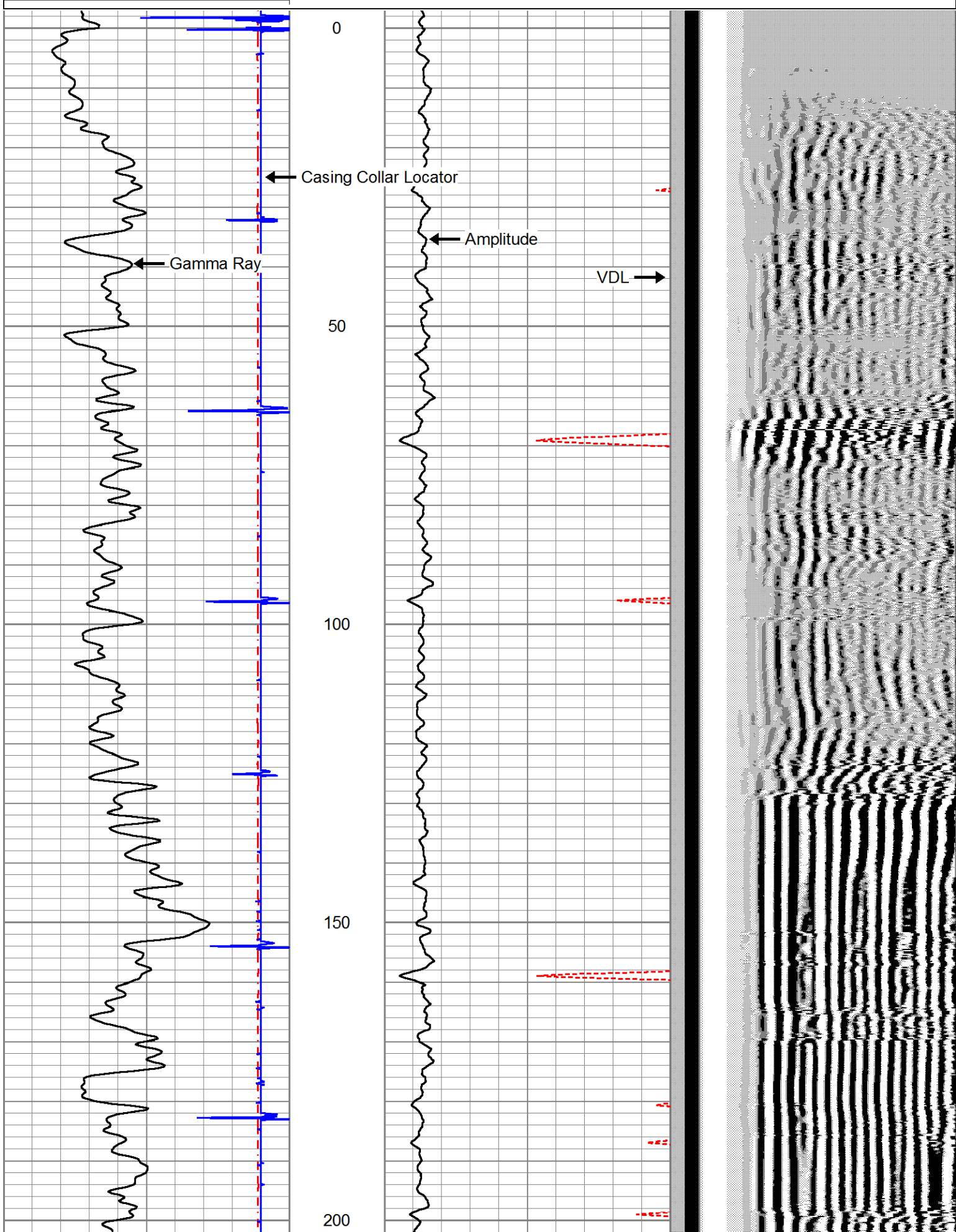
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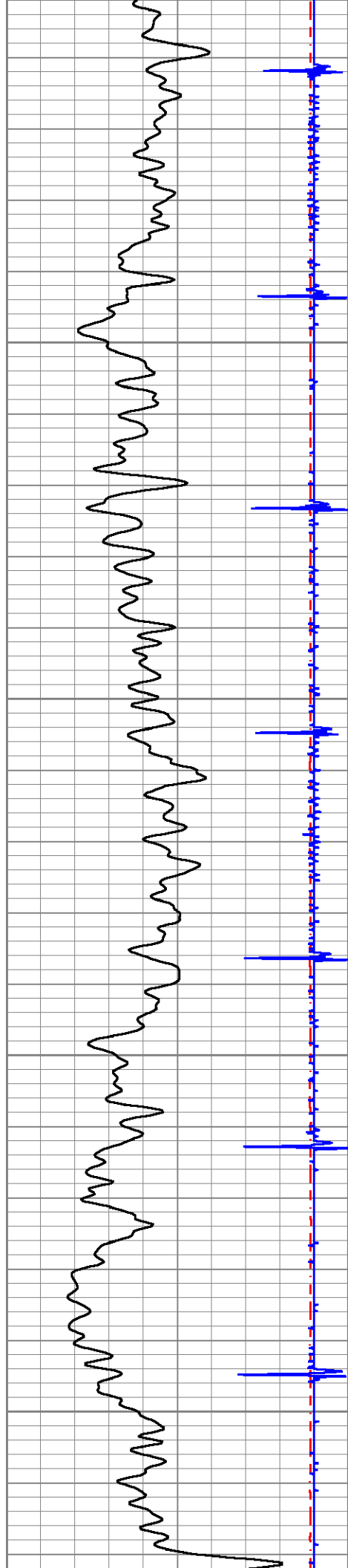
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Presentation Format scbl_dr
Dataset Creation Fri Aug 07 08:18:23 2015
Charted by Depth in Feet scaled 1:240

300	TT3FT (usec)	200
-9	Collar Locator	1
0	Gamma Ray (GAPI)	200

0	Amplified Amplitude (mV)	10	200
0	Amplitude (mV)	100	

VDL 1200



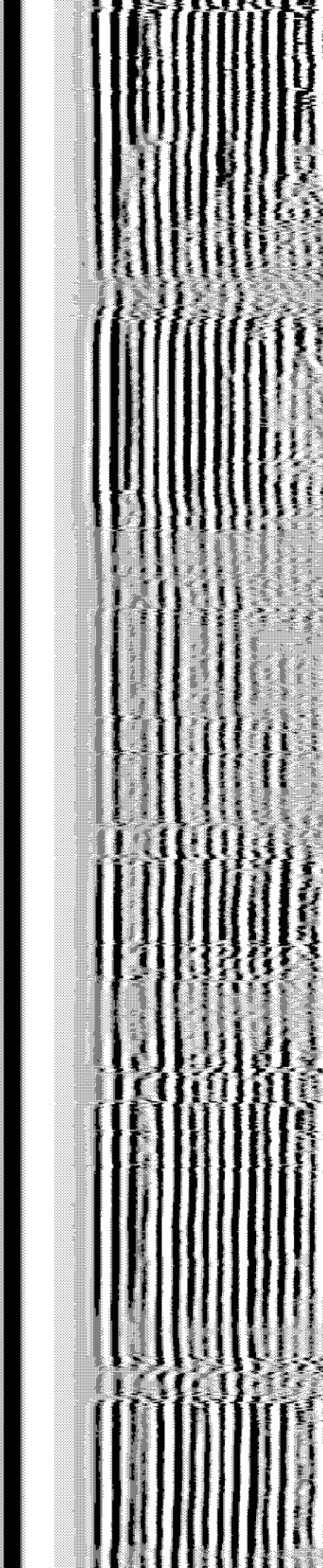
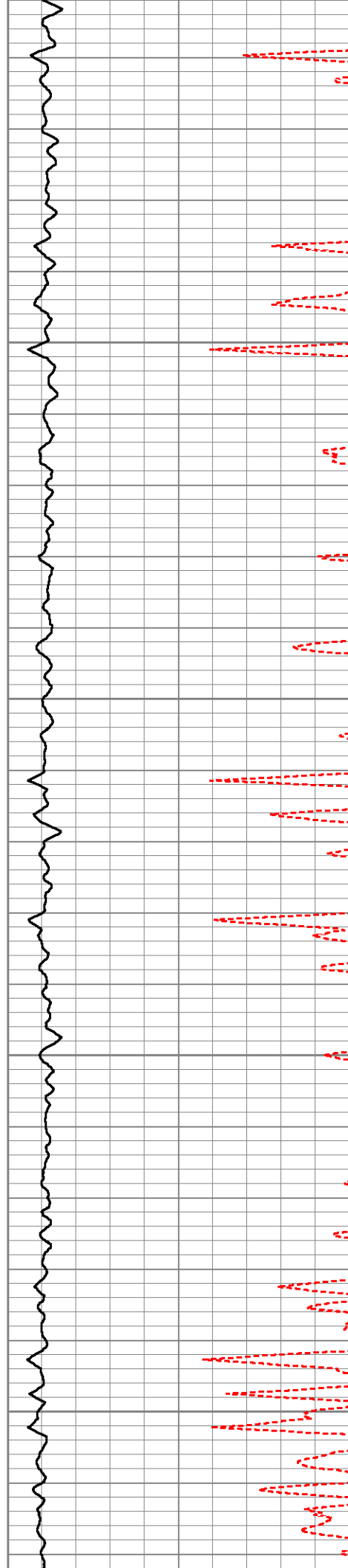


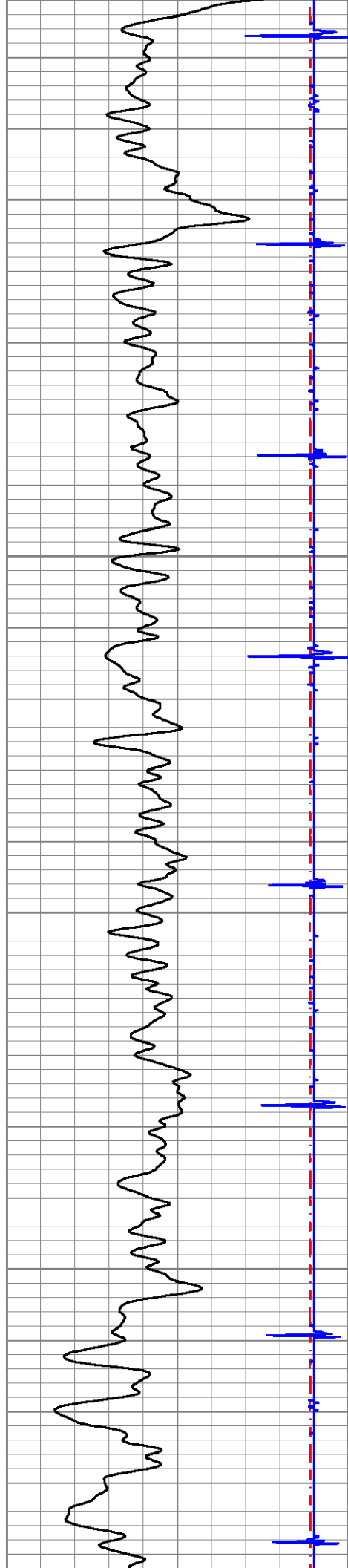
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300

350

400



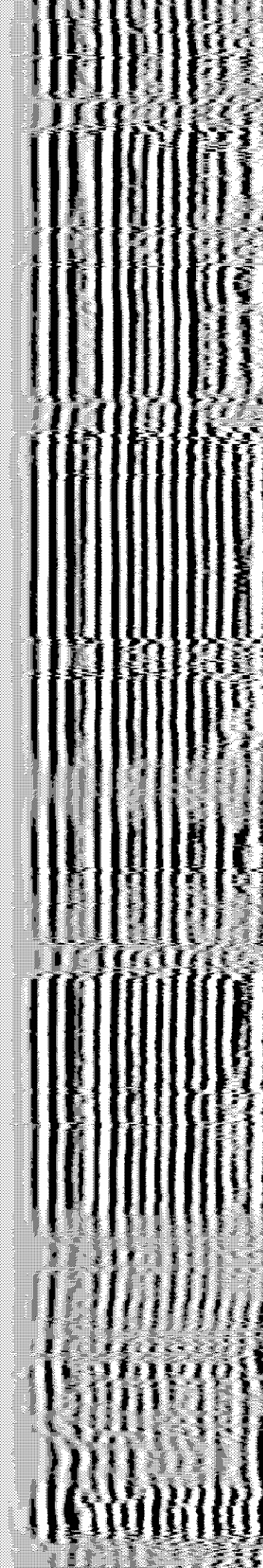
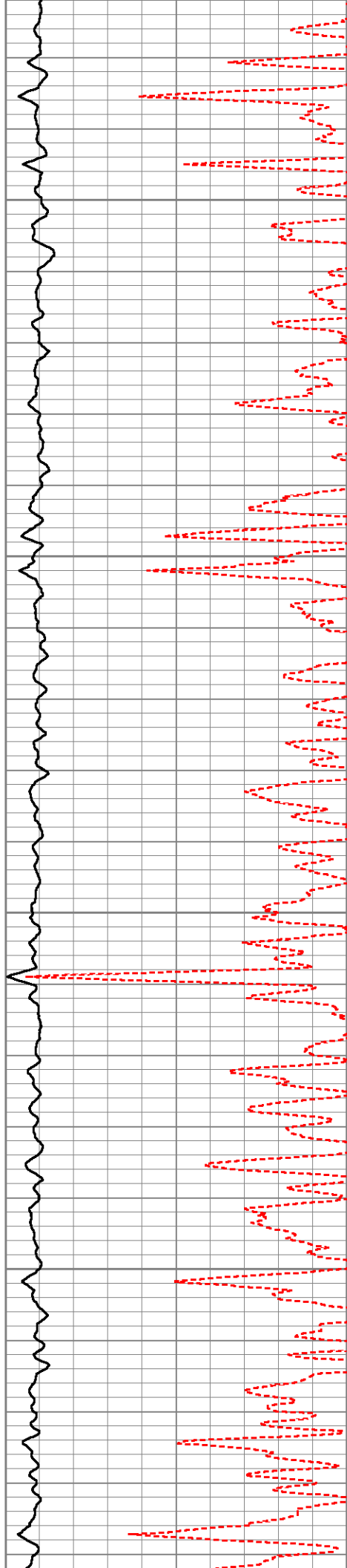


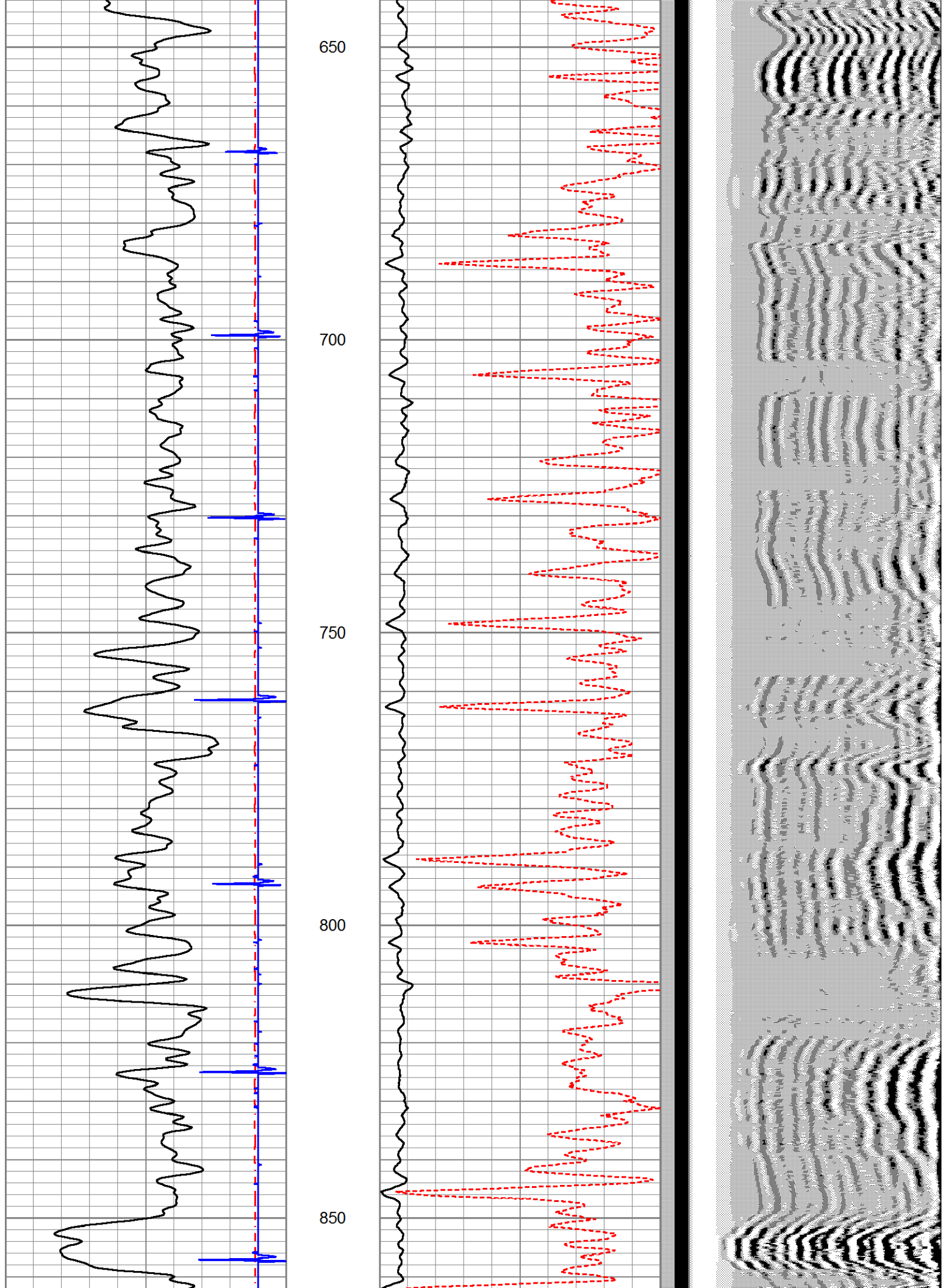
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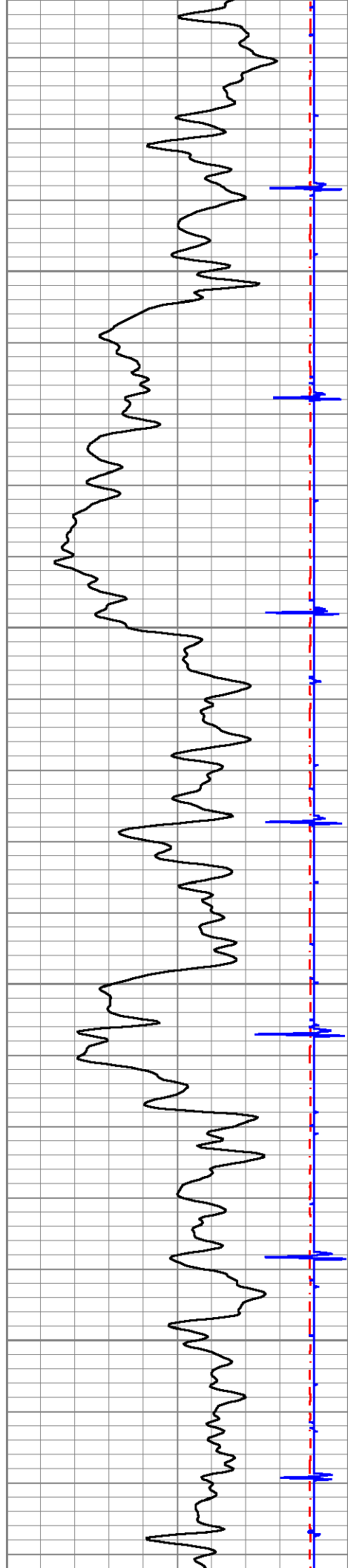
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550

600





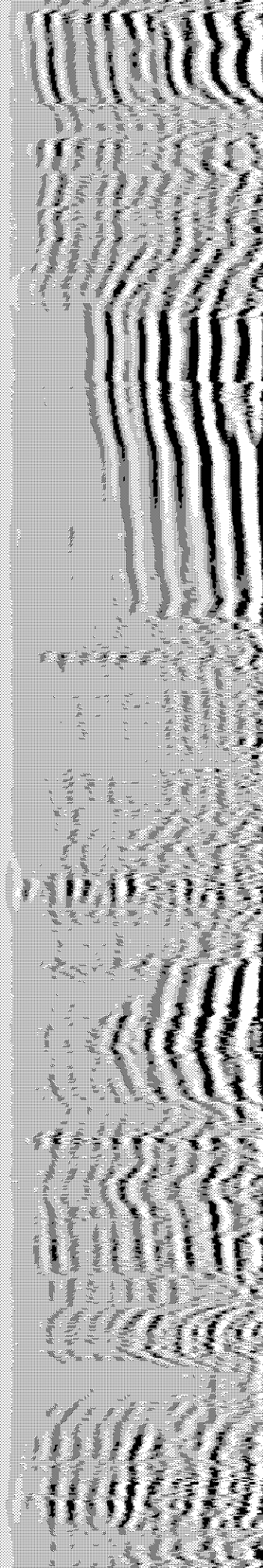
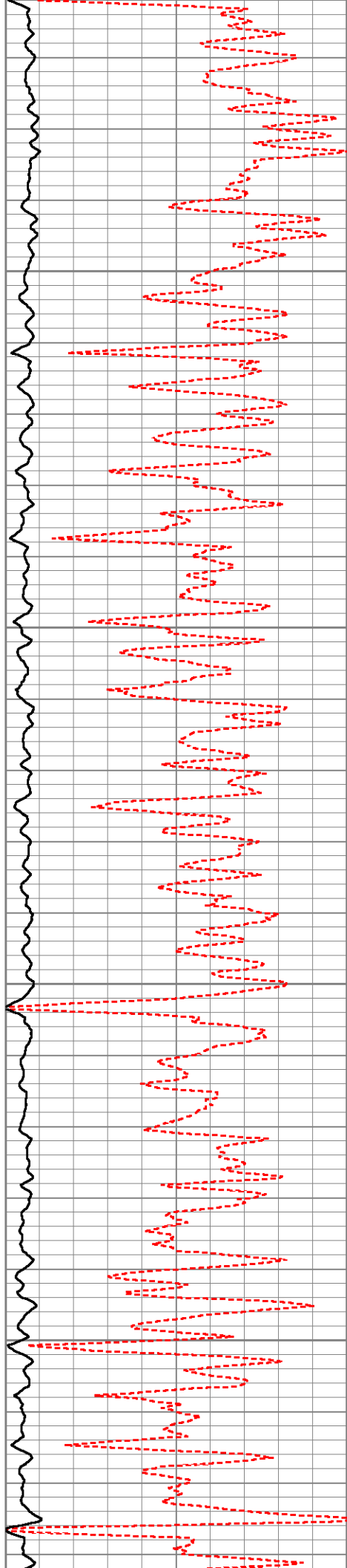


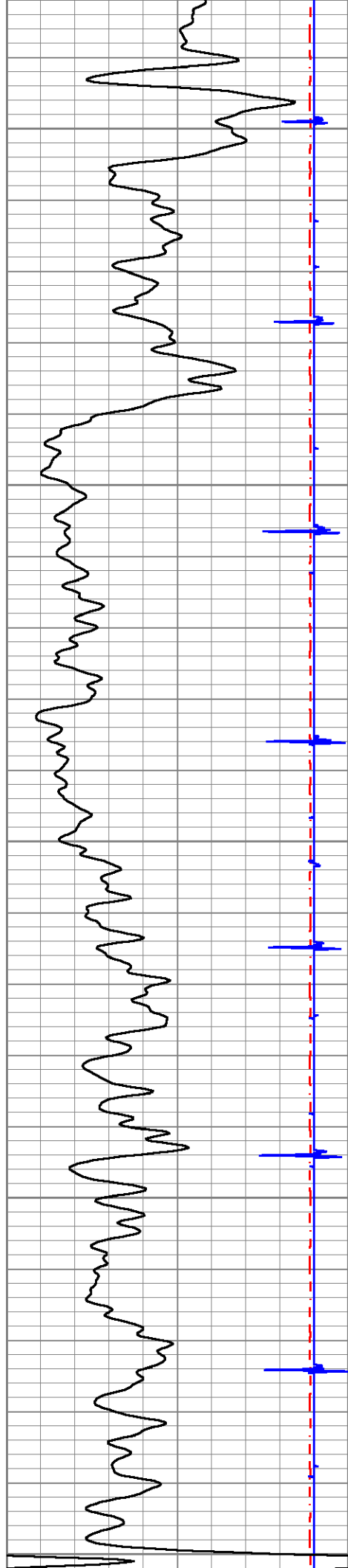
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1000

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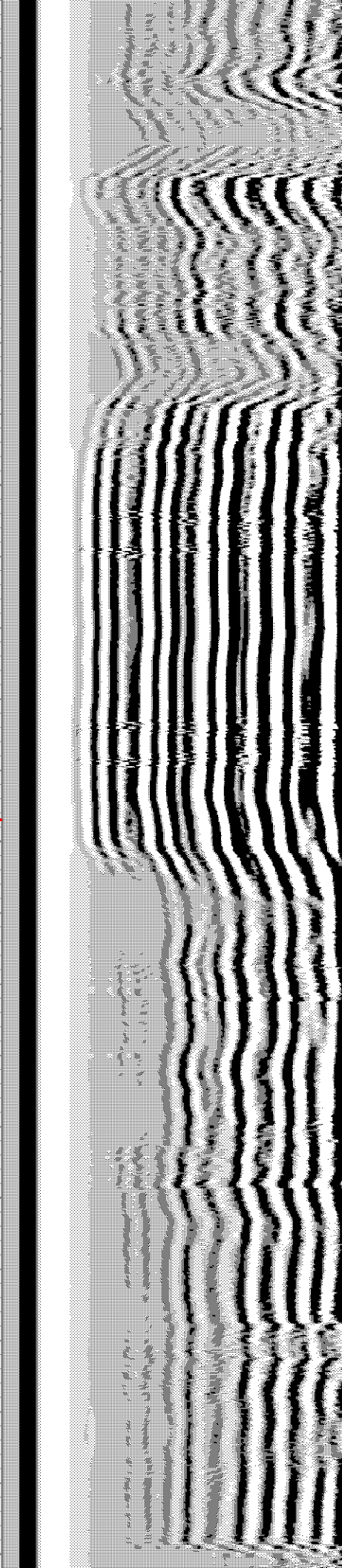
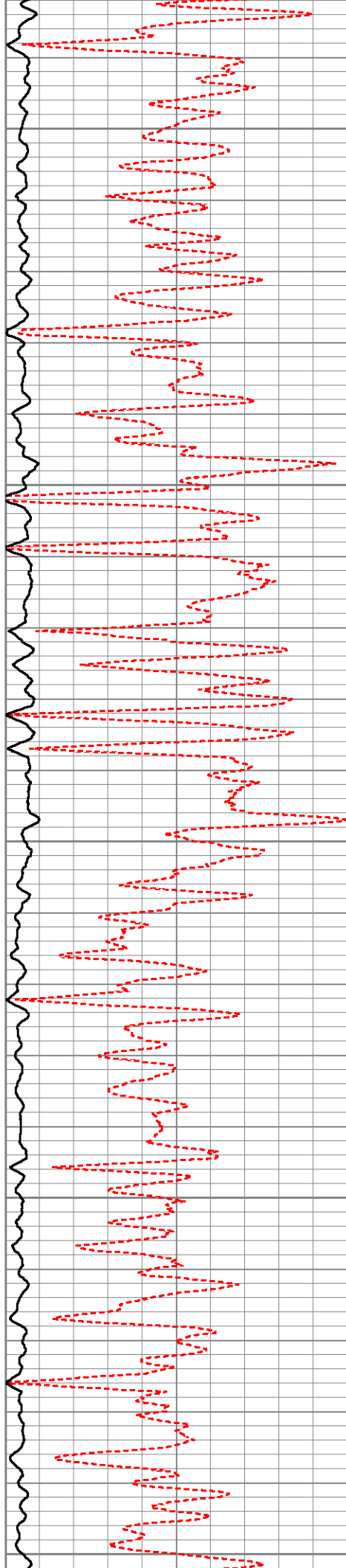
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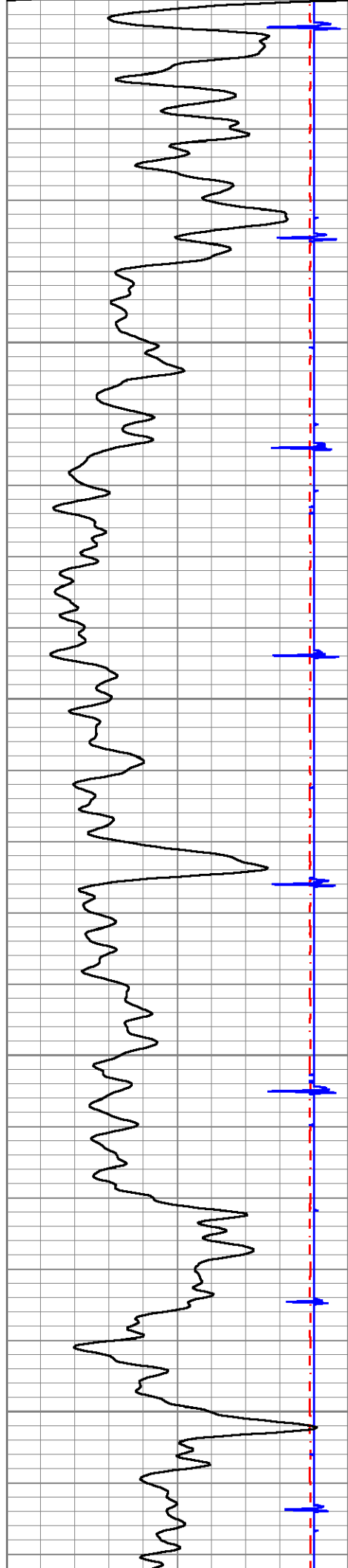
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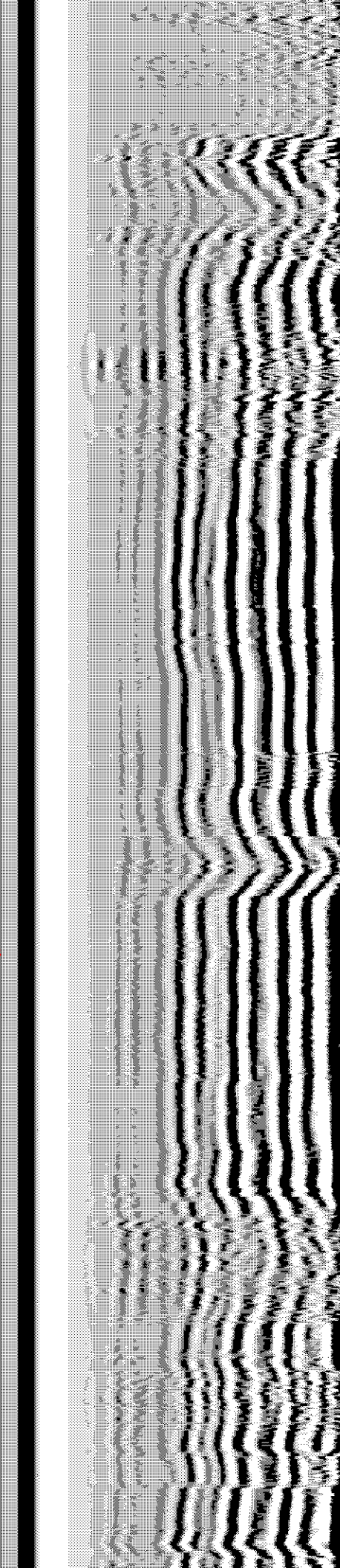
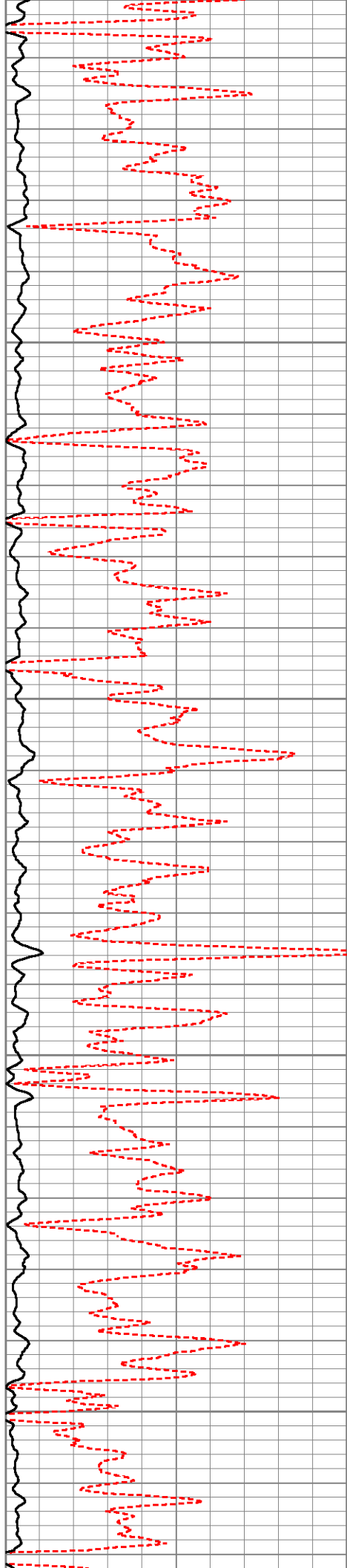


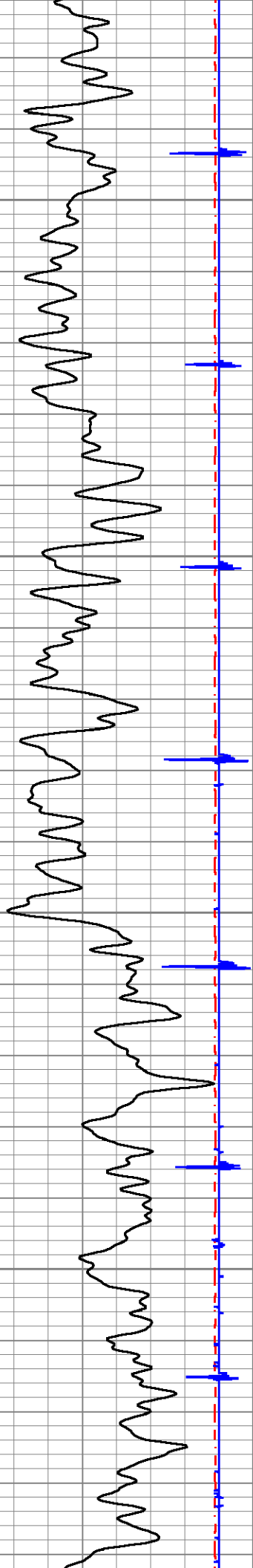
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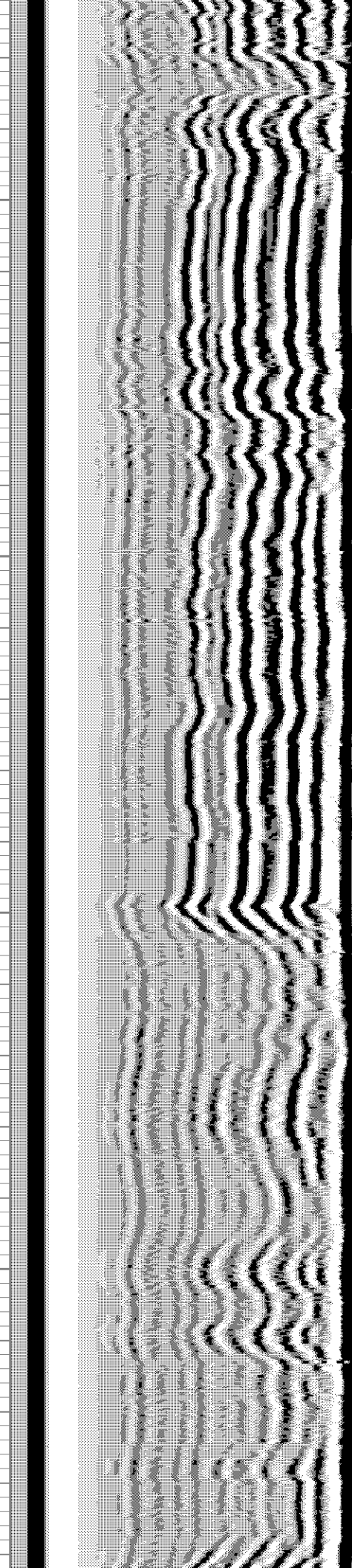
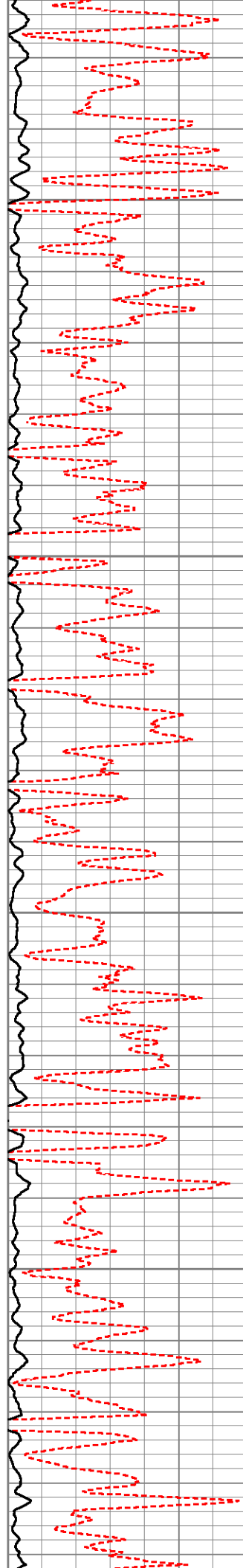


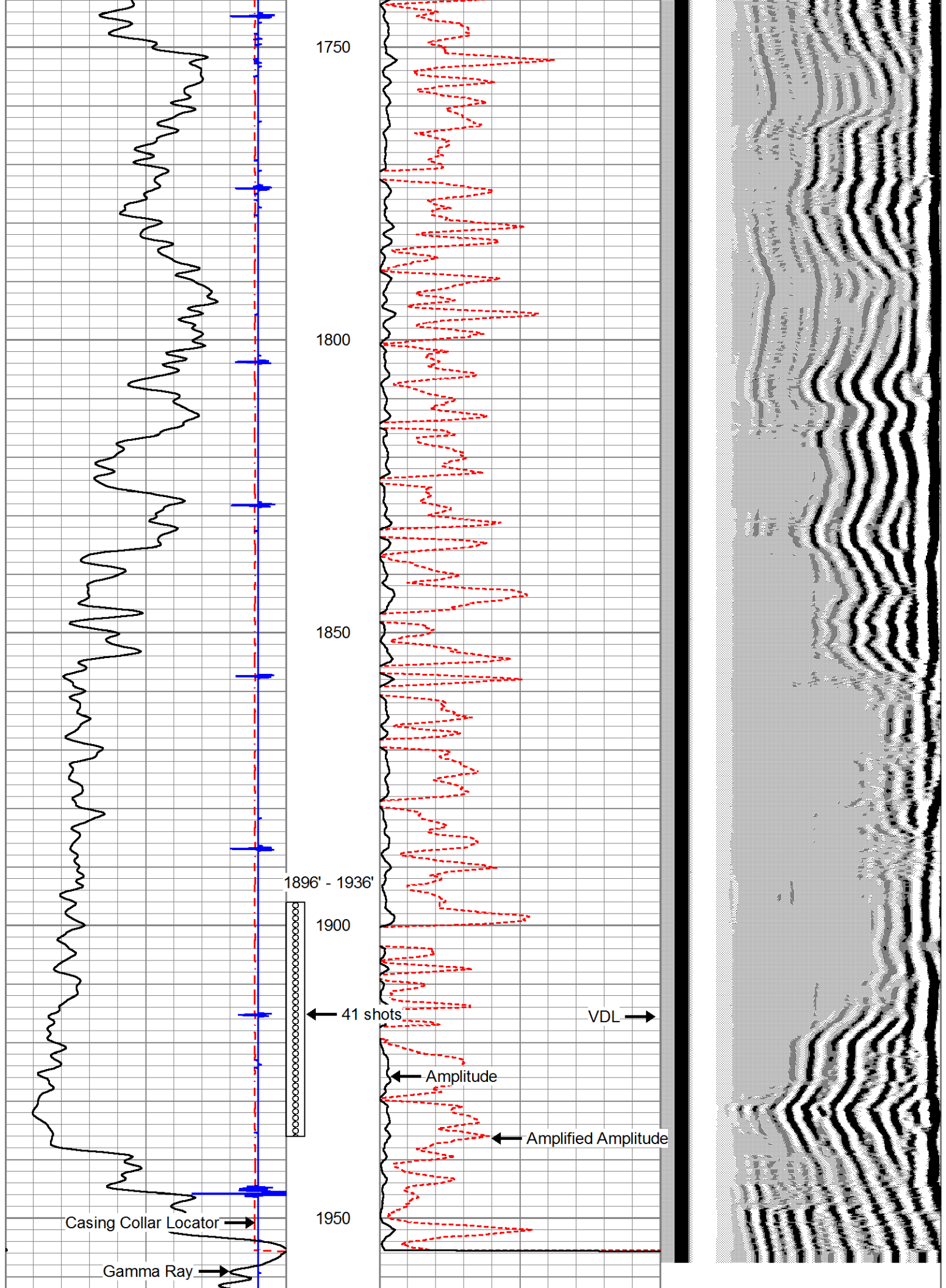
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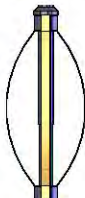
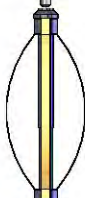
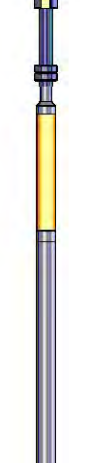
1650

1700





First Reading 1965'										
300	TT3FT (usec)		200	0	Amplified Amplitude (mV)		10	200	VDL	1200
-9	Collar Locator		1	0	Amplitude (mV)		100			
0	Gamma Ray (GAPI)		200							

Sensor	Offset (ft)	Schematic	Description	Length (ft)	O.D. (in)	Weight (lb)
HEADVOLT	16.52		CENT-PTS275	2.83	2.75	
WVF3FT	11.79		CBL-Probe (FW1411-22) Probe Digital CBL	8.92	2.75	60.00
WVF5FT	10.79					
HEADVOLT	7.61		CENT-PTS275	2.83	2.75	
CCL	3.88					
GR	2.54		GR-GC (FW1503-55) GR-CCL CORROSION	4.77	2.75	30.00

ATTACHMENT "M"
Construction Details

Attachment M
Casing and Cement Data
Penneco Sedat #3A Injection Well

Casing	Size Inches	Type	Weight Lbs/Ft	Grade	Set Depth Feet	Internal Yield Pressure PSI	Collapse Pressure PSI	Joint Yield Lbs	Body Yield Lbs
Conductor	13 3/8		48	H-40	16	1730	740	322000	541000
Surface	9 5/8	ST&C	32	H-40	643	2270	1370	254000	365000
Long String	7	LT&C	20	J-55	1948	3740	2270	257000	316000
Injection String	4 ½	LT&C	10.5	J-55	1792	4790	4010	203000	166000

Cement Data

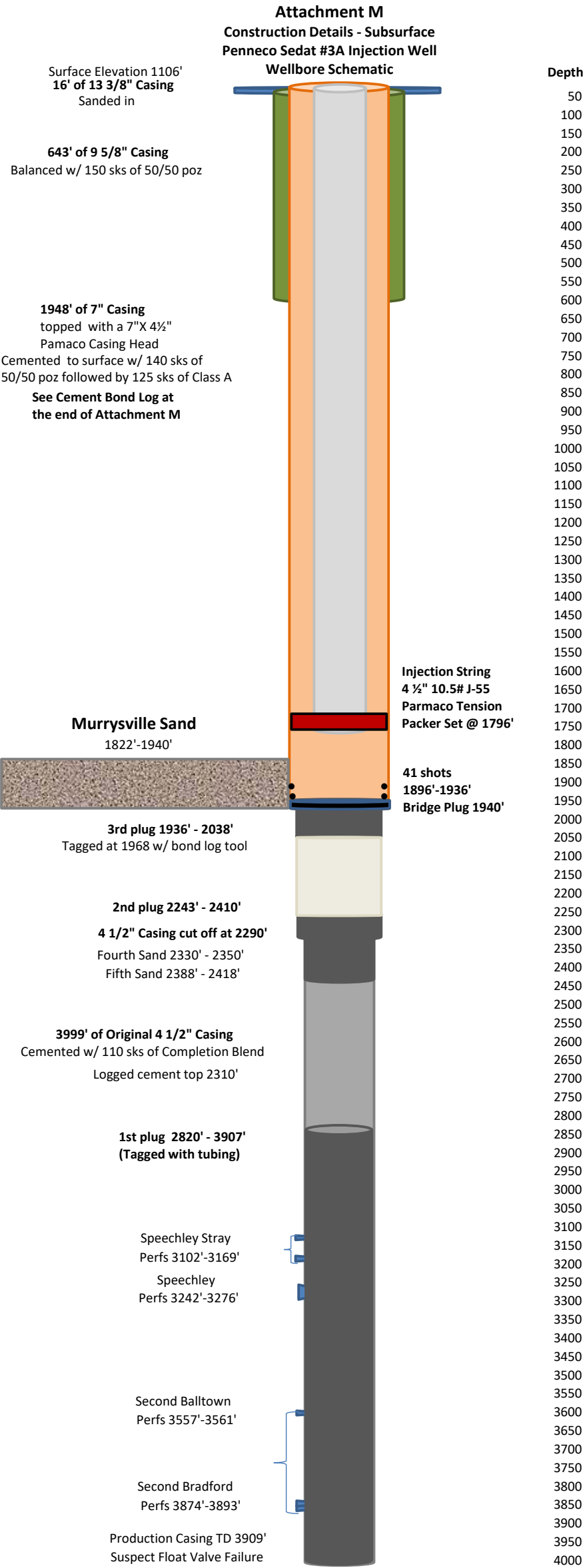
Casing	Size Inches	Class	Amount Sacks	Volume BBLs	Top of Cement
Conductor	13 3/8	Sanded in			
Surface	9 5/8	50/50 Pozmix	150	26.7	Surface
Long String	7	A	265	47.2	Surface*
Injection String	4 ½				

*See cement bond log included in this Attachment and well record in Attachment B

Attachment M
Formation Tops and Bottoms
Penneco Sedat #3A Injection Well

Formation	Top	Bottom	Thickness
Riddlesburg Shale	1652'	1821'	169'
Murrysville Sand	1822'	1950'	128'
Riceville/Oswayo Shale	1951'	1992'	41'
Hundred Foot (Venango)	1993'	2056'	63'

*The top of the Riddlesburg is difficult to determine from the well log, so the 169' interval of low permeability shale/slit section from 1,652 to 1,821 shown on the gamma ray log is included as part of the upper confining zone.



Packers

Parmaco Packers

Parmaco Packers are made of the highest quality American made materials. Our packers are made with 1026 hot rolled and J55ERW steel tubing. All machining is done in house to insure the quality of our product. The element is also made in house from 65-70 durometer neoprene rubber. Parmaco's various packers are all made with the same materials and attention to detail.

We stock our packers in many different sizes and styles. We can also custom make almost any size packer you may need. Our packers are available with some of the following options- Threaded shoe, weld on connection, swab attachment, shear pins, cast iron disk, different element lengths, and many different thread options.

Our hookwall and tension packers all have slips that are made from 1026 hot rolled tubing that has been heat treated to 45 Rockwell.

Not all of our Packers are listed, [contact us](#) for more info.



Standard Upside Down Pressure Packer: Figure (C-301)

- TENSION SET PACKER
- MATERIAL- 1026 HOT ROLL SEAMLESS TUBING
- MANDREL MATERIAL- J55 ERW
- SLIPS HARDENED TO 45 ROCKWELL
- ELEMENT MATERIAL- NEOPRENE RUBBER
- ELEMENT DUROMETER- 65-70
- ELEMENT LENGTH- 16"

Attachment O
Plans for Well Failures
Sedat #3A Injection Well

Plans for Well Failures for Sedat #3A Injection Well

If there is a well failure that involves equipment the well will be shut-in until the faulty equipment is repaired or replaced. If the failure poses no environmental or operational hazard, and the well has been returned to a safe operating condition, the well will be placed back into operation and nothing further will be done.

If there is a casing leak or some other major failure the well will be immediately shut-in and the Pennsylvania DEP and the EPA notified of the problem. Depending on the condition, the corrective action may include squeezing off the leak with cement or running an additional string of casing. The well will not be placed into service until it has been determined that the problem has been corrected and approval is received from the EPA to resume operation. Any fluid produced during the shut-in will be stored on site or disposed of at another approved facility.

2/12/2016

ATTACHMENT "O"
Plan for Well Failures

ATTACHMENT "P"
Monitoring Program

Attachment P
Monitoring Program
Sedat #3A Injection Well

Monitoring Program for Sedat #3A Injection Well

The Sedat #3A injection well will be monitored for the well's entire life in compliance with all EPA monitoring guidelines and reporting requirements.

The injection site is located so that the facilities cannot be seen from public roads or public or private properties adjacent to the site. The access road is gated and will be locked when the site is not operating. The injection site and surface facilities will be fenced and lighted at night with the fenced gate locked when the site is not operating.

There will be one (1) monitoring well, identified by its Pennsylvania issued permit number, 003-21210. This is a depleted gas well that will be adapted for use as an observation well and is 1,010' to the south west of the Sedat #3A, see well plat map at end of Attachment. The well has satisfactory spacing and placement to provide adequate sampling area without having to drill a well or wells for the specific propose of sampling.

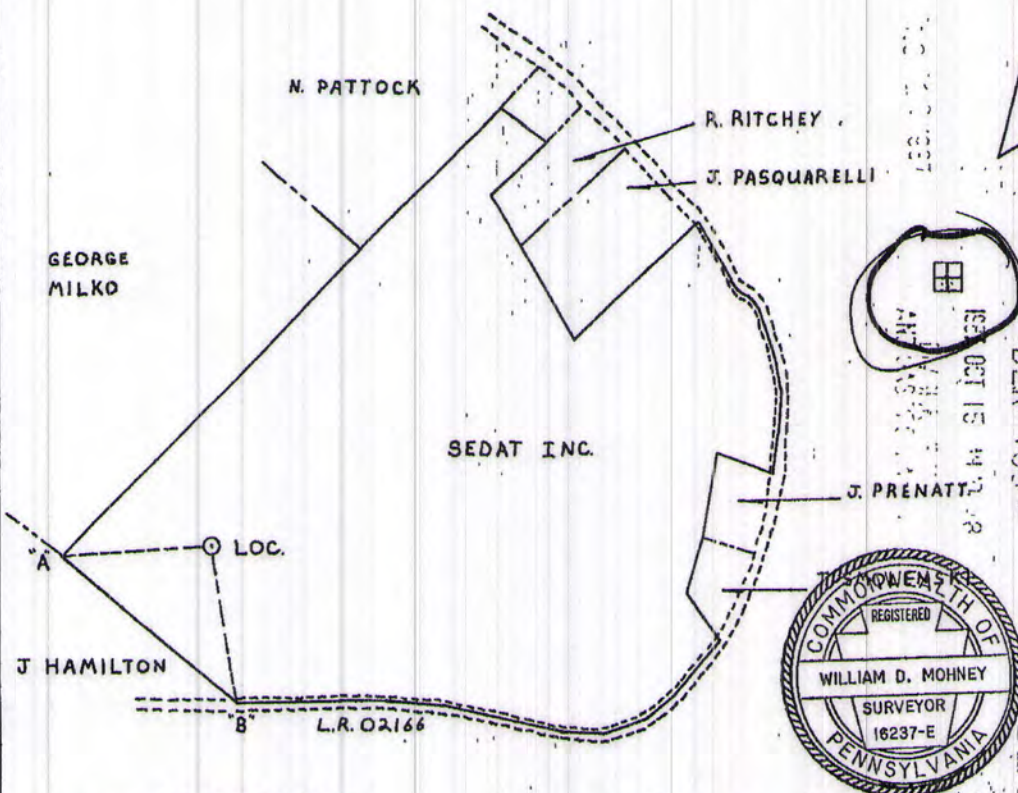
Pressure and rate monitoring will be at the well site (wellhead); both injection pressure and the pressure on the 7" by 4 ½" annulus will be monitored. The company will also conduct quarterly mechanical integrity testing as required by Pennsylvania Oil and Gas regulations. Pressure will be measured by use of a continuously recording pressure gage and the injection rate by a continuously recording flow meter. Results will be reported to the EPA as required by the injection permit or according to EPA guidelines, but not less than annually.

The specific gravity of each truck load will be monitored to ensure the specific gravity of the fluid to be injected does not exceed the allowed value.

Injection fluids will be sampled and analyzed quarterly with the sample taken at the injection site (wellhead). The results will be reported as required by the permit or according to EPA guidelines.

The company will also be prepared to conduct any other monitoring or sampling as required by the permit.

Well is located on topo map 5950 feet south of LATITUDE 40 ° 32 ' 30



Well is located on topo map 2,380 feet west of LONGITUDE 79 ° 42 ' 30

— LIMIT OF LEASE
— PROPERTY LINE
SCALE: 1" = 500'

LOC TO "A" S 86° 52' 41" W 524.02'
LOC TO "B" S 9° 14' 09" E 531.90'
"A" TREE ON CORNER
"B" CENTER LINE OF ROAD CORNER

Include description of the property and courses and distances of the well(s) location to two or more permanent identifiable points or land marks, all buildings and water supplies within 200', all springs, bodies of water and streams within 100' identified on the most current 7 1/2" topographic map and wetlands within 100'. Reference to buildings, springs, bodies of water and wetlands is not required for well plugging.

☒ Denotes location of well on 7 1/2" topo map Permit # 37-003-24310-00 Project #

Well Operator Penneco Oil Company Inc.		Revision ☐ Re-Issue ☐ Alteration ☐ Storage Recondition ☒ New Location ☐ Drill Deeper ☐ Abandonment ☐ Registration ☐ Plugging		Surveyor/Engineer W.D. Mohney	
Address U.S. Route #22				Drawing Number S-1	
Delmont, PA 15626				Date 11/1/86	
Surface Owner Sedat Inc.				Date	
Surface Lessor (if any) N/A		Surface landowner and water purveyor with water supply within 1,000'		Approximate course and distance to water supply	
Farm Name Sedat		Frank Choltko		S 45° E 850'	
Well No. #1		Ferdinand Palombo		S 55° W	
Serial No. PS-7					
Acres 69.5					
Ground Elevation 1260'					
Topo Quadrangle New Kensington East					
Section 7					
County Allegheny		Political Subdivision Plum		Owner/Operator Villa Coal Company	
Angle of Deviation None		Anticipated TD 3,500'		Name of Seam Upper Freeport	
Commonwealth of Pennsylvania Department of Environmental Resources Bureau of Oil and Gas Management		Sedat Inc.		All others	
		RENTON MINE		10-2187	

RECEIVED

DEC 31 1986

Attachment Q
Plugging and Abandonment Plan
Sedat #3A Injection Well

Plugging and Abandonment Plan:

The company will plug the Sedat #3A in accordance with the Pennsylvania Bureau of Oil and Gas Management and the EPA regulations in place at the time of abandonment. The following actions will be taken:

- *Move in service rig
- *Retrieve injection string and packer
- *Run 2 3/8" tubing to TD of 1,940'
- *Load hole with saltwater gel (if necessary a cast iron bridge plug will be placed in 7" casing, at 1,890' to put well in static state prior to setting cement plugs).
- * Balance a 170' cement plug from 1,940' to 1,770'
- * Balance a 200' cement plug from 743' to 543'.
- * Lay down tubing string
- *Bail 7" casing
- *Install Vent
- *Install monument with well name and permit number

Form 7520-14 and cost estimate is attached.

ATTACHMENT "Q"
Plugging and Abandonment Plan

Prepared for
PENNECO OIL COMPANY
6608 RT 22
DELMONT, PA 15626-2408
Printed: December 14, 2015
Prepared: December 14, 2015
Bid #0015917
Stages: 0



Prepared by
Joseph Snyder
114 Universal Dr.
Punxsutawney, PA 15767
(814) 938-2051
Joseph.Snyder@univwell.com

Plug to Abandon Sedat 3
TD - 1940'

Product #	Description	Qty	Units of Sale	Unit Price	Disc	Total Price
860000	Unit Mileage Charge - Trucks and Vans (Except Bulk Units), Per Unit Mile	70.0	Mi	\$8.25	45.0%	\$317.63
860010	Pickup Mileage Charge, Per Unit Mile	70.0	Mi	\$4.00	45.0%	\$154.00
860051	Minimum Cement Delivery Charge	1.0	Ea	\$525.00	45.0%	\$288.75
861311	Cement Pump Casing, Area 1, 1,001'-2,000', 1st 4 Hrs	1.0	Ea	\$2,500.00	45.0%	\$1,375.00
872000	Blending Charge	82.0	CU FT	\$2.50	45.0%	\$112.75
872205	Cement - Type I	70.0	Sack	\$18.50	45.0%	\$712.25
873025	Salt	547.0	Lb	\$0.45	45.0%	\$135.38
873100	Bentonite	600.0	Lb	\$0.51	45.0%	\$168.30

Total Price: \$3,264.06

Price Per Stage: \$3,264.06

Comments:

- Overtime charges will begin after the first 4 hours on location and be charged at \$1160.00 per hour less 45% discount.
- Type 1, 18% Salt - Y-1.22 cuft/sk, W-5.2 gal/sk, D-15.9 lb/gal.
- Payment Terms: Net 30 Days.
- This price quote is valid through 06/30/2016. Actual job scheduling is based upon equipment availability.



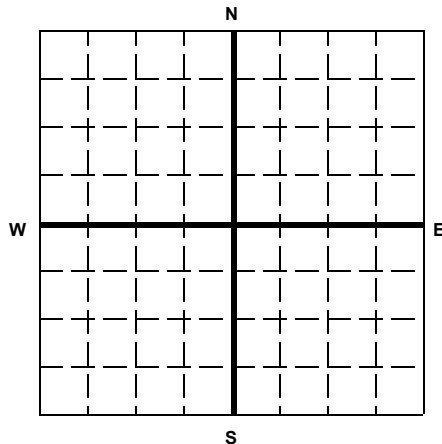
United States Environmental Protection Agency
Washington, DC 20460

PLUGGING AND ABANDONMENT PLAN

Name and Address of Facility

Name and Address of Owner/Operator

Locate Well and Outline Unit on
Section Plat - 640 Acres



State

PA

County

Permit Number

Surface Location Description

1/4 of 1/4 of 1/4 of 1/4 of Section Township Range

Locate well in two directions from nearest lines of quarter section and drilling unit

Surface

Location ft. frm (N/S) Line of quarter section
and ft. from (E/W) Line of quarter section.

TYPE OF AUTHORIZATION

- ☒ Individual Permit
☐ Area Permit
☐ Rule

Number of Wells

Lease Name

Sedat #3

WELL ACTIVITY

- ☐ CLASS I
☒ CLASS II
☒ Brine Disposal
☐ Enhanced Recovery
☐ Hydrocarbon Storage
☐ CLASS III

Well Number

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT (LB/FT)	TO BE PUT IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE
7"	20		1948	8 3/4
9 5/8"	32		643	12 1/4
13 3/8"	48		34	15

METHOD OF EMPLACEMENT OF CEMENT PLUGS

- ☒ The Balance Method
☐ The Dump Bailer Method
☐ The Two-Plug Method
☐ Other

CEMENTING TO PLUG AND ABANDON DATA:

	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7
Size of Hole or Pipe in which Plug Will Be Placed (inches)	7	7					
Depth to Bottom of Tubing or Drill Pipe (ft)	1940	743					
Sacks of Cement To Be Used (each plug)	32	38					
Slurry Volume To Be Pumped (cu. ft.)	38.5	45.5					
Calculated Top of Plug (ft.)	1770	543					
Measured Top of Plug (if tagged ft.)							
Slurry Wt. (Lb./Gal.)	15.6	15.6					
Type Cement or Other Material (Class III)	1	1					

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED (if any)

From	To	From	To
1896	1936		

Estimated Cost to Plug Wells

\$12,515 see attached bid sheets

Certification

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. (Ref. 40 CFR 144.32)

Name and Official Title (Please type or print)

Signature

Date Signed

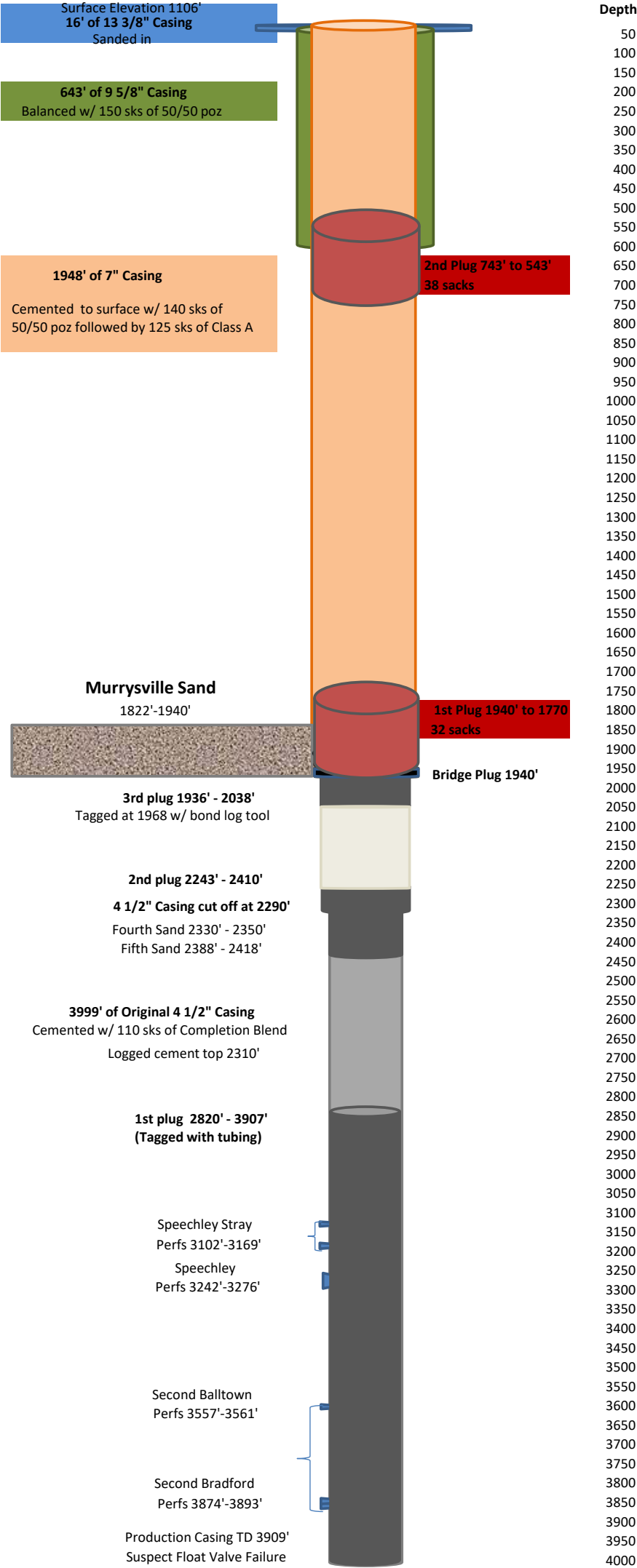
Paperwork Reduction Act Notice

The public reporting and record keeping burden for this collection of information is estimated to average 4.5 hours for operators of Class I hazardous wells, 1.5 hours for operators of Class I non-hazardous wells, 3 hours for operators of Class II wells, and 1.5 hours for operators of Class III wells.

Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to the collection of information; search data sources; complete and review the collection of information; and, transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations are listed in 40 CFR Part 9 and 48 CFR Chapter 15.

Please send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including the use of automated collection techniques to Director, Office of Environmental Information, Collection Strategies Division, U.S. Environmental Protection Agency (2822), Ariel Rios Building, 1200 Pennsylvania Ave., NW., Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, NW., Washington, DC 20503, Attention: Desk Officer for EPA. Please include the EPA ICR number and OMB control number in any correspondence.

Attachment Q
Plugging and Abandonment Plan
Penneco Sedat #3A Injection Well
Wellbore Schematic
With Original Construction Shown



MULTI PRODUCTION SYSTEMS, INC.

OIL AND GAS PRODUCERS

134 MILL RUN DRIVE
INDIANA, PENNSYLVANIA 15701
(724) 465-6663 FAX (724) 465-7375

Penneco Oil Company, Inc.

6608 Route 22

Delmont, PA 15626-2408

ESTIMATED COSTS FOR PLUGGING SERVICES

Operator: Penneco Oil Company

Well Name: Sedat #3

Location: Plum Borough, Westmoreland County

Day 1 – Trip out and lay down packer. Trip back in hole to set bottom hole plugs.

Day 2 – Set plugs and pull tubing.

Day 3 – Bail 7 inch casing dry.

Rig Time 30 hours @ \$225.00/hr = \$6,750.00

Trucking 12 hours @ \$125.00/hr. = \$1,500.00

Misc. Labor 20 hours @ \$50.00/hr. = \$1,000.00

TOTAL ESTIMATED COSTS: \$9,250.00



United States Environmental Protection Agency
Washington, DC 20460

PLUGGING AND ABANDONMENT PLAN

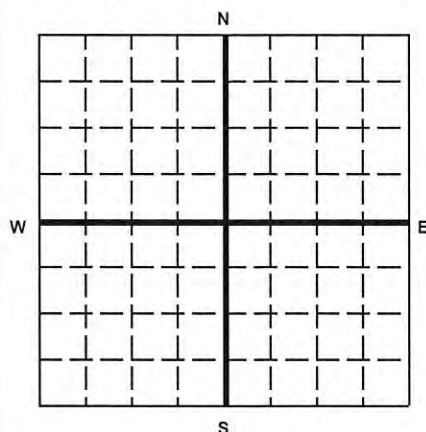
Name and Address of Facility

Penneco Environmental Solutions, LLC
1800 Old Leechburg Road, Pittsburgh, PA 15239

Name and Address of Owner/Operator

Penneco Environmental Solutions, LLC
6608 Route 22, Delmont, PA 15626

Locate Well and Outline Unit on
Section Plat - 640 Acres



State

PA

County

Allegheny

Permit Number

37-003-21223

Surface Location Description

☐ 1/4 of ☐ 1/4 of ☐ 1/4 of ☐ 1/4 of Section ☐ Township ☐ Range ☐

Locate well in two directions from nearest lines of quarter section and drilling unit

Surface

Location ☐ ft. from (N/S) ☐ Line of quarter section

and ☐ ft. from (E/W) ☐ Line of quarter section.

TYPE OF AUTHORIZATION

- ☒ Individual Permit
☐ Area Permit
☐ Rule

Number of Wells

WELL ACTIVITY

- ☐ CLASS I
☒ CLASS II
☒ Brine Disposal
☐ Enhanced Recovery
☐ Hydrocarbon Storage
☐ CLASS III

Lease Name

Sedat #3A

Well Number

PS-46

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT (LB/FT)	TO BE PUT IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE
7"	20		1948	8 3/4
9 5/8	32		643	12 1/4
13 3/8	48		34	15

METHOD OF EMPLACEMENT OF CEMENT PLUGS

- ☒ The Balance Method
☐ The Dump Bailer Method
☐ The Two-Plug Method
☐ Other

CEMENTING TO PLUG AND ABANDON DATA:

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Depth to Bottom of Tubing or Drill Pipe (ft.)	1940	743					
Sacks of Cement To Be Used (each plug)	32	38					
Slurry Volume To Be Pumped (cu. ft.)	38.5	45.5					
Calculated Top of Plug (ft.)	1770	543					
Measured Top of Plug (if tagged ft.)							
Slurry Wt. (Lb./Gal.)	15.6	15.6					
Type Cement or Other Material (Class III)	1	1					

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED (if any)

From	To	From	To
1896	1936		

Estimated Cost to Plug Wells

\$12,515 see attached bid sheets

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Name and Official Title (Please type or print)

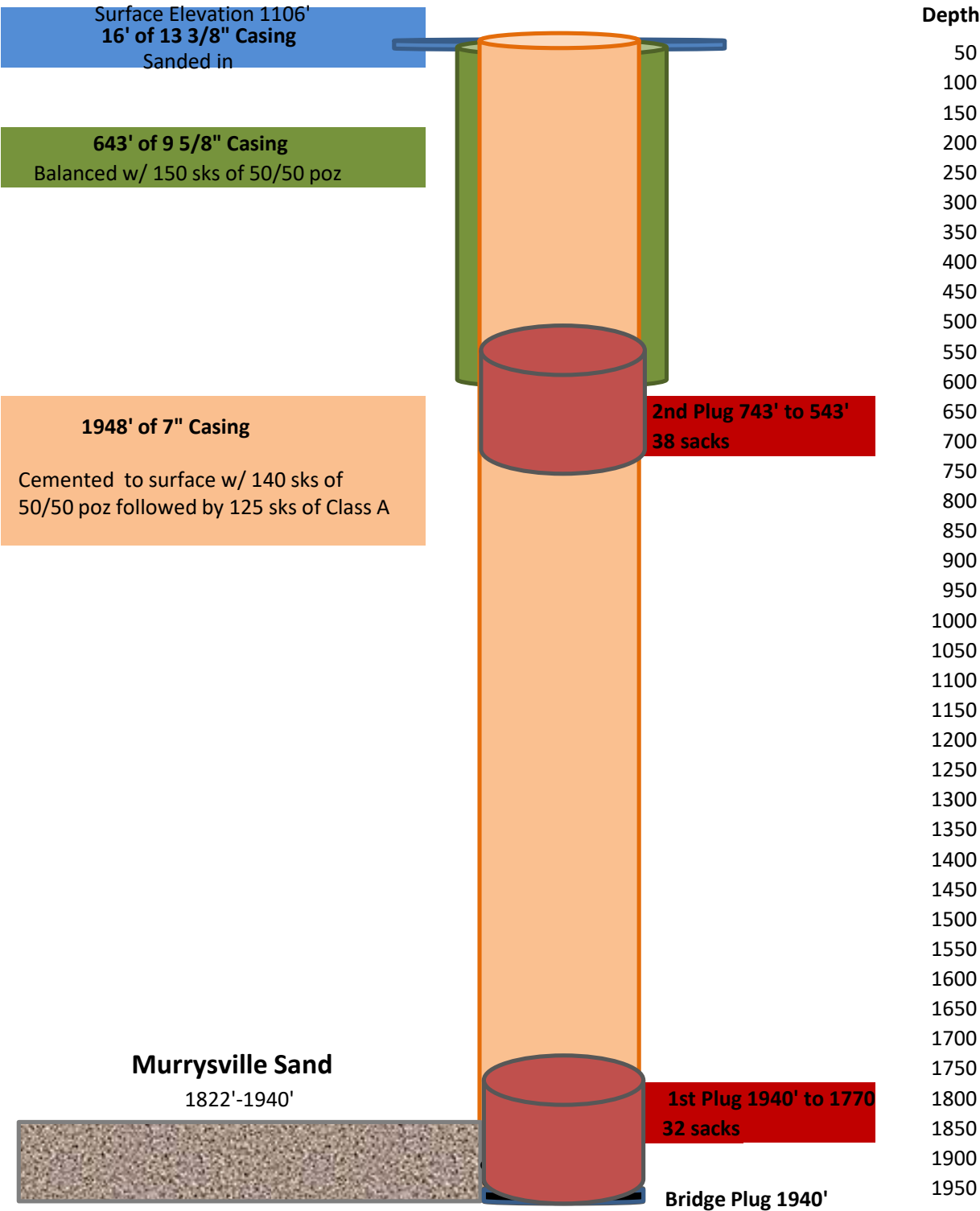
D. Marc Jacobs, Jr. Senior Vice President

Signature

Date Signed

02/26/2016

Attachment Q
Plugging and Abandonment Plan
Penneco Sedat #3A Injection Well
Wellbore Schematic
With only New Plugging work shown





United States Environmental Protection Agency
Washington, DC 20460

PLUGGING AND ABANDONMENT PLAN

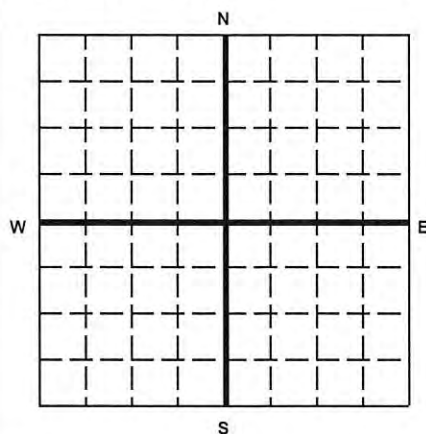
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1800 Old Leechburg Road, Pittsburgh, PA 15239

Name and Address of Owner/Operator

Penneco Environmental Solutions, LLC
6608 Route 22, Delmont, PA 15626

Locate Well and Outline Unit on
Section Plat - 640 Acres



State

PA

County

Allegheny

Permit Number

37-003-21223

Surface Location Description

☐ 1/4 of ☐ 1/4 of ☐ 1/4 of ☐ 1/4 of Section ☐ Township ☐ Range ☐

Locate well in two directions from nearest lines of quarter section and drilling unit

Surface

Location ☐ ft. from (N/S) ☐ Line of quarter section

and ☐ ft. from (E/W) ☐ Line of quarter section.

TYPE OF AUTHORIZATION

- ☒ Individual Permit
☐ Area Permit
☐ Rule

Number of Wells

WELL ACTIVITY

- ☐ CLASS I
☒ CLASS II
☒ Brine Disposal
☐ Enhanced Recovery
☐ Hydrocarbon Storage
☐ CLASS III

Lease Name

Sedat #3A

Well Number

PS-46

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☐ The Two-Plug Method
☐ Other

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Measured Top of Plug (if tagged ft.)							
Slurry Wt. (Lb./Gal.)	15.6	15.6					
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1896	1936		

Estimated Cost to Plug Wells

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Name and Official Title (Please type or print)

D. Marc Jacobs, Jr. Senior Vice President

Signature

Date Signed

02/26/2016

ATTACHMENT “R”
Necessary Resources

STANDBY TRUST AGREEMENT

U.S. Environmental Protection Agency
Underground Injection Control
Financial Responsibility Requirement

THIS TRUST AGREEMENT (the "Agreement") is entered into as of the 23 day of MARCH, 2016, by and between **PENNECO ENVIRONMENTAL SOLUTIONS, LLC**, owner or operator, a Pennsylvania limited liability company of 6608 State Route 22 Delmont, PA 15626 (the "Grantor"), and **FIRST COMMONWEALTH BANK**, of 600 Philadelphia Street, Indiana, Pennsylvania 15701, a Pennsylvania business corporation (the "Trustee").

WHEREAS, the United States Environmental Protection Agency ("EPA"), an agency of the United States Government, has established certain regulations applicable to the Grantor, requiring that an owner or operator of an injection well shall provide assurance that funds will be available when needed for plugging and abandonment of the injection well or wells; and

WHEREAS, the Grantor has elected to establish a trust to provide all of part of such financial assurance for the facility or facilities identified herein; and

WHEREAS, the Grantor, acting through its duly authorized officers, has selected the Trustee to be the trustee under this Agreement, and the Trustee is willing to act as trustee.

NOW THEREFORE, the Grantor and the Trustee agree as follows:

Section 1. Definitions. As used in this Agreement: (a) The term "Grantor" means the owner or operator who enters into this Agreement and any successors or assigns of the Grantor; (b) The term "Trustee" means the Trustee who enters into this Agreement and any successor Trustee; and (c) Facility or activity means any "underground injection well" or any other facility or activity that is subject to regulation under the Underground Injection Control Program.

Section 2. Identification of Facilities and Cost Estimates. This Agreement pertains to the facilities and cost estimates identified on attached Schedule A.

Section 3. Establishment of Fund. The Grantor and the Trustee hereby establish a trust fund (the "Fund") for the purpose of assuring compliance with the plugging and abandonment requirements established by EPA for the facilities identified on Schedule A. The Underground Injection Control regulations which govern the authorization to inject include a requirement for such financial assurance that the well or wells shall be plugged and abandoned at the time designated by EPA. The Grantor and the Trustee acknowledge that the Fund and all expenditures from the Fund shall be to fulfill the legal obligations of the Grantor under such regulations, and not any obligation of EPA. The Grantor and the Trustee intend that no third party have access to the Fund except as herein provided. The Fund is established initially as consisting of the property, which is acceptable to the Trustee, described in Schedule B attached hereto. Such property and any other property subsequently transferred to the Trustee is referred to as the Fund, together with all earnings and profits thereon, less any payments or distributions made by the Trustee pursuant to this Agreement. The Fund shall be held by the Trustee, IN TRUST, as hereinafter provided. The Trustee shall not be responsible, nor shall it undertake any responsibility, for the amount or adequacy of any additional payments necessary to discharge any liabilities of the Grantor established by EPA, nor shall the Trustee have any duty to collect such additional amounts from the Grantor.

Section 4. Payment for Plugging and Abandonment. The Trustee shall make payments from the Fund only for the costs of plugging and abandonment ("P&A") of the injection wells covered by this Agreement and the associated P&A Plan, only after EPA has advised the Trustee that work has been completed under the P&A Plan that complies with 40 C.F.R. § 144.28 and/or § 144.52. The Trustee shall not refund to the Grantor any amounts from the Fund unless and until EPA has advised the Trustee that the P&A Plan has been successfully completed. The Trustee shall not release any funds to the Grantor that are necessary to cover liability for any injection wells covered by this Agreement that remain unplugged.

Section 5. Payments Comprising the Fund. Payments made to the Trustee for the Fund shall consist of cash or securities acceptable to the Trustee.

Section 6. Trustee Management. The Trustee shall invest and reinvest the principal and income of the Fund and keep the Fund invested as a single fund, without distinction between principal and income, in accordance with general investment policies and guidelines which the Grantor may communicate in writing to the Trustee from time to time, subject, however, to the provisions of this Section. In investing, reinvesting, exchanging, selling, and managing the Fund, the Trustee shall discharge his duties with respect to the trust fund solely in the interest of the beneficiary and with the care, skill, prudence, and diligence under the circumstances then prevailing which persons of prudence, acting in a like capacity and familiar with such matters, would use in the conduct of an enterprise of a like character and with like aims; *except that:* (i) Securities or other obligations of the Grantor, or any other owner or operator of the facilities, or any of their affiliates as defined in the Investment Company Act of 1940, as amended, 15 U.S.C. 80a-2.(a), shall not be acquired or held, unless they are securities or other obligations of the Federal or a State government; (ii) The Trustee is authorized to invest the Fund in time or demand deposits of the Trustee, to the extent insured by an agency of the Federal or State government; and (iii) The Trustee is authorized to hold cash awaiting investment or distribution uninvested for a reasonable time and without liability for the payment of interest thereon.

Section 7. Commingling and Investment. The Trustee is expressly authorized in its discretion: (a) To transfer from time to time any or all of the assets of the Fund to any common, commingled, or collective trust fund created by the Trustee in which the Fund is eligible to participate, subject to all of the provisions thereof, to be commingled with the assets of other trusts participating therein; and (b) To purchase shares in any investment company registered under the Investment Company Act of 1940, 15 U.S.C. 80a-I *et seq.*, including one which may be created, managed, underwritten, or to which investment advice is rendered or the shares of which are sold by the Trustee. The Trustee may vote shares in its discretion.

Section 8. Express Powers of Trustee. Without in any way limiting the powers and discretions conferred upon the Trustee by the other provisions of this Agreement or by law, the Trustee is expressly authorized and empowered: (a) To sell, exchange, convey, transfer, or otherwise dispose of any property held by it, by public or private sale. No person dealing with the Trustee shall be bound to see to the application of the purchase money or to inquire into the validity or expediency of any such sale or other disposition; (b) To make, execute, acknowledge, and deliver any and all documents of transfer and conveyance and any and all other instruments that may be necessary or appropriate to carry out the powers herein granted; (c) To register any securities held in the Fund in its own name or in the name of a nominee and to hold any security in bearer form or in book entry, or to combine certificates representing such securities with certificates of the same issue held by the Trustee in other fiduciary capacities, or to deposit or arrange for the deposit of such securities in a qualified central depository even though, when so deposited, such securities may be merged and held in bulk in the name of the nominee of such depository with other securities deposited therein by another person, or to deposit or arrange for the deposit of any securities issued by the United States Government, or any agency or instrumentality thereof, with a Federal Reserve bank, but the books and records of the Trustee shall at all times show that all such securities are part of

the Fund; (d) To deposit any cash in the Fund in interest-bearing accounts maintained or savings certificates issued by the Trustee, in its separate corporate capacity, or in any other banking institution affiliated with the Trustee, to the extent insured by an agency of the Federal or State government; and (e) To compromise or otherwise adjust all claims in favor of or against the Fund.

Section 9. Taxes and Expenses. All taxes of any kind that may be assessed or levied against or in respect of the Fund and all brokerage commissions incurred by the Fund shall be paid from the Fund. All other expenses incurred by the Trustee in connection with the administration of this Trust, including fees for legal services rendered to the Trustee, the compensation of the Trustee to the extent not paid directly by the Grantor, and all other proper charges and disbursements of the Trustee shall be paid from the Fund.

Section 10. Annual Valuation. The Trustee shall annually, at least 30 days prior to the anniversary date of establishment of the Fund, furnish to the Grantor and to the appropriate EPA Regional Administrator a statement confirming the value of the Trust. Any securities in the Fund shall be valued at market value as of no more than 60 days prior to the anniversary date of establishment of the Fund. The failure of the Grantor to object in writing to the Trustee within 90 days after the statement has been furnished to the Grantor and the EPA Regional Administrator shall constitute a conclusively binding assent by the Grantor, barring the Grantor from asserting any claim or liability against the Trustee with respect to matters disclosed in the statement.

Section 11. Advice of Counsel. The Trustee may from time to time consult with counsel, who may be counsel to the Grantor, with respect to any question arising as to the construction of this Agreement of any action to be taken hereunder. The Trustee shall be fully protected, to the extent permitted by law, in acting upon the advice of counsel.

Section 12. Trustee Compensation. The Trustee shall be entitled to reasonable compensation for its services as agreed upon in writing from time to time with the Grantor.

Section 13. Successor Trustee. The Trustee may resign or the Grantor may replace the Trustee, but such resignation or replacement shall not be effective until the Grantor has appointed a successor trustee and this successor accepts the appointment. The successor trustee shall have the same powers and duties as those conferred upon the Trustee hereunder. Upon the successor trustee's acceptance of the appointment, the Trustee shall assign, transfer, and pay over to the successor trustee the funds and properties then constituting the Fund. If for any reason the Grantor cannot or does not act in the event of the resignation of the Trustee, the Trustee may apply to a court of competent jurisdiction for the appointment of a successor trustee or for instructions. The successor trustee shall specify the date on which it assumes administration of the trust in a writing sent to the Grantor, the EPA Regional Administrator, and the present Trustee by certified mail 10 days before such change becomes effective. Any expenses incurred by the Trustee as a result of any of the acts contemplated by this Section shall be paid as provided in Section 9.

Section 14. Instructions to the Trustee. All orders, requests, and instructions by the Grantor to the Trustee shall be in writing, signed by such persons as are designated in the attached Exhibit A or such other designees as the Grantor may designate by amendment to Exhibit A. The Trustee shall be fully protected in acting without inquiry in accordance with the Grantor's orders, requests, and instructions. All orders, requests, and instructions by the EPA Regional Administrator to the Trustee shall be in writing, signed by the EPA Regional Administrators of the Regions in which the facilities are located, or their designees, and the Trustee shall act and shall be fully protected in acting in accordance with such orders, requests, and instructions. The Trustee shall have the right to assume, in the absence of written notice to the contrary, that no event constituting a change or a termination of the authority of any person to act on behalf of the

Grantor or EPA hereunder has occurred. The Trustee shall have no duty to act in the absence of such orders, requests, and instructions from the Grantor and/or EPA, except as provided for herein.

Section 15. Notice of Nonpayment. The Trustee shall notify the Grantor and the appropriate EPA Regional Administrator, by certified mail within 10 days following the expiration of the 30-day period after the anniversary of the establishment of the Trust, if no payment is received from the Grantor during that period. After the pay-in period is completed, the Trustee shall not be required to send a notice of nonpayment.

Section 16. Amendment of Agreement. This Agreement may be amended by an instrument in writing executed by the Grantor, the Trustee, and the appropriate EPA Regional Administrator, or by the Trustee and the appropriate EPA Regional Administrator if the Grantor ceases to exist.

Section 17. Irrevocability and Termination. Subject to the right of the parties to amend this Agreement as provided in Section 16, this Trust shall be irrevocable and shall continue until terminated at the written agreement of the Grantor, the Trustee, and the EPA Regional Administrator, or by the Trustee and the EPA Regional Administrator if the Grantor ceases to exist. Upon termination of the Trust, all remaining trust property, less final trust administration expenses, shall be delivered to the Grantor.

Section 18. Immunity and Indemnification. The Trustee shall not incur personal liability of any nature in connection with any act or omission, made in good faith, in the administration of this Trust, or in carrying out any directions by the Grantor or the EPA Regional Administrator issued in accordance with this Agreement. The Trustee shall be indemnified and saved harmless by the Grantor or from the Trust Fund, or both, from and against any personal liability to which the Trustee may be subjected by reason of any act or conduct in its official capacity, including all expenses reasonably incurred in its defense in the event the Grantor fails to provide such defense.

Section 19. Choice of Law. This Agreement shall be administered, construed, and enforced according to the laws of the Commonwealth of Pennsylvania.

Section 20. Interpretation. As used in this Agreement, words in the singular include the plural and words in the plural include the singular. The descriptive headings for each Section of this Agreement shall not affect the interpretation or the legal efficacy of this Agreement.

[The remainder of this page is intentionally left blank. Signatures follow.]

SCHEDULE A

Identification of Facilities and Cost Estimates

Schedule A is referenced in the Standby Trust Agreement dated March 23, 2016,
by and between PENNECO ENVIRONMENTAL SOLUTIONS, LLC, the "Grantor" and
FIRST COMMONWEALTH BANK, the "Trustee."

EPA identification number	API# 37-003-21223
Name of facility	Sedat 3A Injection Well
Address of facility	1800 Old Leechburg Road Pittsburgh, PA 15239
Current plugging and abandonment cost estimate	\$12,515.00
Date of estimate	December 6, 2015

SCHEDULE B
Identification of Fund

Schedule B is referenced in the Standby Trust Agreement dated March 23, 2016
by and between PENNECO ENVIRONMENTAL SOLUTIONS, LLC, the "Grantor" and
FIRST COMMONWEALTH BANK, the "Trustee."

The fund consists of: (Check one and provide identification number)

☒ Irrevocable Letter of Credit No. #430R1167

☐ Surety Performance Bond No. _____

☐ Other (Describe) _____

IN WITNESS WHEREOF the parties below have caused this Agreement to be executed by their respective representatives duly authorized and their seals to be hereunto affixed and attested as of the date first above written.

GRANTOR:
**PENNECO ENVIRONMENTAL
SOLUTIONS, LLC**

By: [Signature]
Name: Terrence S. Jacobs
Title: President

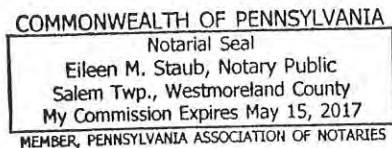
TRUSTEE:
FIRST COMMONWEALTH BANK

By: [Signature]
Name: Douglas I. Sako
Title: Senior Vice President

Before me came the individual whose identity I confirmed as Terrence S. Jacobs and whose true signature is set forth above; wherefore have I set my hand and seal this 18th day of MARCH, 2016.

Eileen M. Staub
Notary Public

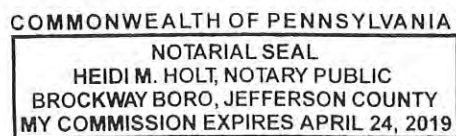
[Seal]



Before me came the individual whose identity I confirmed as Douglas I. Sako and whose true signature is set forth above; wherefore have I set my hand and seal this 23rd day of March, 2016.

Heidi M. Holt
Notary Public

[Seal]



() This bank/institution has the authority to act as trustee and its trust activities are examined and regulated by a State or Federal agency.

**CERTIFICATE OF ACKNOWLEDGMENT
FOR
STANDBY TRUST FUND AGREEMENT**

STATE OF Pennsylvania)
) SS:
COUNTY OF Jefferson)

On this, the 23rd day of March, 2016, before me personally came
Douglas I Sako, to me known, who, being by me duly sworn, did depose
and say that he/she resides at 654 Philadelphia St. Indiana, PA 15701
(Address)

that he/she is the Senior Vice President of FIRST COMMONWEALTH BANK
(Title) (Corporation)

the corporation described in and which executed the above instrument; that he/she knows the seal of said corporation; that the seal affixed to such instrument in such corporate seal; that it was so affixed by order of the Board of Directors of said corporation, and that he/she signed his/her name thereto by like order.

Heidi Molt
(Notary Public)

(Seal)

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
HEIDI M. HOLT, NOTARY PUBLIC
BROCKWAY BORO, JEFFERSON COUNTY
MY COMMISSION EXPIRES APRIL 24, 2019

IN WITNESS WHEREOF the parties below have caused this Agreement to be executed by their respective representatives duly authorized and their seals to be hereunto affixed and attested as of the date first above written.

GRANTOR:
**PENNECO ENVIRONMENTAL
SOLUTIONS, LLC**

By: _____

Name: _____

Title: _____

Before me came the individual whose identity
I confirmed as _____
and whose true signature is set forth above;
wherefore have I set my hand and seal this
_____ day of _____, 2016.

Notary Public

[Seal]

TRUSTEE:
FIRST COMMONWEALTH BANK

By: *Danny Diveley*

Name: Danny Diveley

Title: Trust Officer

Before me came the individual whose identity
I confirmed as Danny Diveley
and whose true signature is set forth above;
wherefore have I set my hand and seal this
24th day of March, 2016.

Kelly Perney
Notary Public

[Seal]

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
KELLY PERNEY, NOTARY PUBLIC
CITY OF GREENSBURG, WESTMORELAND CO.
MY COMMISSION EXPIRES NOV. 25, 2018

☒ This bank/institution has the authority to act as trustee and its trust activities are examined and regulated by a State or Federal agency.

**CERTIFICATE OF ACKNOWLEDGMENT
FOR
STANDBY TRUST FUND AGREEMENT**

STATE OF Pennsylvania)
)
COUNTY OF Westmoreland) SS:

On this, the 24th day of March, 2016, before me personally came
Danny Diveley, to me known, who, being by me duly sworn, did depose
and say that he/she resides at 654 Philadelphia Street, Indiana, PA 15601
(Address)

that he/she is the Trust Officer of FIRST COMMONWEALTH BANK
(Title) (Corporation)

the corporation described in and which executed the above instrument; that he/she knows the seal of said corporation; that the seal affixed to such instrument in such corporate seal; that it was so affixed by order of the Board of Directors of said corporation, and that he/she signed his/her name thereto by like order.

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
KELLY PERNEY, NOTARY PUBLIC
CITY OF GREENSBURG, WESTMORELAND CTY.
MY COMMISSION EXPIRES NOV. 25, 2018
(Notary Public)

Kelly Perney

(Seal)



First Commonwealth Bank
Central Offices:
Philadelphia and Sixth Streets
P.O. Box 400
Indiana, PA 15701-0400
800.711.2265
fcbanking.com

IRREVOCABLE STANDBY LETTER OF CREDIT # 430R1167

Issue Date: March 11, 2016

Beneficiary:

U.S. Environmental Protection Agency
Underground Injection Control
Financial Responsibility Requirement

Regional Administrator
Environmental Protection Agency Region 111
1650 Arch Street, Philadelphia, PA 19103

Applicant:

Penneco Environmental
Solutions, LLC
6608 Route 22, PO Box 300
Delmont, PA 15626

Dear Beneficiary:

We hereby establish our Irrevocable Standby Letter of Credit No.430R1167 in your favor, at the request and for the account of, Penneco Environmental Solutions, LLC, up to the aggregate amount of twelve thousand five hundred fifteen and 00/100 U.S. Dollars (\$12,515.00), available upon presentation of

1. your sight draft, bearing reference to this letter of credit No. 430R1167

AND

2. your signed statement reading as follows: "I certify that the amount of the draft is payable pursuant to regulations issued under authority of the Safe Drinking Water Act."

"This letter of credit is effective as of March 11, 2016 and shall expire on March 11, 2017, but such expiration date shall be automatically extended for a period of one year on March 11, 2017 and each successive expiration date at least 120 days before the current expiration date, we notify both you and Penneco Environmental Solutions, LLC by certified mail that we have decided not to extend this letter of credit beyond the current expiration date. In the event you are so notified, any unused portion of the credit shall be available upon presentation of your sight draft for 120 days after the date of receipt by both you and Penneco Environmental Solutions, LLC, as shown on the signed return receipts.



Page 2

March 11, 2016

Letter of Credit No. 430R1167

Whenever this letter of credit is drawn on under and in compliance with the terms of this credit, we shall duly honor such draft upon presentation to us, and we shall deposit the amount of the draft directly into the standby trust fund of Penneco Environmental Solutions, LLC in accordance with your instructions.

We certify that the wording of this letter of credit is identical to the wording specified in 40 CFR 264.151(d) as such regulations were constituted on the date shown immediately below.

Sincerely,
First Commonwealth Bank

By: Karen E. Martin

Name: Karen E. Martin

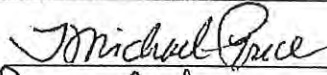
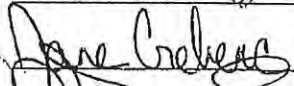
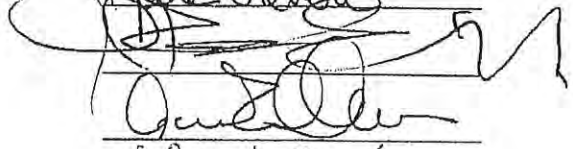
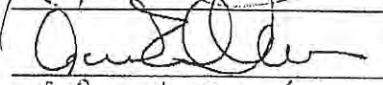
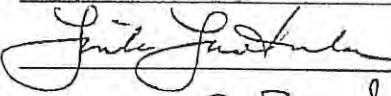
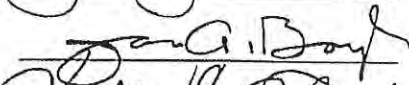
Title: Loan Operations Mgr

Date: 3/29/16

This Letter of Credit is subject to and shall be governed in accordance with the terms of the Uniform Commercial Code, Article 5, Letters of Credit, 13 Pa.C.S.A. § 5101 *et seq.* ("Article 5"); and shall not be subject to or governed by the provisions of the Uniform Customs and Practice for Documentary Credit (2007 Revision) International Chamber of Commerce Publication No. 600 (the "UCP 600") or International Standby Practices Publication No. 590 (1998 Edition) (the "ISP 98"), except that where Article 5 is silent as to any issue which is addressed by the UCP 600, then the UCP 600 shall govern as to that issue only.

SECRETARY'S CERTIFICATE
(Letters of Credit)

The undersigned, being the duly appointed Secretary of First Commonwealth Bank, a Pennsylvania bank and trust company (the "Bank"), hereby certifies on behalf of the Bank as follows: (1) each person whose name appears below is the duly elected, qualified and acting incumbent in the office of the Bank set forth opposite his or her name, (2) the signature opposite the name of such person is his or her genuine signature, and (3) each person whose name appears below has been duly authorized by the Board of Directors of the Bank to execute and deliver on behalf of the Bank (a) letters of credit and (b) applications for standby letters of credit, documentary collections, bankers' acceptances and other loans and extensions of credit relating to letters of credit from one or more correspondent banks under a master letter of credit agreement:

Name	Title	Signature
T. Michael Price	Chief Executive Officer	
Jane Grebenc	President	
I. Robert Emmerich	Chief Credit Officer	
Tony E. Kallsen	Senior Credit Officer	
Linda A. Larotonda	Consumer Credit Services Manager	
James A. Boyle	Loan Operations Manager	
Karen E. Martin	Loan Operations Manager	
Mona M. Straw	Loan Operations Manager	

IN WITNESS WHEREOF, the undersigned has signed this Secretary's Certificate as of the 26th day of July, 2013.

FIRST COMMONWEALTH BANK

By: 
Matthew C. Tomb, Secretary

Attachment U
Description of Business
Sedat #3A Injection Well

Business Description for Sedat #3A Injection Well

The Company's business is the treatment and disposal of oil and gas well produced fluids by injection of the fluid into an underground formation via an injection well constructed by the company for this purpose.

1/4/2016

ATTACHMENT "U"
Description of Business