TETRA TECH

December 4, 2020

David Rectenwald.
Source Water & UIC Section
Water Division
U.S. EPA Region III
40084 Mystic Park Road
Titusville, PA 16354

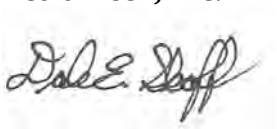
Subject: Application For EPA UIC Class II-D Well (Commercial) Permit
Catalyst Energy, Inc. Lot 580-1 Well
API# 37-083-46237
McKean County, Pennsylvania

Dear Mr. Rectenwald:

Enclosed please find three (3) copies of the Underground Injection Control (UIC) Class II-D Well (Commercial) permit application for the Catalyst Energy, Inc. (Catalyst) Lot 580-1 well located in McKean County, Pennsylvania. The application was prepared by Tetra Tech, Inc. (Tetra Tech) on behalf of Catalyst. As indicated in "Section 6.0 – Financial Assurance", Catalyst will provide under separate cover documentation that Catalyst has the necessary resources to properly plug and abandon the well. An electronic copy of the application has also been submitted to you by email.

Prompt EPA review of the application would be greatly appreciated. If you have any questions or comments, please feel free to contact Paul Rodgers, Catalyst CEO at (412) 325-4350, prr@catalystenergyinc.com or me at (724) 766-5987, dale.skoff@tetratech.com.

Sincerely,
Tetra Tech, Inc.



Dale E. Skoff, P.G.
Sr. Project Manager

cc: Paul Rodgers, Catalyst Energy, Inc.

Tetra Tech NUS
661 Andersen Drive, Pittsburgh, PA 15220
Tel 412.921.7090 Fax 412.921.4040 www.tetratech.com

TETRA TECH

UIC CLASS IID WELL PERMIT APPLICATION (COMMERCIAL)
CATALYST ENERGY, INC. LOT 580-1 WELL (API# 37-083-46237)

MCKEAN COUNTY, PA

December 2020

complex world

CLEAR SOLUTIONS™

OMB No. 2040-0042 Approval Expires 4/30/2022

United States Environmental Protection Agency

Underground Injection Control
Permit Application for a Class II Well

(Collected under the authority of the Safe Drinking Water Act. Sections 1421, 1422, and 40 CFR Part 144)

For Official Use Only

Date Received

Permit Number

Read Attached Instructions Before Starting

I. Owner Name, Address, Phone Number and/or Email

Catalyst Energy, Inc.
1112 S Braddock Ave, Suite 201
Pittsburgh, PA 15218
(412) 325-4350

II. Operator Name, Address, Phone Number and/or Email

Catalyst Energy, Inc.
1112 S Braddock Ave, Suite 201
Pittsburgh, PA 15218
(412) 325-4350

III. Commercial Facility

- [X] Yes
- [ ] No

IV. Ownership

- [X] Private
- [ ] Federal
- [ ] State/Tribal/ Municipal

V. Permit Action Requested

- [X] New Permit
- [ ] Permit Renewal
- [ ] Modification
- [ ] Add Well to Area Permit
- [ ] Other

VI. SIC Code(s)

1311 - Crude Petroleum and Natural Ga

VII. Indian Country

- [ ] Yes
- [X] No

VIII. Type of Permit (For multiple wells, use additional page(s) to provide the information requested for each additional well)

- [X] A. Individual
- [ ] B. Area

Number of Wells: 1

Well Field and/or Project Names: CATALYST ENERGY LOT 580-1 WELL

IX. Class and Type of Well (see reverse)

A. Class	B. Type (enter code(s))	C. If type code is "X," explain.
II	D	

X. Well Status

- [ ] A. Operating
- [x] B. Conversion
- [ ] C. Proposed

Date Injection Started:

Date Well Constructed: 05/19/1990

XI. Well Information

API Number: 37-083-46237

Permit (or EPA ID) Number:

Full Well Name: CATALYST ENERGY LOT 580-1 WELL

XII. Location of Well or, for Multiple Wells, Approximate Center of Field or Project

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

Surface Location

1/4 of 1/4 of Section Township Range

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

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

Latitude: 41.830586°

Longitude: -78.58174°

XIII. Attachments

In addition to this form, complete Attachments A-U (as appropriate for the specific well class) on separate sheets. Submit complete information, as required in the instructions and list all attachments, maps or other figures, by the applicable letter.

XIV. 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 possibliity of fine and imprisonment. (Ref. 40 CFR § 144.32)

Name and Official Title *(Please Type or Print)*	Signature	Date Signed
Paul Ryan Rodgers, CEO	Paul Ryan Rodgers	12/03/2020

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INTRODUCTION

This UIC Class IID Permit application was prepared by Tetra Tech, Inc. (Tetra Tech) on behalf of Catalyst Energy, Inc. (Catalyst) for conversion of the Catalyst Lot-580-1 Well (API# 37-083-46237) to a commercial brine disposal well. The Lot 580-1 well is located in Keating Township of McKean County, Pennsylvania. The well was drilled by Belden and Blake Corporation in 1990 to a TD of 5420 ft and completed in the Onondaga Reef Formation through perforations from 5170 to 5188 ft. The Lot 580-1 has very high cumulative production for a conventional well totaling approximately 2.6 billion cubic feet of gas with 6,500 barrels of oil. As a result the well is highly depleted with low reservoir pressure indicating substantial potential for brine disposal. An injection volume of 100,000 barrels per month is proposed. This application has been developed to meet all pertinent requirements of EPA Form 7520-6 and 40 CFR Sections 144 and 146.

1.0 ATTACHMENT A – MAPS AND AREA OF REVIEW (AOR)

1.1 Part 1 – Well Location

The surface location of the proposed injection well, Catalyst Energy Lot 580-1 well, is adequately described by the latitude and longitude coordinates on the attached EPA Form 7520-6. The well is a conventional (vertical) well located near Cyclone in Keating Township of McKean County, Pennsylvania.

1.2 Part II - Area Of Review Size Determination (40 CFR § 146.6)

The Area of Review (AOR) utilized in this application is a ¼ mile fixed radius from the proposed injection well per 40 CFR § 146.6(b).

1.3 Part III. Map(s) (40 CFR §§ 144.31 & 146.24)

The mapping presented in this section is based upon the EPA Region 3 "Clarification of Maps required for Class II Permit Application" developed to address requirements of 40 C.F.R. §§ 144.21(e)(7) & 146.24(2). Oil and gas well locations and other well information referenced in this section were obtained from the Pennsylvania Geologic Survey Exploration and Development Well Information Network (EDWIN). In addition, an historic Pennzoil base map was reviewed for locations of historic oil and gas wells drilled in the area. The Pennzoil base map was utilized as a base layer in Figures 1-1 and 1-2, which show oil and gas well locations based on the EDWIN well information. Water well information was obtained from the Pennsylvania Ground Water Information System (PAGWIS) database and from PADEP staff (for the Pithole Water Association municipal water supply well). Table 1-1 provides available information on producing and plugged wells in the referenced mapped areas. Available completion reports and documentation of plugging and abandonment for wells in the AOR are included in Appendices A and B, respectively.

Figure 1-1 - Topographic map showing the AOR and the following items within the AOR:

- Producing oil or gas wells – As indicated on Table 1-1, there are two wells identified in the EDWIN database as producing oil or gas wells in the AOR:
  - The Catalyst Lot 580-1 well (API# 083-46237), the proposed injection well, was drilled in 1990 to a Total Depth of 5,420 ft and perforated in the Onondaga Reef Formation at a depth of 5170 to 5188 ft.
  - The Catalyst Energy Amoco-Witco #1 (API# 083-30629) is located approximately 1000 ft southeast of the proposed injection well. The well was drilled in 1974 to a depth of 7015 ft, plugged back to 6448 ft and perforated in the Onondaga Reef Formation from 5184 to 5270 ft. The well was the discovery well for the Onondaga Reef play in McKean County. (As discussed in Section 4.0 of this application, this well is proposed for use as a monitoring well.)

- Abandoned oil or gas wells

Wells to injection interval - There was one plugged and abandoned oil and gas well identified in the AOR which penetrated the injection interval: the Enervest Lot 581-1 well (API# 083-40667) which is located approximately 900 ft to the southwest of the proposed injection well. The well, which was a redrill of an older shallow well, was drilled in 1982 to a Total Depth of 5439 ft as a dry hole. According to information obtained by Catalyst the well was plugged and abandoned.. The completion report for the well is included in Appendix A. As discussed in Section 2.2, 3-D seismic data and production information on wells in the reef area indicates that the Onondaga Formation in this well is not hydraulically connected to the main reef structure where the injection will take place. As such it is expected that there would be little to no migration of brine into this off-reef structure area from injection into the Lot 580-1 well located well within the reef structure.

- Shallow oil and gas wells – The EDWIN database included 19 abandoned shallow oil and gas wells in the AOR as shown on Table 1-1. As indicated these wells ranged in depth from 2077 to 2104 ft and were oil wells or enhanced recovery wells in the Bradford Sands. The Certificates of Plugging for these wells are included in Appendix B. In addition there are numerous old oil and gas wells which were plotted on the Pennzoil map (black dots shown on Figure 1-1). In many cases the well numbers are not legible. Research into the EDWIN historical database records for available data on wells which could be identified indicated these wells ranged in depth from 1700 to 2300 ft, which is consistent with the depth of the above-referenced Pennzoil wells. As discussed in Section 2.0 of this application, there is approximately 3000 ft of confining interval between the Bradford Sands (target of the old wells) and the injection interval, the Onondaga Formation; therefore, the shallow oil and gas wells should not be impacted by the brine to be injected at depths greater than 5,000 ft.

- Dry holes – There are no dry holes referenced in the EDWIN database (other than the above-referenced plugged and abandoned Enervest Lot 581-1 well).

- Injection wells – No UIC Class IID injection wells were identified in the AOR. There were some historic injection wells referenced as part of the Bradford Sands enhanced oil recovery.

- Drinking water wells– No drinking water wells identified within the AOR.

- Springs and surface water bodies – No surface water features were identified in the AOR.

- Mines (surface and subsurface), quarries –No mines or quarries were identified within the AOR.

- Residences – The surface owners of properties within 1/4 mile of the injection well are shown on Figure 1-4. Table 1-2 lists the owners and addresses for the subject parcels.

- Schools - No schools were identified in the AOR.

- Hospitals – No hospitals were identified in the AOR.

- Roads – Summit Road transects the AOR in a general northeast-southwest direction. Woodard Road also runs through the AOR located northeast of Summit Road.

- Faults – There were no faults identified in the AOR based on information available to Tetra Tech including the surface geologic map (included in Section 2..0).

Figure 1-2 - Topographic map that extends ¼-mile beyond the facility property boundary (a radius of ½ mile from the proposed injection well was reviewed)

- Producing oil or gas wells – There were four producing oil wells in the reviewed area in addition to the gas wells identified above in the AOR. The oil wells are shown on Figure 1-2 and listed on Table C-1 in Appendix C.

- Abandoned oil or gas wells – In addition to the one plugged and abandoned oil and gas well referenced above (Enervest Lot-580-1 well) to the injection interval and the 19 shallow abandoned Pennzoil wells in the AOR, there were 48 additional plugged oil and gas wells identified in the EDWIN database. The EDWIN database also included 4 abandoned wells on the DEP Abandoned List. The above-referenced wells are shown on Figure 1-2 with a number identifier tied to Table C-1 and well records in Appendix C. A review of available depth information in these records indicates a similar depth as for the shallow wells in the AOR - approximately 2100 ft. As for the AOR there were various old Pennzoil oil and gas wells in the reviewed area with no additional information available. It is assumed that these wells are of similar depth to the other shallow wells in the area for which data were available (i.e., approximately 2100 ft TD and former Bradford Sand wells.)

- Dry holes – There were no dry holes in the reviewed area other than the above-referenced plugged and abandoned Enervest Lot 581-1 well.

- Injection wells – No UIC Class IID injection wells were identified in the reviewed area. There were some historic injection wells referenced as part of the Bradford Sands enhanced oil recovery.

- Drinking water wells– As summarized in Table 1-3 and presented on Figure 1-2, the following drinking water wells were identified in the reviewed area:

    - Residential water well PA ID# 130920 which is located approximately 1800 ft to the northeast of the proposed injection well. This well was drilled to a Total Depth of 172 ft and produces water from the Pennsylvanian Pottsville Formation.

- The Pithole Water Association Municipal Water Supply Well, which is located approximately 2000 ft to the northeast of the proposed injection well, was drilled in August 2014. The well has a Total Depth of 265 ft and has a permitted flow rate of 30 gpm.

- Springs and surface water bodies – There are the upper portions of intermittent streams shown on the USGS topographic map to the west and east of the proposed injection well at distances of approximately 1600 ft in each direction. There is a pond shown in upper portion of the intermittent stream to the west.

- Mines (surface and subsurface), quarries – No mines or quarries were identified in the reviewed area.

- Residences – The surface owners of properties within 1/4 mile of the injection well are shown on Figure 1-4. Table 1-2 lists the owners and addresses for the subject parcels.

- Schools- No schools were identified in the reviewed area.

- Hospitals – No hospitals were identified in the reviewed area.

- Roads – Summit Road transects the reviewed area in a general northeast-southwest direction. Woodard Road also runs through the reviewed area located northeast of Summit Road. Pithole Road is located in the northern portion of the reviewed area.

- Faults – There were no faults identified in the reviewed area based on information reviewed by Tetra Tech including the surface geologic map (included in Section 2.0).

Figure 1-3 - Topographic map extending one mile beyond the facility property boundary (a radius of 1.25 miles from the proposed injection well was reviewed)

- Project injection well(s), well pad(s) and/or project area – The proposed injection well, Catalyst Lot 580-1 well, is shown on the map.

- Applicable AOR – the ¼ mile AOR is shown.

- All outcrops of injection and confining formations – Based on the surface geologic map for the reviewed area, there were no outcrops of the injection or confining formations.

- All surface water intake and discharge structures – No surface water intake or discharge structures were identified in the reviewed area.

- All hazardous waste treatment, storage, or disposal facilities – No such facilities were identified in the reviewed area.

1.4 Part IV. Area of Review Wells and Corrective Action Plans (40 CFR §§ 144.55 & 146.24)

As discussed above, two oil and gas wells (in addition to the proposed injection well) were identified as present within the AOR which had penetrated the Onondaga Formation, the injection interval. The Catalyst Energy Amoco-Witco #1 is located approximately 1000 ft southeast of the proposed injection well, and as indicated on Table 1-1 was drilled to a depth of 7015 ft then plugged back to 6448 ft. The well was the discovery well for the Onondaga Reef play in McKean County. As discussed in Section 4.0, the Amoco-Witco #1 will be a monitoring well for the proposed injection well. The second well in the AOR which penetrated the injection interval is the above-referenced Enervest Lot 581-1 well, which is located approximately 1000 ft southwest of the proposed injection well.

As discussed above, the AOR includes historic oil and gas wells drilled to the shallow Bradford Sands; however, there is approximately 3000 ft of confining interval between the Bradford Sands (typical well depth of 2100 ft) and the injection interval, the Onondaga Formation. Based on this great thicknesses of unimpacted confining interval, no additional remediation of these shallow wells is considered necessary relative to the proposed UIC well permitting project.

Based on the above, no corrective action is deemed necessary for any of the shallow or deep wells in the AOR.

2.0 ATTACHMENT B – GEOLOGICAL AND GEOPHYSICAL INFORMATION

2.1 Part I. Geological Data (40 CFR § 146.24)

2.1.1 USDW Determination

The project site lies within the Deep Valleys Section of the Appalachian Plateaus Physiographic province. As indicated by Figure 2-1, the geologic map for the site area, the Pennsylvanian Pottsville and Mississippian and Devonian Shenango Formation through Oswayo Formation undivided (MDso) are the bedrock units closest to the surface.

The Pennsylvania Geologic Survey "Ground Water Inventory System" (GWIS) database was accessed to determine sources of groundwater in the site area. It is noted that the well reporting requirement, which was established in 1968, is not considered to be a complete record of water wells and other wells which may be present. (Pennsylvania Topographic and Geologic Survey, February 7, 2019). The database contained only one groundwater well within a one-mile radius of the site as follows:

- Residential water well PA ID# 130920 which is located approximately 1800 ft to the northeast of the proposed injection well. This well was drilled to a Total Depth of 172 ft and produces water from the Pennsylvanian Pottsville Formation.

In addition, a local municipal water supply well was identified within a one-mile radius of the site:

- The Pithole Water Association Municipal Water Supply Well, which is located approximately 2000 ft to the northeast of the proposed injection well, was drilled in August 2014. The well has a Total Depth of 265 ft and has a permitted flow rate of 30 gpm. The producing formation was not identified but is interpreted to be the Pennsylvania Pottsville Sandstone or perhaps underlying Shenango Formation.

The location of these wells are shown on Figure 1-2 and data summarized in Table 1-3.

The depth of the deepest well in the vicinity of the Lot 580-1 is 265 ft. To be conservative, 85 ft was added to result in an estimate of the base of the lowestmost USDW of 350 ft.

2.1.2 Structural Geology

Regional Geologic Setting

From a regional perspective, the Lot 580-1 is located in the Appalachian Plateau Geologic Province. As mentioned above, the Pennsylvania Pottsville Formation is shown as being the uppermost bedrock formation in the immediate vicinity of the well. As shown on Figure 2-1, Geologic Map, the well is situated between an anticline to the northwest and a syncline to the southeast. There are no faults indicated on the geologic map suggesting that there are no significant faults extending to the surface.

Figure 2-2 is a structural geologic map on top of the Onondaga Formation for the Lot 580-1 area. As indicated, the Lot 580-1 is positioned on a local structural high. No faults were identified in the mapped area as part of information reviewed by Tetra Tech.

Reef Structure Based on Seismic Profile Data

Attached is a structure map on top of the Onondaga formation based on 3-D seismic profile data. This 3-D image depicts the reef and its boundaries. This is the reef proposed for brine injection via the Lot 580-1 Well (API # 083-46237). A total of two wells were drilled into the productive portion of the reef. The first well, drilled in 1974 was the Amoco Witco #1 well (API #083-30629). Later, during 1982 the Lot 581-ON1 (API #083-40667) was drilled but missed the reef which was present northeast of the well. During 1990, the Lot 580-1 well (proposed injection well) was drilled and was successfully completed.

This 3-D seismic clearly shows that the dry hole, #083-40667, missed the reef and thus is not hydraulically connected to the reef's hydrocarbons. As such it is expected that there would be little to no migration of brine into this off-reef structure area from injection into the Lot 580-1 well located well within the reef structure.

The subject structure contour map was developed by Mr. Jim Morris, who was the Senior Geophysicist for Belden and Blake at the time when the dry hole was drilled. Mr. Morris held several positions as an exploration geophysicist in the northeastern U. S. prior to founding Zero Phase Geophysical Consultant, LLC in 2019. He served as the Director of Geophysics with Range Resources, who pioneered the Marcellus Shale. His publications and presentations primarily focused on seismic structural and/or stratigraphic studies related to northeastern U. S. Mr. Morris performed seismic interpretation, processing and acquisition of over 1,000 miles of 3-D seismic.

When Mr. Morris worked on the subject reef prospects in McKean County he held the position of Chief Geophysicist at Belden and Blake. In addition to the Cyclone Reef prospect, Mr. Morris explored the Oriskany, Trenton, Knox and other Onondaga prospects throughout the Appalachian Basin. Mr. Morris served as a Vice President at Quaker State E&P Company and as District Geophysicist for Pennzoil Exploration and Production Division.

2.1.3 Injection and Confining Interval Characteristics

Injection and Confining Zones

As discussed above, the proposed injection interval for the Lot 580-1 is the Middle Devonian Onondaga Formation. The Onondaga in the Lot 580-1 well is approximately 97 ft thick and occurs at a depth of approximately 5169 to 5266 ft with 18 ft of the upper portion of the formation perforated (5170 to 5188 ft). The gamma ray / borehole compensated sonic log indicates a porosity for the completed interval averaging approximately 15%.

Figure 2-3 is the portion of the log through the Onondaga and adjacent formations. A copy of the entire log is included in Appendix D.

The perforated interval in the Lot 580-1 was acidized with 500 gallons of 15% HCL According to the completion report the well had 0 MCF natural open flow. The after treatment open flow was not gauged; the after treatment rock pressure was 1440 psi. The Lot 580-1 had a very high cumulative production for a conventional well with reported total 2.6 BCF gas with 6500 bbl oil. The reservoir in the well area is highly depleted with recent well head pressures of approximately 90 psi.

Figure 2-4 is a generalized stratigraphic column for the Onondaga and adjacent stratigraphic units in McKean County, PA (Source: Figure 12, Oil and Gas Developments in Pennsylvania in 1975. Commonwealth of Pennsylvania, Department of Environmental Resources, Bureau of Topographic and Geologic Survey, Progress Report 1989, 1976.) As indicated, the Onondaga Formation has four members with the "reef" facies as encountered in the Lot 580-1 developing in the Edgecliff Member.

Figure 2-5 is a generalized stratigraphic column for the area which shows the Onondaga Formation and overlying units. Also shown are the following underlying units identified in the Lot 580-1 and nearby wells: Bois Blanc, Helderberg, Bass Island, Salina, Lockport, Clinton, Tuscarora and Queenston Formations. Injection, oil and gas producing and confining intervals are identified on the stratigraphic column. As indicated on Figure 2-5, there is a thick package of rocks of approximately 3000 feet between the Onondaga Formation and Upper Devonian Bradford Sandstone which include the Marcellus Shale and other Middle and Upper Devonian shales. The Upper Devonian Bradford Sandstone, which occurs at a depth of approximately 2100 to 2300 ft in the site area has produced oil and gas since the 1800s and was subsequently the subject of enhanced recovery efforts. (The locations of identified Bradford Sandstone wells in the Lot 580-1 area are summarized on maps and tables in Section 1.0.) In addition to the thick confining interval between the Onondaga Formation and the Bradford Sandstone, there are Upper Devonian shales between the Bradford and the lowestmost USDW.

In summary, there is a substantial thickness of shale confining intervals between the Onondaga Formation and the lowestmost USDW (estimated at a depth of approximately 350 ft). There are also confining intervals beneath the Onondaga including the Silurian Salina Formation which includes evaporites and dolomite.

Figure 2-6 is a geologic cross-section A-A' which traverses the site area in a general southwest to northeast direction with the line of cross-section shown on Figure 2-7. The cross-section, which is stamped by a Professional Geologist, includes the following:

- Vertical & horizontal scale
- Disposal well & injection formation
- Location of the Salina Group
- Location of Basement rock

- Location of confining layers above and below the injection formation
- Geologic structure

It is noted that the geologic structure depicted on the cross-section is based on publicly available information (e.g., well completion reports and geophysical logs for included wells) and surface geologic information.

2.2 Evaluation of Potential For Induced Seismicity

Faulting is known to occur in the Appalachian Plateau region, particularly associated with anticlinal structures. Many researchers consider the potential for induced seismicity related to injection wells to be greater when injected fluids and pressures interact with faults which extend to Precambrian basement rocks. As discussed in the "Geology of Pennsylvania" (Pennsylvania Geological Survey and Pittsburgh Geological Survey, 1999) in describing the typical faults occurring in the Appalachian Plateau structures, "These faults die out in the overlying Devonian Shales." It is also reported in published literature that in the Appalachian Plateau such faults often "ramp out of" the Salina salt. According to the PA DCNR "Precambrian Basement Map of the Appalachian Basin and Piedmont Province in Pennsylvania" http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_016250.pdf) the depth to Precambrian basement in the site vicinity is estimated at approximately 3200 meters (or approximately 10,500 feet) below sea level (Figure 2-8). The base of the Onondaga Formation at the Lot 580-1 well is approximately 3,100 ft. below sea level, or approximately 7,400 ft (roughly 1.4 miles) above the estimated top of Precambrian basement.

According to the PADCNR map viewer website http://www.gis.dcnr.state.pa.us/maps/index.html?geology=true, the closest listed earthquake to the Lot 580-1 well occurred in 1995 near Russel, Pennsylvania approximately 25 miles to the northwest with a 2.4 magnitude.

The PASEIS website, which is operated by Penn State, http://paseis.geosc.psu.edu/events.html, was also reviewed for evidence of earthquakes in the site vicinity. The PSU website lists and presents on a map the 25 most recent seismic events within Pennsylvania. As of May 27, 2020, the nearest event was near Liberty approximately 100 miles to the southeast of the Lot 580-1.

The USGS Seismic Hazards Map for Pennsylvania (Figure 2-9) indicates that the Lot 580-1 well is situated in the lowest seismic risk area.

The potential for induced seismicity to be associated with operation of the Lot 580-1 was evaluated with regard to the USEPA Region 3 "Framework for evaluating seismic potential associated with UIC Class II permits". This document states that, " Seismic activity induced by Class II wells is likely to occur only where all of the following conditions are present: (1) there is a fault in a near-failure state of stress; (2) the fluid injected has a path of communication to the fault; and (3) the pressure exerted by the fluid is high enough and lasts long enough to cause movement along the fault line."

The following evaluates conditions pertaining to the Lot 580-1 well and site area, relative to key statements in the USEPA Region 3 document. The key statements are in italics followed by an overview of operational or site conditions.

"Therefore, limiting the rate and volume of the fluids injected limits the potential for seismicity." The proposed injection rate (100,000 barrels/month) is a relatively low rate (e.g., compared to injection wells in Texas, Oklahoma, etc.).

"Because of the likelihood of greater permeability and the reduction in pore pressure, injecting into formations with a significant history of oil and gas production is unlikely to cause seismicity." The Onondaga Reef wells in the proposed injection well area have very high cumulative production:

- Lot 580-1 (drilled and completed in 1990) – 2.6 BCF gas and 6500 bbl oil
- Amoco-Witco #1 (drilled and completed in 1974) - Onondaga Reef discovery well, located approximately 1000 feet to the southeast of the proposed injection well - 2.9 BCF gas and 11,500 bbl oil

Recent wellhead pressure measurements indicate very depleted conditions at these wells with current wellhead pressures only in the 90 psi range, resulting in highly under-pressured conditions further decreasing the risk of induced seismicity.

"Further, history of past, as well as currently active, injection for disposal and enhanced recovery wells (as opposed to production wells) into a formation without induced seismicity is also supporting evidence that seismicity is unlikely, either because no faults are present or because increases in formation pore pressure due to injection have not caused sufficient pressure changes for movement to occur along the fault." There are no other injection wells to the Onondaga Formation in the site area to enable an evaluation relative to the above criteria.

"Finally, to minimize conduits for fluid to potentially contaminate underground sources of drinking water (USDWs), operating conditions in an injection well permit can expressly limit the injection pressure to prevent fracturing (or cracking of the rock) of the injection zone. Limiting injection pressure provides the secondary benefit of preventing fractures that also could act as conduits through which fluid could flow and act upon an existing fault." The proposed MAIP is below the breakdown pressure of the overlying Marcellus Shale confining interval.

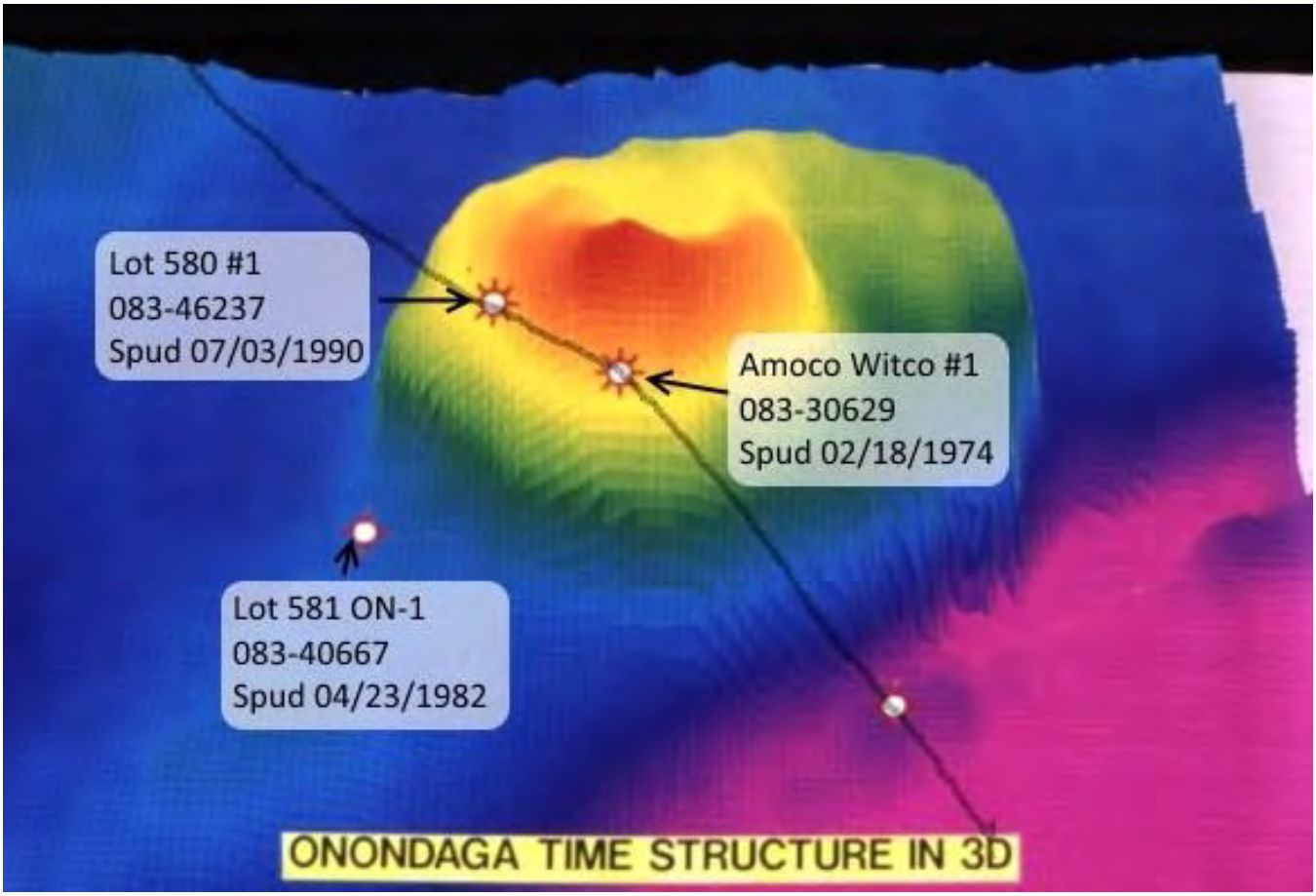
In summary, based on the overall low seismic risk in the region of the Commonwealth where the Lot 580-1 is located and the favorable evaluation relative to the EPA Region 3 framework for evaluating seismic potential for UIC Class II well permits, the potential risk of significant induced seismicity resulting from injection operations at the Lot 580-1 is considered extremely low.

2.3 Part II . Proposed Formation Testing Program (40 CFR § 146.22)

No formation testing program is planned for the Lot 580-1 well at this time

Exhibit 2-A

3-D Seismic Onondaga Structure Map


Lot 580 #1
083-46237
Spud 07/03/1990
Amoco Witco #1
083-30629
Spud 02/18/1974
Lot 581 ON-1
083-40667
Spud 04/23/1982
ONONDAGA TIME STRUCTURE IN 3D

3.0 ATTACHMENT C – WELL CONSTRUCTION/CONVERSION INFORMATION

3.1 PART 1 – Well Schematic Diagram (40 CFR § 146.24)

Figures 3-1 and 3-2 are well construction diagrams for the existing and converted well, respectively. The primary difference between the two figures is that the converted well will have tubing and packer installed along with an annular pressure gauge. The completion report for the well is included in Appendix A. The following features are shown on Figure 3-2:

- Underground Source of Drinking Water (USDW) – As discussed in Section 2.0 Attachment B – Geological and Geophysical Information, the base of the USDW is estimated at 350 ft based on the depth of drinking water wells in the area and regional hydrogeologic conditions.
- Confining and Injection Zones - The injection interval, the Onondaga Reef Formation, is overlain by over 2700 ft of confining interval which is predominantly Middle and Upper Devonian shales. The Onondaga Reef Formation is perforated from 5170 to 5188 ft,
- Casing and Cementing Details. The 11 ¾ inch surface casing extends to a depth of 425.9 ft, which is approximately 75 ft below the base of the USDW (a minimum of 50 ft is required by EPA).
- As indicated in the well completion report, there were cement returns to surface during cementing the surface casing. The calculated top of cement for the 4 ½ inch production casing is 3427 ft, which is 1,757 ft above the top of the injection interval (a minimum of 50 ft is required by EPA). The cement top calculation is attached.
- Tubing and Packer – The tubing will be 2 3/8 inch diameter, and the packer will be set at approximately 5150 ft, which is approximately 20 ft above the injection interval.
- Pressure Gauges: As indicated there will be a well head pressure gauge as well as an annular pressure gauge continually monitoring the pressure between the tubing and production casing for any pressure changes indicative of mechanical failure in the tubing/packer or casing.

3.2 PART II - Well Construction or Conversion Procedures (40 CFR §§ 144.52, 146.22, & 146.24)

The primary change related to the conversion of the existing well to an injection well will be the placement of tubing and packer system along with an annular pressure and well head pressure gauge as shown on Figure 3-2. Alarm and shut-down systems for the well related to pressures approaching the Maximum Allowable Injection Pressure (MAIP) (Surface) and annular pressure changes indicative of mechanical integrity failure are discussed in Section 4.0 Attachment D – Injection Operation and Monitoring Program. The Borehole Compensated Sonic Log is included in Appendix D.

Exhibit 3-A

Lot 580-1 Well Production Casing Cement Top Calc

Top of Cement Calculation
Catalyst Lot 580-1 Well (API #37 -083-46237) 4 1/2 in casing in 7 7/8 in hole

Sacks cmt	385	From Completion Report
Yield - cubic ft./sk*	1.18	
Volume (cu. ft.)	454.3	
Cu. ft./ft.**	0.228	https://www.calculator.net/volume-calculator.html
Cement height (ft)	1993	
TD (ft)	5420	From Completion Report
Top of Cement (ft)	3427	

*Yield estimate based on typical Class A cement
**Annular space between 4 1/2 inch casing and 7 7/8 inch borehole

4.0 ATTACHMENT D – INJECTION OPERATION AND MONITORING PROGRAM (40 CFR §§ 146.23 & 146.24)

Upon obtaining all necessary permits, Catalyst Energy proposes to operate the UIC Class IID well facility as summarized in this section.

4.1 Facility Layout and Operation

Figure 4-1 is the UIC facility layout schematic which shows the following elements:

- Two independent triplex pumps on 3' x 3' skids
- One filtration system
- A pump house surrounding the filtration system and two triplex pumps
- Three unloading terminals
- 62' x 62' x 2.75' (33") Galvanized Steel Containment with Epoxy Liner (raw capacity with 1" of freeboard equals 1,821 barrels which is more than 110% of the required maximum tank capacity which is equivalent to 550 barrels)
- One 500 Barrel wheelie tank for Raw Water
- One 500 Barrel wheelie tank for Filtered Water
- One 50 Barrel waste tank
- One gunbarrel separator
- 343' of fence line and a gate
- One 10' x 15' office building

Produced water will arrive on location via truck and pumped into a gun barrel tank for any oil/water separation, with water then fed to the raw water tank for additional sediment settling. From the settling tanks the water is pumped thru cannister filters and into a filtered water tank, from which the water is then pumped to the Catalyst UIC well and down hole.

4.2 Injection Fluid

Catalyst proposes to inject flowback and produced water generated from its oil and gas related operations as well as approved oil and gas related wastewaters from other conventional and unconventional oil and gas well operators. Other oil and gas related wastewaters associated with the production of oil and natural gas or natural gas storage operations, which are approved by EPA for injection under a UIC Class II D injection well, may also be injected. According to Title 40 Chapter I Sec. 144.6 (b)(1), such fluids include those "Which are brought to the surface in connection with natural gas storage operations, or conventional oil or natural gas production and may be commingled with waste waters from gas plants which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection."

Catalyst anticipates the Specific Gravity of the injected fluid will be approximately 1.16 based on the high end of Specific Gravity testing results for produced water from its Bradford Sand and Marcellus Shale produced water. Attached are laboratory analytical results for produced water

from Catalyst's Bradford Sand and Marcellus Shale produced water. The samples are considered representative of the types of brine which will be injected into the Lot 580-1.

4.3 Injection Rate

The proposed monthly injection rate for the Lot 580-1 is 100,000 bbls/mo, which is considered an achievable rate based on the well's very high cumulative production and depleted conditions. The average and maximum daily injection rate are anticipated to be 3300 bbls and 4000 bbls/d, respectively.

4.4 Maximum Allowable Injection Pressure

Maximum Allowable Injection Pressure (MAIP)(Surface) calculations based on EPA-approved equations are attached. Since the Onondaga Reef wells in the area were not frac'd (only acidized) Instantaneous Shut-In Pressure (ISIP) or breakdown pressure data for the formation from nearby wells to the injection formation was not available. Therefore as agreed by EPA Region 3 UIC staff, the calculations were based on the calculated frac gradient for the Marcellus Shale, the confining interval situated immediately above the Onondaga. This is consistent with the following federal UIC well regulations stating that the maximum injection pressure must not cause fractures in the confining interval:

'§ 146.23 Operating, monitoring, and reporting requirements.

(a) Operating requirements. Operating requirements shall, at a minimum, specify that:

(1) Injection pressure at the wellhead shall not exceed a maximum which shall be calculated so as to assure that the pressure during injection does not initiate new fractures or propagate existing fractures in the confining zone adjacent to the USDWs. In no case shall injection pressure cause the movement of injection or formation fluids into an underground source of drinking water'

The frac gradient was calculated based on shut-in pressure data for the Catalyst Energy MROC Pad B 4H(A) (API# 37-083-55072) horizontal Marcellus Shale well located approximately 5 miles to the north of the Lot 580-1. The well was originally drilled and completed by Triana in 2008. There are 8 frac stages referenced with shut-in pressure data ranging from 3317 to 4180 psi. Applying the lowest shut-in pressure to the frac gradient calculation, results in a frac gradient of 1.061. Applying the FG of 1.061 into the MAIP calc along with the SG of 1.16 results in a MAIP (surface) of 2889 psi. The Bottom Hole Pressure (BHP) associated with the proposed MAIP (surface) is 5486 psi. The MAIP and BHP calculation is attached. The completion report for the Catalyst MROC Pad B 4(H)A well is included in Appendix A.

4.5 Monitoring of Injection Fluid Samples and Well Integrity Monitoring of Injection Fluid Samples and Well

The following identifies the UIC Class II underground injection well regulatory requirements and operational procedures which will be conducted to meet the subject requirements:

1. **Monitoring of the nature of injected fluids at time intervals sufficiently frequent to yield data representative of their characteristics**. An initial sample of fluid will be collected and analyzed from initial loads proposed for disposal from new formations / areas. In addition, samples will be collected for analysis from new types of sources (e.g., from different geologic formations, geographic regions, etc.) which would be expected to differ significantly from brine previously characterized for disposal at the facility. Samples will be analyzed for the following parameters at a minimum: specific gravity, total dissolved solids and pH. In addition, Catalyst will measure the specific gravity of each truckload of fluid delivered to the facility for injection. The sample for specific gravity measurement will be collected prior to unloading to confirm the specific gravity is consistent with permit conditions and MAIP requirements.

2. **Observation of injection pressure, flow rate, and cumulative volume at least weekly based on the regulatory requirements for produced fluid disposal operations.** Injection pressures, annular pressure, injection rate, and cumulative volume will be continuously monitored and recorded electronically.

3. **A demonstration of mechanical integrity pursuant to 40 CFR Sec. 146.8 during the life of the injection well.** A mechanical integrity test will be performed prior to initiating injection and at least once every five years.

4. **Maintenance of the results of all monitoring until the next permit review.** All monitoring records will be maintained throughout the life of the well.

4.6 Plan for Well Failures

General System Design and Monitoring

The system being utilized for monitoring and control will function with the use of pressure switch gauges with adjustable limit switches in the PLC. The gauges provide a sensing device for changes in pressure conditions, and if the limit switches are reached, they will send responses to activate the PLC controller for injection flow and pressure relief. All monitoring data described below will be stored and transmitted via a SCADA system and will be continuously monitored remotely (24/7/365). In addition to the automated portion of the system, the manual operation of all pumping equipment as well as the continual inspections of the pumping and monitoring equipment provide additional safeguards for appropriate actions necessary in case of well failures.

Injection Pressure Limit Monitoring

The primary safeguard to prevent over pressuring is the automated shutdown on the pumping equipment at which the Maximum Allowable Injection Pressure (MAIP) (Surface) will be set as a limit at which all pumping will cease. Additional switch gauges and the PLC will be utilized by reading the gauges at the wellhead to monitor pressure changes that would be caused by tubing or casing failures and the appropriate valve will be activated to cease injection.

Tubing and Packer Monitoring

With the monitoring switch gauge connected to the tubing, there will be a secondary system to prevent over pressuring of the tubing. When the MAIP is sensed, a response is sent to a PLC which will stop additional injection into the tubing.

Tubing to Casing Annulus Monitoring

This annular space will be monitored for both increase and decreases in pressure. The switch gauge will have both a low and high shutdown tab limit. When either of the limits is reached, the sensor will send a response to the PLC for shutting down flow. The lower limit will be used to monitor damage to the casing which allows fluid to leave the casing, and the high limit will sense a pressure increase in the annular space that may be caused by communication with the tubing or flow into the annular space. Both of these limits when reached will send responses shutting down the injection cycle.

Under the monitoring provided above, well failures will either be identified by the automated equipment and switch gauges or by visual inspection during injection operations or at other times. Should any failure occur, all injections will cease and EPA will be verbally notified within 24 hours and notified in writing within 7 days. Analysis of the failure will take place and the necessary repairs to be implemented along with any equipment replacement will be coordinated with the EPA.

4.7 Monitoring Wells

The well head pressure and fluid levels in the Catalyst Energy Amoco-Witco #1 will be measured and recorded semi-annually, at a minimum. The well is located approximately 700 ft southeast of the proposed injection well. Figure 4-2 is the well construction diagram for the Catalyst Energy Amoco-Witco #1. As indicated the well is perforated in the Onondaga Reef Formation from 5184 to 5270 ft. The Gamma Ray – Compensated Neutron Density Log for the well is included as Figure 4-3. The monitoring well location is shown on Figure 1-2 and the well completion report is included in Appendix A.

4.8 Reporting Requirements

An annual report will be submitted to EPA summarizing the results of the required monitoring, including monthly records of injected fluids, and any major changes in characteristics or sources of injected fluid.

4.9 Proposed Annulus Fluid

The proposed annulus fluid for the injection well will consist of fresh water mixed with Multi-Chem's MC MX 6-2960 Corrosion Inhibitor at 2% by volume of the annular capacity. The corrosion inhibitor will be mixed in accordance with the manufacturer's recommendations then loaded into the well annulus prior to conducting injection operations. Product information for the above-referenced corrosion inhibitor is attached. A similar type product may be used instead of the example product referenced.

Exhibit 4-A

Maximum Allowable Injection Pressure (MAIP) Calc

Maximum Injection Pressure (MIP) Calculation
Catalyst Energy Lot 580-1 (McKean County, PA)
Onondaga Reef

1) Frac Gradient (FG)
Based on FG for Marcellus Shale (confining unit) - Catalyst MROC Pad B Well 4HA (API# 37-083-55072)
FG = [ISIP + (0.433 X SG X D)] /D
Where:
ISIP = 3317 psi - From lowest of shut-in pressure from 8 stage Marcellus frac*
SG = 1.0 (frac fluid)
D = 5281 ft - Top of Marcellus referenced in the well Completion Report

ISIP (psi)	Hydrostatic Factor (psi/ft)	SG	D (ft)	Fracture Gradient (psi/ft)
3317	0.433	1	5281	1.061

*Based on shut-in pressures for 8 stages per the Catalyst MROC Pad B Well 4HA completion report.

2) Maximum Injection Pressure (MIP) Calculation

MIP = [FG - (0.433XSG)] X D
FG = 1.061 (Frac Gradient for Marcellus Shale confining interval - calculated above)
SG = 1.16 (brine) - Est. for brine for injection (high end of estimated range)
D= 5170 ft top of Onondaga Reef perf interval

	Hydrostatic Factor (psi/ft)	SG	D (ft)	Fracture Gradient (psi/ft)	**MIP (Surface)**
-	0.433	1.16	5170	1.061	**2889**

Bottom Hole Pressure

Hydrostatic Factor (psi/ft)	SG	D (ft)	Hydrostatic Pressure	MIP (Surface)	
0.433	1.16	5170	2597	2889	**5486**

Exhibit 4-B

Corrosion Inhibitor Information

multi-chem®
A HALLIBURTON SERVICE

SAFETY DATA SHEET

Product Trade Name: **MC MX 6-2960**

Revision Date: 18-Jul-2016 **Revision Number:** 4

1. Identification

1.1. Product Identifier

Product Trade Name: MC MX 6-2960
Synonyms None
Chemical Family: Blend
Internal ID Code MC001977

1.2 Recommended use and restrictions on use

Application: Corrosion Inhibitor
Uses advised against Consumer use

1.3 Manufacturer's Name and Contact Details

Manufacturer/Supplier
Multi-Chem Group LLC
3000 N. Sam Houston Pkwy E., Houston, TX 77032
Phone: 1 281 871 4000

Halliburton Energy Services, Inc.
645 - 7th Ave SW Suite 1800
Calgary, AB
T2P 4G8
Canada

Prepared By Chemical Stewardship
Telephone: 1-281-871-6107
e-mail: fdunexchem@halliburton.com

1.4. Emergency telephone number

Emergency Telephone Number: 1-866-519-4752 or 1-760-476-3962
Global Incident Response Access Code: 334305
Contract Number: 14012

2. Hazards Identification

2.1 Classification in accordance with paragraph (d) of §1910.1200

Skin Corrosion / Irritation	Category 1 - H314
Serious Eye Damage/Irritation	Category 1 - H318
Skin Sensitization	Category 1 - H317
Reproductive Toxicity	Category 1B - H360
Specific Target Organ Toxicity - (Repeated Exposure)	Category 1 - H372
Acute Aquatic Toxicity	Category 1 - H400
Chronic Aquatic Toxicity	Category 2 - H411

Flammable liquids.	Category 4 - H227

2.2. Label Elements

Hazard Pictograms

Signal Word: Danger

Hazard Statements

H227 - Combustible liquid
H314 - Causes severe skin burns and eye damage
H317 - May cause an allergic skin reaction
H318 - Causes serious eye damage
H360 - May damage fertility or the unborn child
H372 - Causes damage to organs through prolonged or repeated exposure
H400 - Very toxic to aquatic life
H411 - Toxic to aquatic life with long lasting effects

Precautionary Statements

Prevention

P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash face, hands and any exposed skin thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P272 - Contaminated work clothing should not be allowed out of the workplace
P273 - Avoid release to the environment
P280 - Wear protective gloves/protective clothing/eye protection/face protection

Response

P301 + P330 + P331 - IF SWALLOWED: rinse mouth. Do NOT induce vomiting
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P303 + P361 + P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P363 - Wash contaminated clothing before reuse
P304 + P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
P310 - Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P370 + P378 - In case of fire: Use CO2, dry chemical, or foam
P391 - Collect spillage

Storage

P403 + P235 - Store in a well-ventilated place. Keep cool
P405 - Store locked up

Disposal

P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

2.3 Hazards not otherwise classified

None known

3. Composition/information on Ingredients

Substances	CAS Number	PERCENT (w/w)	GHS Classification - US
Ethylene glycol	107-21-1	5 - 10%	Acute Tox. 4 (H302) STOT RE 1 (H372)
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	1 - 5%	Acute Tox. 4 (H302) Acute Tox. 3 (H311) Skin Corr. 1B (H314) Eye Corr. 1 (H318) STOT SE 3 (H335) Aquatic Acute 1 (H400) Aquatic Chronic 1 (H410)
Pyridinium Salt	Proprietary	1 - 5%	Acute Tox. 4 (H302) Acute Tox. 3 (H311) Acute Tox. 3 (H331) Skin Irrit. 2 (H315) Eye Irrit. 2 (H319) Skin Sens. 1 (H317) Aquatic Acute 2 (H401) Flam. Liq. 4 (H227)
Ammonium bisulfite	10192-30-0	1 - 5%	Eye Irrit. 2A (H319) STOT SE 3 (H335) Aquatic Acute 3 (H402)
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	1 - 5%	Skin Irrit. 2 (H315) Eye Irrit. 2 (H319) STOT SE 3 (H335) Aquatic Acute 1 (H400)
Complex Phosphate Ester Compounds	Proprietary	1 - 5%	Skin Corr. 1 (H314) Eye Corr. 1 (H318) STOT SE 3 (H335) Aquatic Acute 1 (H400) Aquatic Chronic 2 (H411)
Complex Amine Compound	Proprietary	1 - 5%	Acute Tox. 4 (H302) Eye Irrit. 2 (H319)
Isopropanol	67-63-0	1 - 5%	Eye Irrit. 2 (H319) STOT SE 3 (H336) Flam. Liq. 2 (H225)
2-Mercaptoethanol	60-24-2	1 - 5%	Acute Tox. 3 (H301) Acute Tox. 2 (H310) Acute Tox. 2 (H330) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Skin Sens. 1 (H317) STOT SE 3 (H335) STOT RE 2 (H373) Aquatic Acute 1 (H400) Aquatic Chronic 1 (H410) Flam. Liq. 4 (H227)
Methanol	67-56-1	0.1 - 1%	Acute Tox. 3 (H301) Acute Tox. 3 (H311) Acute Tox. 3 (H331) Repr. 1B (H360) STOT SE 1 (H370) Flam. Liq. 2 (H225)
Diethylenetriamine	111-40-0	0.1 - 1%	Acute Tox. 4 (H302) Acute Tox. 4 (H312) Acute Tox. 2 (H330) Skin Corr. 1B (H314) Eye Corr. 1 (H318) Skin Sens. 1 (H317) STOT SE 2 (H371) STOT SE 3 (H335) Aquatic Acute 3 (H402)
Triethylenetetraamine	112-24-3	0.1 - 1%	Acute Tox. 3 (H311) Skin Corr. 1B (H314)

			Eye Corr. 1 (H318) Skin Sens. 1 (H317) STOT SE 3 (H335) Aquatic Acute 2 (H401) Aquatic Chronic 2 (H411)

The specific chemical identity of the composition has been withheld as proprietary. The exact percentage (concentration) of the composition has been withheld as proprietary.

4. First Aid Measures

4.1. Description of first aid measures

Inhalation If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

Eyes In case of contact, immediately flush eyes with plenty of water for at least 30 minutes. Remove contact lenses after the first 5 minutes and continue washing. Seek immediate medical attention/advice. Suitable emergency eye wash facility should be immediately available

Skin In case of contact, immediately flush skin with plenty of soap and water for at least 30 minutes and remove contaminated clothing, shoes and leather goods immediately. Get medical attention immediately.

Ingestion Following ingestion, onset of symptoms may be delayed by 12 to 24 hours. Admission to hospital should be the first priority even if symptoms are absent.

4.2 Most important symptoms/effects, acute and delayed

Causes severe skin irritation with tissue destruction. Causes severe eye irritation which may damage tissue. May cause allergic skin reaction. Potential reproductive hazard. May cause birth defects. May cause damage to organs through prolonged or repeated exposure.

4.3. Indication of any immediate medical attention and special treatment needed

Notes to Physician Gastric lavage or emesis should be performed as soon as possible to minimize absorption, and is recommended within 4 hours of ingestion. Ethanol may be given intravenously to prevent build-up of toxic effects of methanol metabolites. Visual disturbances and metabolic acidosis may occur and dialysis, preferably hemodialysis may be employed to treat these complications.

5. Fire-fighting measures

5.1. Extinguishing media

Suitable Extinguishing Media

Water fog, carbon dioxide, foam, dry chemical.

Extinguishing media which must not be used for safety reasons

Do NOT spray pool fires directly with water. A solid stream of water directed into hot burning liquid can cause splattering.

5.2 Specific hazards arising from the substance or mixture

Special exposure hazards in a fire

Decomposition in fire may produce harmful gases.

5.3 Special protective equipment and precautions for fire-fighters

Special protective equipment for firefighters

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Ensure adequate ventilation. Use appropriate protective equipment. Do not breathe dust/fume/gas/mist/vapors/spray. Remove sources of ignition. Take precautionary measures against static discharges All equipment used when handling the product must be grounded Avoid contact with skin, eyes and clothing.
See Section 8 for additional information

6.2. Environmental precautions

Prevent from entering sewers, waterways, or low areas.

6.3. Methods and material for containment and cleaning up

Dike far ahead of liquid spill for later disposal. Soak up with inert absorbent material. Pick up and transfer to properly labeled containers. Remove ignition sources and work with non-sparking tools.

7. Handling and storage

7.1. Precautions for safe handling

Handling Precautions

Do not breathe dust/fume/gas/mist/vapors/spray. Ensure adequate ventilation. Use appropriate protective equipment. Remove sources of ignition. Ground and bond containers when transferring from one container to another. Avoid contact with eyes, skin, or clothing.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage Information

Store in a cool well ventilated area. Keep from heat, sparks, and open flames.

8. Exposure Controls/Personal Protection

8.1 Occupational Exposure Limits

Substances	CAS Number	OSHA PEL-TWA	ACGIH TLV-TWA
Ethylene glycol	107-21-1	Not applicable	Not applicable
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	Not applicable	Not applicable
Pyridinium Salt	Proprietary	Not applicable	Not applicable
Ammonium bisulfite	10192-30-0	Not applicable	Not applicable
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	Not applicable	Not applicable
Complex Phosphate Ester Compounds	Proprietary	Not applicable	Not applicable
Complex Amine Compound	Proprietary	Not applicable	Not applicable
Isopropanol	67-63-0	TWA: 400 ppm TWA: 980 mg/m^3	TWA: 200 ppm STEL: 400 ppm
2-Mercaptoethanol	60-24-2	Not applicable	Not applicable
Methanol	67-56-1	TWA: 200 ppm TWA: 260 mg/m^3	TWA: 200 ppm STEL: 250 ppm
Diethylenetriamine	111-40-0	Not applicable	TWA: 1 ppm
Triethylenetetraamine	112-24-3	Not applicable	Not applicable

8.2 Appropriate engineering controls

Engineering Controls Ensure adequate ventilation, especially in confined areas

8.3 Individual protection measures, such as personal protective equipment

Personal Protective Equipment If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the

specific application of this product.

Respiratory Protection	If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.
Hand Protection	Use gloves which are suitable for the chemicals present in this product as well as other environmental factors in the workplace.
Skin Protection	Wear impervious protective clothing, including boots, gloves, lab coat, apron, rain jacket, pants or coverall, as appropriate, to prevent skin contact.
Eye Protection	Safety glasses with side-shields. If splashes are likely to occur, wear: Goggles, Face-shield.
Other Precautions	Eyewash fountains and safety showers must be easily accessible.

9. Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical State:	Liquid	**Color**	Clear to Slightly Hazy , Light Amber to Dark Amber
Odor:	Pungent	**Odor Threshold:**	No information available

Property Remarks/ - Method	Values
pH:	5.0-7.0 (10% in 1:1 IPA:H2O)
Freezing Point / Range	-12.2 °C / 10 °F
Melting Point / Range	No data available
Boiling Point / Range	No data available
Flash Point	69.4 °C / 156.9 °F (SFCC)
Flammability (solid, gas)	No data available
Upper flammability limit	No data available
Lower flammability limit	No data available
Evaporation rate	
Vapor Pressure	No data available
Vapor Density	No data available
Specific Gravity	1.0236-1.0486 (20 °C/68 °F)
Water Solubility	No data available
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

9.2. Other information

VOC Content (%)	No data available
Liquid Density	8.53 - 8.74 lbs/gal

10. Stability and Reactivity

10.1. Reactivity

Not expected to be reactive.

10.2. Chemical stability
Stable

10.3. Possibility of hazardous reactions
Will Not Occur

10.4. Conditions to avoid
Keep away from heat, sparks and flame.

10.5. Incompatible materials
Strong oxidizers.

10.6. Hazardous decomposition products
Carbon oxides. Oxides of nitrogen.

11. Toxicological Information

11.1 Information on likely routes of exposure
Principle Route of Exposure Inhalation. Ingestion. Eye contact. Skin contact.

11.2 Symptoms related to the physical, chemical and toxicological characteristics
Acute Toxicity

Inhalation May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.

Eye Contact Causes serious eye damage.

Skin Contact Causes severe burns. May cause an allergic skin reaction.

Ingestion Ingestion of this product may cause blindness due to the presence of methanol. Causes burns of the mouth, throat and stomach.

Chronic Effects/Carcinogenicity May cause birth defects. Contains known or suspected reproductive toxins. Causes damage to organs through prolonged or repeated exposure.

11.3 Toxicity data

Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Ethylene glycol	107-21-1	4000 mg/kg (Rat) 7712 mg/kg (Rat) > 10000 mg/kg (Rat) 1670 mg/kg (Cat) 1400 – 1600 mg/kg (Human)	9530 µL/kg (Rabbit) > 3500 mg/kg (Mouse)	> 2.5 mg/L (Rat) 6h (saturated concentration)
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	304.5 mg/kg (Rat)	930 mg/kg (rat)	No data available
Pyridinium Salt	Proprietary	1377 mg/kg bw (rat) (similar substance)	1000 mg/kg-bw (rabbit) (similar substance)	2.67 mg/L (rat, 4h, vapor) (similar substance)
Ammonium bisulfite	10192-30-0	11200 mg/kg 2610 mg/kg (Rat) (similar substance)	> 2000 mg/kg (Rat) (similar substance)	> 5.5 mg/L (Rat) 4h (similar substance)
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	No data available	No data available	No data available
Complex Phosphate Ester Compounds	Proprietary	> 2000 mg/kg < 5000 mg/kg (Rat) (similar substance)	No data available	No data available
Complex Amine Compound	Proprietary	1990 mg/kg (Rat) (similar substance)	> 5000 mg/kg (Rabbit) (similar substance)	> Saturated Vapors (Rat) 8h (similar substace)
Isopropanol	67-63-0	5840 mg/kg-bw (rat)	12870 mg/kg-bw (rabbit)	72.6 mg/L (Rat, 4h, vapor)

2-Mercaptoethanol	60-24-2	98 - 336 mg/kg (Rat)	112-251 mg/kg (Rabbit)	2 mg/L (Rat) 4h
Methanol	67-56-1	300 mg/kg-bw (human) < 790 to 13,000 mg/kg (rat)	1000 mg/kg-bw (human) 17,100 mg/kg (rabbit)	10 mg/L (human, 4h, vapor)
Diethylenetriamine	111-40-0	1553 mg/kg (Rat)	678 mg/kg (Rabbit)	0.07 mg/L (Rat, 4h, aerosol)
Triethylenetetraamine	112-24-3	2500 mg/kg (Rat)	550 mg/kg (Rabbit)	> Saturated concentration (Rat, 4h, vapour)

Substances	CAS Number	Skin corrosion/irritation
Ethylene glycol	107-21-1	Non-irritating to the skin (Rabbit)
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	Causes burns (Rabbit)
Pyridinium Salt		Skin, rabbit: Causes moderate skin irritation. (similar substances) Irritating to skin.
Ammonium bisulfite	10192-30-0	Not irritating to skin in rabbits.
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	May cause moderate skin irritation.
Complex Phosphate Ester Compounds		Causes severe skin irritation with tissue destruction.
Complex Amine Compound		Not irritating to skin in rabbits.
Isopropanol	67-63-0	Non-irritating to the skin (Rabbit)
2-Mercaptoethanol	60-24-2	Skin, rabbit: Causes moderate skin irritation.
Methanol	67-56-1	Non-irritating to the skin (Rabbit)
Diethylenetriamine	111-40-0	Corrosive to skin (Rabbit)
Triethylenetetraamine	112-24-3	Causes severe skin irritation with tissue destruction. (Rabbit)

Substances	CAS Number	Serious eye damage/irritation
Ethylene glycol	107-21-1	Non-irritating to the eye (Rabbit)
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	Causes eye burns (Rabbit)
Pyridinium Salt		Causes severe eye irritation (similar substances) Causes moderate eye irritation Eye, rabbit:
Ammonium bisulfite	10192-30-0	Eye, rabbit: Causes mild eye irritation. (similar substances)
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	May cause moderate eye irritation.
Complex Phosphate Ester Compounds		Causes severe eye irritation (Rabbit) (similar substances)
Complex Amine Compound		Eye, rabbit: Causes moderate eye irritation
Isopropanol	67-63-0	Causes moderate eye irritation (Rabbit)
2-Mercaptoethanol	60-24-2	Eye, rabbit: Causes severe eye irritation. Will damage tissue.
Methanol	67-56-1	Non-irritating to the eye (Rabbit)
Diethylenetriamine	111-40-0	Corrosive to eyes (Rabbit)
Triethylenetetraamine	112-24-3	Causes severe eye irritation which may damage tissue. (Rabbit)

Substances	CAS Number	Skin Sensitization
Ethylene glycol	107-21-1	Did not cause sensitization on laboratory animals (guinea pig) Patch test on human volunteers did not demonstrate sensitization properties
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	Did not cause sensitization on laboratory animals (guinea pig)
Pyridinium Salt		May cause sensitization by skin contact (mouse) (similar substances)
Ammonium bisulfite	10192-30-0	Did not cause sensitization on laboratory animals (mouse) (similar substances)
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	No information available
Complex Phosphate Ester Compounds		Did not cause sensitization on laboratory animals (guinea pig) (similar substances)
Complex Amine Compound		Did not cause sensitization on laboratory animals (guinea pig) (similar substances)
Isopropanol	67-63-0	Did not cause sensitization on laboratory animals (guinea pig)
2-Mercaptoethanol	60-24-2	Skin sensitizer in guinea pig.
Methanol	67-56-1	Did not cause sensitization on laboratory animals (guinea pig)
Diethylenetriamine	111-40-0	Skin sensitizer in guinea pig.
Triethylenetetraamine	112-24-3	Skin sensitizer in guinea pig.

Substances	CAS Number	Respiratory Sensitization

Ethylene glycol	107-21-1	No information available
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	No information available
Pyridinium Salt		No information available
Ammonium bisulfite	10192-30-0	No information available
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	No information available
Complex Phosphate Ester Compounds		No information available
Complex Amine Compound		No information available
Isopropanol	67-63-0	No information available
2-Mercaptoethanol	60-24-2	No information available
Methanol	67-56-1	No information available
Diethylenetriamine	111-40-0	No data of sufficient quality are available.
Triethylenetetraamine	112-24-3	No information available

Substances	CAS Number	Mutagenic Effects
Ethylene glycol	107-21-1	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects.
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	Did not show mutagenic effects in animal experiments
Pyridinium Salt		While some in vitro tests were positive and/or equivocal, in vivo results were negative. (similar substances)
Ammonium bisulfite	10192-30-0	Did not show mutagenic effects in animal experiments (similar substances)
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	No information available
Complex Phosphate Ester Compounds		In vitro tests did not show mutagenic effects (similar substances)
Complex Amine Compound		In vitro tests did not show mutagenic effects In vivo tests did not show mutagenic effects. (similar substances)
Isopropanol	67-63-0	In vitro tests did not show mutagenic effects. In vivo tests did not show mutagenic effects.
2-Mercaptoethanol	60-24-2	The weight of evidence from available in vitro and in vivo studies indicates that this substance is not expected to be mutagenic.
Methanol	67-56-1	The weight of evidence from available in vitro and in vivo studies indicates that this substance is not expected to be mutagenic.
Diethylenetriamine	111-40-0	In vitro tests did not show mutagenic effects In vivo tests did not show mutagenic effects.
Triethylenetetraamine	112-24-3	While some in vitro tests were positive and/or equivocal, in vivo results were negative.

Substances	CAS Number	Carcinogenic Effects
Ethylene glycol	107-21-1	Did not show carcinogenic effects in animal experiments
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	Did not show carcinogenic effects in animal experiments
Pyridinium Salt		No information available
Ammonium bisulfite	10192-30-0	Did not show carcinogenic or teratogenic effects in animal experiments (similar substances)
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	No information available
Complex Phosphate Ester Compounds		Did not show carcinogenic effects in animal experiments (similar substances)
Complex Amine Compound		No information available
Isopropanol	67-63-0	Did not show carcinogenic effects in animal experiments
2-Mercaptoethanol	60-24-2	No information available
Methanol	67-56-1	No data of sufficient quality are available.
Diethylenetriamine	111-40-0	Did not show carcinogenic effects in animal experiments
Triethylenetetraamine	112-24-3	Did not show carcinogenic effects in animal experiments

Substances	CAS Number	Reproductive toxicity
Ethylene glycol	107-21-1	Fetotoxic and teratogenic effects observed in experimental animals at concentrations that did not produce maternal toxicity.
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	Not a confirmed teratogen or embryotoxin.
Pyridinium Salt		Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal

		experiments. (similar substances)
Ammonium bisulfite	10192-30-0	Animal testing did not show any effects on fertility. (similar substances)
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	No information available
Complex Phosphate Ester Compounds		Not a confirmed teratogen or embryotoxin. (similar substances)
Complex Amine Compound		Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)
Isopropanol	67-63-0	Animal testing did not show any effects on fertility.
2-Mercaptoethanol	60-24-2	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.
Methanol	67-56-1	Experiments have shown reproductive toxicity effects on laboratory animals
Diethylenetriamine	111-40-0	Did not show teratogenic effects in animal experiments.
Triethylenetetraamine	112-24-3	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments.

Substances	CAS Number	STOT - single exposure
Ethylene glycol	107-21-1	No significant toxicity observed in animal studies at concentration requiring classification.
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	Causes moderate respiratory irritation.
Pyridinium Salt		No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Ammonium bisulfite	10192-30-0	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	May cause respiratory irritation.
Complex Phosphate Ester Compounds		May cause respiratory irritation. (similar substances)
Complex Amine Compound		No information available
Isopropanol	67-63-0	May cause headache, dizziness, and other central nervous system effects.
2-Mercaptoethanol	60-24-2	May cause respiratory irritation.
Methanol	67-56-1	May cause disorder and damage to the Central Nervous System (CNS)
Diethylenetriamine	111-40-0	May cause respiratory irritation. May cause disorder and damage to the (Liver) Kidney Respiratory system.
Triethylenetetraamine	112-24-3	May cause respiratory irritation.

Substances	CAS Number	STOT - repeated exposure
Ethylene glycol	107-21-1	Causes damage to organs through prolonged or repeated exposure: Kidney
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	None under normal use conditions
Pyridinium Salt		No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Ammonium bisulfite	10192-30-0	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	No information available
Complex Phosphate Ester Compounds		No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Complex Amine Compound		No significant toxicity observed in animal studies at concentration requiring classification.
Isopropanol	67-63-0	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
2-Mercaptoethanol	60-24-2	Causes damage to organs through prolonged or repeated exposure: (Liver) Heart
Methanol	67-56-1	No data of sufficient quality are available.
Diethylenetriamine	111-40-0	No significant toxicity observed in animal studies at concentration requiring classification.
Triethylenetetraamine	112-24-3	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Ethylene glycol	107-21-1	Not applicable
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	No information available
Pyridinium Salt		Not applicable
Ammonium bisulfite	10192-30-0	Not applicable

Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	Not applicable
Complex Phosphate Ester Compounds		Not applicable
Complex Amine Compound		Not applicable
Isopropanol	67-63-0	Not applicable
2-Mercaptoethanol	60-24-2	Not applicable
Methanol	67-56-1	Not applicable
Diethylenetriamine	111-40-0	No information available
Triethylenetetraamine	112-24-3	Not applicable

12. Ecological Information

12.1. Toxicity

Ecotoxicity effects

Very toxic to aquatic life. Toxic to aquatic life with long lasting effects.

Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Ethylene glycol	107-21-1	EC50 6500 - 13000 mg/L (Pseudokirchneriella subcapitata) TGK (8d) > 10000 mg/L (Scenedesmus quadricauda) EC50 (72h) 6500 mg/L (Selenastrum capricornatum)	LC50 41000 mg/L (Oncorhynchus mykiss) LC50 (96h) 72860 mg/L (Pimephales promelas) LC50 (96h) 8050 mg/L (Selenastrum capricornatum) NOEC (7d) 15380 mg/L (mortality) (Pimephales promelas)	TTC (16h) > 10000 mg/L (Pseudomonas putida) EC20 (30 m) > 1995 mg/L (activated sludge, domestic) (similar substance)	EC50 46300 mg/L (Daphnia magna) EC50 (48 h) 7170 mg/L (Daphnia magna) NOEC (7d) 8590 mg/L (reproduction) (Ceriodaphnia dubia)
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	EC50 (72h) < 0.1 mg/L (Skeletonema costatum)	LC50 (96h) 0.44 mg/L (Scophthalmus maximus)	No information available	LC50 (48h) 0.72 mg/L (Acartia tonsa)
Pyridinium Salt	Proprietary	LC50 (72 h) =61.2 mg/L (Scenedesmus capricornutum)	LC50 (96 h) =2.96 mg/L (Oncorhynchus mykiss)	No information available	EC50 (48 h) =39.6 mg/L (Daphnia magna) NOEC (21 d) =22.2 mg/L (Daphnia magna)
Ammonium bisulfite	10192-30-0	ErC50 (72h) 43.8 mg/L (Desmodesmus subspicatus) (similar substance)	LC50 5000 mg/L (Lepomis macrochirus) LC50 (96h) 681.2 mg/L (Danio rerio) (similar substance) LC50 (96h) 316 mg/L (Leuciscus idus) (similar substance) NOEC (34d) => 316 mg/L (Danio rerio) (similar substance)	EC50 (17h) 410 mg/L (Pseudomonas putida) (similar substance) EC50 (17h) 65 mg/L (Pseudomonas putida) (similar substance)	EC50 (48h) >1000 mg/L (Daphnia magna) EC50 (48 hr) 89 mg/L (Daphnia magna) (similar substance) NOEC (21d) > 10 mg/L (Daphnia magna) (reproduction) (similar substance)
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	No information available	No information available	No information available	No information available
Complex Phosphate Ester Compounds	Proprietary	EC50 (72h) 3 mg/L (Pseudokirchneriella subcapitata)	LC50 (96h) 0.323 mg/L (Pimephales promelas)	EC50 (3h) 104 mg/L (Sludge) (similar substance)	LC50 (48h) 0.148 mg/L (Daphnia magna) NOEC (21d) 0.1 mg/L (Daphnia magna)
Complex Amine Compound	Proprietary	EC50 (72h) 141 mg/L (Skeletonema costatum) NOEC (72h) 6.25 mg/L (Desmodesmus subspicatus) (similar substances)	LC50 (96h) 1466 mg/L (Leuciscus idus) LC50 (96h) > 1000 mg/L (Cyprinodon variegatus) LC50 (96h) 1170 mg/L (Pimephales promelas) (similar substances)	EC50 (17h) 413.8 mg/L (Pseudomonas putida) (similar substance)	EC50 (48h) 230 mg/L (Daphnia magna) (similar substance)
Isopropanol	67-63-0	EC50 (72h) > 1000 mg/L (Desmodesmus subspicatus)	LC50 (96h) 9640 mg/L (Pimephales promelas) LC50 (7d) 7060 mg/L	TT (16h) 1050 mg/L (Pseudomonas putida)	EC50 (48h) 13,299 mg/L (Daphnia magna) EC50 (24h) > 10,000

		EC50 (7d) 1800 mg/L (Scenedesmus quadricauda)	(Poecilia reticulata)		mg/L (Daphnia magna)
2-Mercaptoethanol	60-24-2	EC50 (72h) 12 mg/L (Desmodesmus subspicatus) EC50 (72h) 19 mg/L (Desmodesmus subspicatus)	LC50 (96h) 37 mg/L (Leuciscus idus) LC50 (96h) 46 mg/L (Leuciscus idus) LC50 (96h) 46-100 mg/L (Leuciscus idus) LC50 (96h) 46-100 mg/L (Carassius carassis auratis)	No information available	EC50 (48h) 0.4 mg/L (Daphnia magna) NOEC (21d) 0.0632 mg/L (Daphnia magna)
Methanol	67-56-1	EC50 (96 h) =22000 mg/L (Pseudokirchnerella subcapitata) NOEC (8 d) =8000 mg/L (Scenedesmus quadricauda)	LC50 (96 h) =15400 mg/L (Lepomis macrochirus) EC50 (200 h) =14536 mg/L (Oryzias latipes)	IC50 (3h) > 1000 mg/L (activated sludge)	EC50 (96 h) =18260 mg/L (Dapnia magna) NOEC (21 d) =208 mg/L (Dapnia magna)
Diethylenetriamine	111-40-0	EC50 (72h) 187 mg/L (Pseudokirchnerella subcapitata) (biomass)	LC50 (96h) 430 mg/L (Poecilia reticulata) NOEC (28d) > 10 mg/L (Gasterosteus aculeatus)	ErC50 (3h) 32.7 mg/L (Nitrifying bacteria)	EC50 (48h) 16 mg/L (Daphnia magna) NOEC (21d) 5.6 mg/L (Daphnia magna)
Triethylenetetraamine	112-24-3	EC50 (72h) 2.5 mg/L (Desmodesmus subspicatus) ErC50 (96h) 3.7 mg/L (Selenastrum capriocornutum)	LC50 (96h): 570 mg/L (Poecilia reticulate) LC50(96h): 495 mg/L (Pimephales promelas)	EC6 (25h) 500 mg/L (Pseudomonas fluorescens)	EC50 (48h) 31.1 mg/L (Daphnia magna) NOEC (21d) 1 mg/L (Daphnia magna)

12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Ethylene glycol	107-21-1	Readily biodegradable (100% @ 10d)
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	Biodegradable.
Pyridinium Salt	Proprietary	Not readily biodegradable. (56.6% @ 28d)
Ammonium bisulfite	10192-30-0	The methods for determining biodegradability are not applicable to inorganic substances.
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	Readily biodegradable
Complex Phosphate Ester Compounds	Proprietary	Not readily biodegradable (58.7%% @ 28d) (similar substances)
Complex Amine Compound	Proprietary	Readily biodegradable (96% @ 18d)
Isopropanol	67-63-0	Readily biodegradable (53% @ 5d)
2-Mercaptoethanol	60-24-2	Product is not biodegradable (15-21% @ 28d)
Methanol	67-56-1	Readily biodegradable (95-97% @ 20d)
Diethylenetriamine	111-40-0	Readily biodegradable (> 96% @ 10d)
Triethylenetetraamine	112-24-3	(0% @ 28d)

12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Ethylene glycol	107-21-1	-1.36
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	No information available
Pyridinium Salt	Proprietary	2.1 - 2.52 (similar substance)
Ammonium bisulfite	10192-30-0	No information available
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	No information available
Complex Phosphate Ester Compounds	Proprietary	4.48
Complex Amine Compound	Proprietary	-1.16 (similar substance)
Isopropanol	67-63-0	0.05
2-Mercaptoethanol	60-24-2	-0.056
Methanol	67-56-1	-0.77 BCF = 1.0 – 4.5 (Cyprinus carpio)

		BCF < 10 (Leuciscus idus melanotus)
Diethylenetriamine	111-40-0	-1.58
Triethylenetetraamine	112-24-3	-1.4

12.4. Mobility in soil

Substances	CAS Number	Mobility
Ethylene glycol	107-21-1	No information available
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	No information available
Pyridinium Salt	Proprietary	No information available
Ammonium bisulfite	10192-30-0	No information available
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	No information available
Complex Phosphate Ester Compounds	Proprietary	No information available
Complex Amine Compound	Proprietary	KOC = 0.17
Isopropanol	67-63-0	No information available
2-Mercaptoethanol	60-24-2	KOC = 1.325
Methanol	67-56-1	No information available
Diethylenetriamine	111-40-0	KOC = 2582 - 36,658
Triethylenetetraamine	112-24-3	No information available

12.5 Other adverse effects

No information available

13. Disposal Considerations

13.1. Waste treatment methods

Disposal methods Disposal should be made in accordance with federal, state, and local regulations.
Contaminated Packaging Dispose of container according to national or local regulations.

14. Transport Information

US DOT

UN Number UN1760
UN proper shipping name: Corrosive Liquid, N.O.S. (Contains Quaternary ammonium compound, Complex Phosphate Ester Compounds)
Transport Hazard Class(es): 8
Packing Group: III
Environmental Hazards: Marine Pollutant
NAERG: NAERG 154

Canadian TDG

UN Number UN1760
UN proper shipping name: Corrosive Liquid, N.O.S. (Contains Quaternary ammonium compound, Complex Phosphate Ester Compounds)
Transport Hazard Class(es): 8
Packing Group: III
Environmental Hazards: Marine Pollutant

IMDG/IMO

UN Number UN1760
UN proper shipping name: Corrosive Liquid, N.O.S. (Contains Quaternary ammonium compound, Complex Phosphate Ester Compounds)
Transport Hazard Class(es): 8
Packing Group: III
Environmental Hazards: Marine Pollutant
EMS: EmS F-A, S-B

IATA/ICAO

UN Number UN1760
UN proper shipping name: Corrosive Liquid, N.O.S. (Contains Quaternary ammonium compound, Complex Phosphate Ester Compounds)
Transport Hazard Class(es): 8
Packing Group: III
Environmental Hazards: Marine Pollutant

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable
Special Precautions for User None

15. Regulatory Information

US Regulations

US TSCA Inventory All components listed on inventory or are exempt.

TSCA Significant New Use Rules - S5A2

Substances	CAS Number	TSCA Significant New Use Rules - S5A2
Ethylene glycol	107-21-1	Not applicable
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	Not applicable
Pyridinium Salt	Proprietary	Not applicable
Ammonium bisulfite	10192-30-0	Not applicable
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	Not applicable
Complex Phosphate Ester Compounds	Proprietary	Not applicable
Complex Amine Compound	Proprietary	Not applicable
Isopropanol	67-63-0	Not applicable
2-Mercaptoethanol	60-24-2	Not applicable
Methanol	67-56-1	Not applicable
Diethylenetriamine	111-40-0	Not applicable
Triethylenetetraamine	112-24-3	Not applicable

EPA SARA Title III Extremely Hazardous Substances

Substances	CAS Number	EPA SARA Title III Extremely Hazardous Substances
Ethylene glycol	107-21-1	Not applicable
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	Not applicable
Pyridinium Salt	Proprietary	Not applicable
Ammonium bisulfite	10192-30-0	Not applicable
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	Not applicable
Complex Phosphate Ester Compounds	Proprietary	Not applicable
Complex Amine Compound	Proprietary	Not applicable
Isopropanol	67-63-0	Not applicable
2-Mercaptoethanol	60-24-2	Not applicable
Methanol	67-56-1	Not applicable
Diethylenetriamine	111-40-0	Not applicable
Triethylenetetraamine	112-24-3	Not applicable

EPA SARA (311,312) Hazard Class

Acute Health Hazard
Chronic Health Hazard
Fire Hazard

EPA SARA (313) Chemicals

Substances	CAS Number	Toxic Release Inventory (TRI) - Group I	Toxic Release Inventory (TRI) - Group II
Ethylene glycol	107-21-1	1.0%	Not applicable
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	Not applicable	Not applicable

Pyridinium Salt	Proprietary	Not applicable	Not applicable
Ammonium bisulfite	10192-30-0	1.0%	Not applicable
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	Not applicable	Not applicable
Complex Phosphate Ester Compounds	Proprietary	Not applicable	Not applicable
Complex Amine Compound	Proprietary	Not applicable	Not applicable
Isopropanol	67-63-0	1.0%	Not applicable
2-Mercaptoethanol	60-24-2	Not applicable	Not applicable
Methanol	67-56-1	1.0%	Not applicable
Diethylenetriamine	111-40-0	Not applicable	Not applicable
Triethylenetetraamine	112-24-3	Not applicable	Not applicable

EPA CERCLA/Superfund Reportable Spill Quantity

Substances	CAS Number	CERCLA RQ
Ethylene glycol	107-21-1	5000 lb 2270 kg
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	Not applicable
Pyridinium Salt	Proprietary	Not applicable
Ammonium bisulfite	10192-30-0	5000 lb 2270 kg
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	Not applicable
Complex Phosphate Ester Compounds	Proprietary	Not applicable
Complex Amine Compound	Proprietary	Not applicable
Isopropanol	67-63-0	Not applicable
2-Mercaptoethanol	60-24-2	Not applicable
Methanol	67-56-1	5000 lb 2270 kg
Diethylenetriamine	111-40-0	Not applicable
Triethylenetetraamine	112-24-3	Not applicable

EPA RCRA Hazardous Waste Classification

Corrosivity D002

California Proposition 65

Substances	CAS Number	California Proposition 65
Ethylene glycol	107-21-1	developmental toxicity
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	Not applicable
Pyridinium Salt	Proprietary	Not applicable
Ammonium bisulfite	10192-30-0	Not applicable
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	Not applicable
Complex Phosphate Ester Compounds	Proprietary	Not applicable
Complex Amine Compound	Proprietary	Not applicable
Isopropanol	67-63-0	Not applicable
2-Mercaptoethanol	60-24-2	Not applicable
Methanol	67-56-1	developmental toxicity
Diethylenetriamine	111-40-0	Not applicable
Triethylenetetraamine	112-24-3	Not applicable

U.S. State Right-to-Know Regulations

Substances	CAS Number	MA Right-to-Know Law	NJ Right-to-Know Law	PA Right-to-Know Law
Ethylene glycol	107-21-1	Present	0878	Environmental hazard
n-Benzyl dimethyl cocoamine, C12-C18 quaternary salt	61789-71-7	Not applicable	Not applicable	Not applicable
Pyridinium Salt	Proprietary	Not applicable	Not applicable	Not applicable
Ammonium bisulfite	10192-30-0	Present	0090	Environmental hazard
Fatty acids, tall-oil, reaction products with diethylenetriamine, acetates	68153-60-6	Not applicable	Not applicable	Not applicable
Complex Phosphate Ester Compounds	Proprietary	Not applicable	Not applicable	Not applicable
Complex Amine Compound	Proprietary	Not applicable	Not applicable	Not applicable
Isopropanol	67-63-0	Present	1076	Environmental hazard

2-Mercaptoethanol	60-24-2	Present	2821	Present
Methanol	67-56-1	Present	1222	Environmental hazard
Diethylenetriamine	111-40-0	Present	0700	Present
Triethylenetetraamine	112-24-3	Present	1908	Present

NFPA Ratings: Health 3, Flammability 2, Reactivity 0
HMIS Ratings: Health 3*, Flammability 2, Physical Hazard 0 , PPE: X

Canadian Regulations

Canadian Domestic Substances List (DSL) All components listed on inventory or are exempt.

16. Other information

Preparation Information

Prepared By
Chemical Stewardship
Telephone: 1-281-871-6107
e-mail: fdunexchem@halliburton.com

Revision Date: 18-Jul-2016

Reason for Revision Initial Release

Additional information
For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

Key or legend to abbreviations and acronyms used in the safety data sheet
bw – body weight
CAS – Chemical Abstracts Service
d - day
EC50 – Effective Concentration 50%
ErC50 – Effective Concentration growth rate 50%
h - hour
LC50 – Lethal Concentration 50%
LD50 – Lethal Dose 50%
LL50 – Lethal Loading 50%
mg/kg – milligram/kilogram
mg/L – milligram/liter
mg/m^3 - milligram/cubic meter
mm - millimeter
mmHg - millimeter mercury
NIOSH – National Institute for Occupational Safety and Health
NTP – National Toxicology Program
OEL – Occupational Exposure Limit
PEL – Permissible Exposure Limit
ppm – parts per million
STEL – Short Term Exposure Limit
TWA – Time-Weighted Average
UN – United Nations
w/w - weight/weight

Key literature references and sources for data
www.ChemADVISOR.com/

Disclaimer Statement

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

End of Safety Data Sheet

Exhibit 4-C

Brine Laboratory Results

ENVIRONMENTAL SERVICE LABORATORIES, INC.

1803 Philadelphia Street
Indiana, PA 15701
P: (724) 463-8378
F: (724) 465-4209
PADEP: 32-00382

1276 Bentleyville Road
Van Voorhis, PA 15366
P: (724) 258-8378
F: (724) 258-8376
PADEP: 63-04247

435 Broad Street
Montoursville, PA 17754
P: (570) 321-9002
F: (570) 321-1957
PADEP: 41-04880

950 West Main Street
Sharpsville, PA 16150
P: (724) 463-8378 x 500
F: (724) 465-4209
PADEP: 43-04934

30 April 2020

Catalyst Energy, Inc.
Attn: Tyson Ruhlman
112 S. Braddock Ave, Suite 201
Pittsburgh, PA 15203

Work Order: 0041492
Project: Production Water

Report of Analysis

Client Sample ID	Lab Sample ID	Matrix	Date Sampled	Date Received	Sample Notes
Triana Wells Marcellus	0041492-01	Water	04/21/2020 09:52	4/21/20 12:35	

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. Sample does not meet hold time requirements of 40 CFR Part 136.
H Analyzed out of recommended hold time. Sample does not meet hold time requirements of 40 CFR Part 136.
RL Reporting Limit

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

Sierra Grguric
Oil & Gas Field Supervisor/Project Manager

ENVIRONMENTAL SERVICE LABORATORIES, INC.

1803 Philadelphia Street
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PADEP: 41-04880

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PADEP: 43-04934

Catalyst Energy, Inc.
112 S. Braddock Ave, Suite 201
Pittsburgh, PA 15203

Reported: 04/30/2020 09:42

Lab Sample ID#: 0041492-01
Sample Type: Water
Sample Source: Grab
Sampler: Melissa Armstrong
Client Sample ID: Triana Wells Marcellus

Sample Date: 04/21/2020 09:52
Receipt Date: 04/21/2020 12:35

Analyte	Sample Result	Units	Data Qualifier	RL	Analyst/ Certification	Prep Date/Time	Analysis Date/Time
General Chemistry	**Analytical Method: -**				**Prep Method: No Prep - WetChem**		
Specific Gravity	1.16				LMB/Z	04/27/20 14:44	04/27/20 14:44
General Chemistry	**Analytical Method: SM2510 B-11**				**Prep Method: No Prep - WetChem**		
Specific Conductance	211000	umhos/cm		5.00	JKK	04/23/20 10:08	04/23/20 10:08
General Chemistry	**Analytical Method: SM2540 C-11**				**Prep Method: No Prep - WetChem**		
Total Dissolved Solids	302000	mg/L		2500	LMB	04/23/20 13:08	04/23/20 14:10
General Chemistry	**Analytical Method: SM4500-H B-11**				**Prep Method: No Prep - WetChem**		
pH	5.88	S.U.	H,R		JKK	04/23/20 10:08	04/23/20 10:08
Temp at time of pH, °C	20.4		H,R		JKK	04/23/20 10:08	04/23/20 10:08

ENVIRONMENTAL SERVICE LABORATORIES, INC.

For assistance epa.gov

SAMPLE REQUEST & CHAIN OF CUSTODY

PAGE 1 OF 1

HEADQUARTERS
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Indiana, PA 15701
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FAX: (724) 465-4209
☑

SOUTHERN DIVISION
1276 Bentleyville Road
Van Voorhis, PA 15366
(724) 258-TEST
FAX: (724) 258-8376
☐

NORTHERN DIVISION
435 Broad Street
Montoursville, PA 17754
(570) 321-9003
FAX: (570) 321-1957
☐

0041492

d TAT:
__ days ☐
Standard ☐

FOR INTERNAL LABORATORY USE ONLY

Sample Identification	ESL#	Sample Type: Composite Date on/off	Composite Time on/off	Grab Date	Grab Time	Matrix	# of Containers	Container Type / Preservative	Analysis Requested
Triana Wells Marcellus	0041492 01			4/21/20	952	W	2	Poly 1000mL No Preservative	Specific Gravity, pH, TDS, SC 7

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 ATTENDANT COLLECTION COSTS.

Melissa Ang	4/21/20 952		
Sampled By: (Signature)	Date/ Time		
Melissa Ang	4/21/20 1220	DD	4/21/20 1235
Relinquished By: (Signature)	Date/ Time	Received By: (Signature)	Date/ Time
Relinquished By: (Signature)	Date/ Time	Received By: (Signature)	Date/ Time
Relinquished By: (Signature)	Date/ Time	Received By: (Signature)	Date/ Time

Project Notes:
Production Water
McKean County, PA

Company/Name:	**Catalyst Energy, Inc.**
Address:	112 S. Braddock Ave, Suite 201
	Pittsburgh, PA 15218
Contact Person:	Tyson Ruhlman
Phone Number:	814-331-7589
Email Address:	truhlman@catalystenergyinc.com
Bill To:	Same

Correct Preservations Y / N / NA **Correct Containers Y / N / NA** **Receipt Temperature** _____

ENVIRONMENTAL SERVICE LABORATORIES, INC.

SAMPLE RECEIPT AND REVIEW FORM

PART A: General Information

0041492

Client: Catalyst Energy	**Work Order:**	
Received by: DD	**Date/Time Received:** 4/21/20 1235	**Date Sampled:** 4/21/20
Method of Delivery: FedEx UPS Client Drop off ESL courier Other:		
Sample Receipt Temp: 1.8 **IR Gun # Used:** 1 2 (3) 4	**Samples Received on Ice:** (YES) NO	
Samples Removed by Satellite Lab Division: Southern(BV) NorthWest(NW) Northern(WP)	**Containers removed by Satellite Lab for analysis of:** TCMPN Fecal Coliform TC/EC ECMPN	
Sample State of Collection: (PA) NY OH WV Other:____	**PWSID COMPLIANCE DRINKING WATER SAMPLES:** YES (NO)	

PART B: Receipt Details

Completed (if different from above): _____ / / _____
Signature Date Time

	Sample Receipt Criteria				Comments/Qualifiers (Required for Non-Conforming Items)	Deficiency Log Required
1	Chain of custody documents included with samples?	Yes	No	N/A	Comments:	YES NO
2	COC form is properly signed in relinquished/received sections?	Yes	No	N/A	Comments:	YES NO
3	Sample containers intact and sealed?	Yes	No	N/A	Circle Applicable: Damaged container Leaking container Custody Seal Broken Other:____	YES NO
4	Number of containers received match number indicated on COC?	Yes	No	N/A	Sample ID's affected:	YES NO
5	Sample ID's on COC match ID's on bottles?	Yes	No	N/A	Sample ID's and containers affected:	YES NO
6	Date and time on COC match date and time on bottles?	Yes	No	N/A	Sample ID's affected:	YES NO
7	Samples received within holding time?	Yes	No	N/A	ID's and tests affected:	YES NO
8	Samples received at appropriate pH for analysis requested?	Yes	No	N/A	Sample ID's, containers affected and observed pH:	YES NO
9	Samples requiring thermal preservation within 0 ≤ 6°C? Microbiology within 0 ≤ 10°C?	Yes	No	N/A	For non-WV samples outside of thermal preservation range sampled same day and received on ice are considered acceptable condition as the cooling process has begun.	YES NO
11	Adequate sample volume received?	Yes	No	N/A	Analyses Affected:	YES NO
10	VOA vials free of headspace (defined as < 6mm bubble)?	Yes	No	N/A	Sample ID's and containers affected:	YES NO
Other Comments:						**Deficiency Log Created:** Yes No

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F: (570) 321-1957
PADEP: 41-04880

950 West Main Street
Sharpsville, PA 16150
P: (724) 463-8378 x 500
F: (724) 465-4209
PADEP: 43-04934

30 April 2020

Catalyst Energy, Inc.
Attn: Tyson Ruhlman
112 S. Braddock Ave, Suite 201
Pittsburgh, PA 15203

Work Order: 0041491
Project: Production Water

Report of Analysis

Client Sample ID	Lab Sample ID	Matrix	Date Sampled	Date Received	Sample Notes
Bradford Sands	0041491-01	Water	04/21/2020 09:54	4/21/20 12:35	

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. Sample does not meet hold time requirements of 40 CFR Part 136.
H Analyzed out of recommended hold time. Sample does not meet hold time requirements of 40 CFR Part 136.
RL Reporting Limit

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

Sierra Grguric
Oil & Gas Field Supervisor/Project Manager

ENVIRONMENTAL SERVICE LABORATORIES, INC.

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PADEP: 41-04880

950 West Main Street
Sharpsville, PA 16150
P: (724) 463-8378 x 500
F: (724) 465-4209
PADEP: 43-04934

Catalyst Energy, Inc.
112 S. Braddock Ave, Suite 201
Pittsburgh, PA 15203

Reported: 04/30/2020 09:43

Lab Sample ID#: 0041491-01
Sample Type: Water
Sample Source: Grab
Sampler: Melissa Armstrong
Client Sample ID: Bradford Sands

Sample Date: 04/21/2020 09:54
Receipt Date: 04/21/2020 12:35

Analyte	Sample Result	Units	Data Qualifier	RL	Analyst/ Certification	Prep Date/Time	Analysis Date/Time
General Chemistry	**Analytical Method: -**				**Prep Method: No Prep - WetChem**		
Specific Gravity	1.06				LMB/Z	04/27/20 14:44	04/27/20 14:44
General Chemistry	**Analytical Method: SM2510 B-11**				**Prep Method: No Prep - WetChem**		
Specific Conductance	105000	umhos/cm		5.00	JKK	04/23/20 10:04	04/23/20 10:04
General Chemistry	**Analytical Method: SM2540 C-11**				**Prep Method: No Prep - WetChem**		
Total Dissolved Solids	79500	mg/L		2500	LMB	04/23/20 13:08	04/23/20 14:10
General Chemistry	**Analytical Method: SM4500-H B-11**				**Prep Method: No Prep - WetChem**		
pH	6.31	S.U.	H,R		JKK	04/23/20 10:04	04/23/20 10:04
Temp at time of pH, °C	20.1		H,R		JKK	04/23/20 10:04	04/23/20 10:04

ENVIRONMENTAL SERVICE LABORATORIES, INC.

SAMPLE REQUEST & CHAIN OF CUSTODY

PAGE 1 OF 1

HEADQUARTERS ☑
1803 Philadelphia St.
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FAX: (724) 258-8376

NORTHERN DIVISION ☐
435 Broad Street
Montoursville, PA 17754
(570) 321-9003
FAX: (570) 321-1957

NORTHWEST DIVISIC
950 Main Street
Sharpsville, PA 16150
(724) 463-TEST
FAX: (724) 465-4209

0041491

FOR INTERNAL LABORATORY USE ONLY

Sample Identification	ESL# 0041491	Sample Type: Composite Date on/off	Composite Time on/off	Grab Date	Grab Time	Matrix	# of Containers	Container Type / Preservative	Analysis Requested
Bracl Ford Sands.	01			4/21/20	954	W	2	Poly 1000mL No Preservative	Specific Gravity, pH, TDS, SC

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 ATTENDANT COLLECTION COSTS.

melissa arg 4/21/20 954 — Sampled By: (Signature)	Date/ Time		
melissa arg 4/21/20 1220 — Relinquished By: (Signature)	Date/ Time	Received By: (Signature)	Date/ Time 4/21/20 4/20/2020 1235
Relinquished By: (Signature)	Date/ Time	Received By: (Signature)	Date/ Time
Relinquished By: (Signature)	Date/ Time	Received By: (Signature)	Date/ Time

Project Notes:
Production Water
McKean County, PA

Company/Name:	**Catalyst Energy, Inc.**
Address:	112 S. Braddock Ave, Suite 201 Pittsburgh, PA 15218
Contact Person:	Tyson Ruhlman
Phone Number:	814-331-7589
Email Address:	truhlman@catalystenergyinc.com
Bill To:	Same

Correct Preservations Y / N / NA **Correct Containers** Y / N / NA **Receipt Temperature** _____

ENVIRONMENTAL SERVICE LABORATORIES, INC.

SAMPLE RECEIPT AND REVIEW FORM

PART A: General Information

0041491

Client: Catalyst Energy	**Work Order:**	
Received by: DM	**Date/Time Received:** 4/21/20 1235	**Date Sampled:** 4/21/20
Method of Delivery: FedEx UPS Client Drop off (ESL courier) Other:		
Sample Receipt Temp: 1.8 **IR Gun # Used:** 1 2 (3) 4	**Samples Received on Ice:** (YES) NO	
Samples Removed by Satellite Lab Division: Southern(BV) NorthWest(NW) Northern(WP)	**Containers removed by Satellite Lab for analysis of:** TCMPN Fecal Coliform TC/EC ECMPN	
Sample State of Collection: (PA) NY OH WV Other:____	**PWSID COMPLIANCE DRINKING WATER SAMPLES:** YES (NO)	

PART B: Receipt Details

Completed (if different from above): _____ / / _____
Signature Date Time

	Sample Receipt Criteria		Comments/Qualifiers (Required for Non-Conforming Items)	Deficiency Log Required
1	Chain of custody documents included with samples?	Yes No N/A	Comments:	YES NO
2	COC form is properly signed in relinquished/received sections?	Yes No N/A	Comments:	YES NO
3	Sample containers intact and sealed?	Yes No N/A	Circle Applicable: Damaged container Leaking container Custody Seal Broken Other:_____	YES NO
4	Number of containers received match number indicated on COC?	Yes No N/A	Sample ID's affected:	YES NO
5	Sample ID's on COC match ID's on bottles?	Yes No N/A	Sample ID's and containers affected:	YES NO
6	Date and time on COC match date and time on bottles?	Yes No N/A	Sample ID's affected:	YES NO
7	Samples received within holding time?	Yes No N/A	ID's and tests affected:	YES NO
8	Samples received at appropriate pH for analysis requested?	Yes No N/A	Sample ID's, containers affected and observed pH:	YES NO
9	Samples requiring thermal preservation within 0 ≤ 6°C? Microbiology within 0 ≤ 10°C?	Yes No N/A	For non-WV samples outside of thermal preservation range sampled same day and received on ice are considered acceptable condition as the cooling process has begun.	YES NO
11	Adequate sample volume received?	Yes No N/A	Analyses Affected:	YES NO
10	VOA vials free of headspace (defined as < 6mm bubble)?	Yes No (N/A)	Sample ID's and containers affected:	YES NO
Other Comments:				**Deficiency Log Created:** Yes (No)

5.0 PLUGGING AND ABANDONMENT PLAN

At the point when the Lot 580-1 Well is no longer used, the well will be abandoned in accordance with EPA and PADEP regulations. With regard to PADEP regulations, this currently includes providing a "Notice of Intent to Plug a Well" no less than 3 days and no more than 30 days prior to abandoning the well, to allow a PADEP inspector to be present during the plugging procedure. The PADEP may waive the notification period. The notification will include well location plat, and available well logs, production logs, injection logs, construction details, and proposed abandonment method. After receiving approval from PADEP to proceed, the well will be abandoned and the abandonment procedures will be documented on a "Certificate of Plugging".

The USEPA will be notified of the plugging activity at least 45 days prior to commencing activities. This notification will include USEPA Form No. 7520-19 which is attached.

The well will be completed as detailed in the DEP Chapter 78 78a.91 b), plugging a well in a non-coal area when the surface and production casing is cemented. This well will be plugged using the tubing balanced plug placement method. All plugs will be set through tubing at the desired locations with a gel spacer between each plug. The cement to be used will be class A common cement mixed to 15.6 #/gal with a yield of 1.18 cubic feet per sack. An excess of 10% will be pumped for each plug.

The cement top in the annulus between the 4.5 inch pipe and the 7.875 hole was calculated to be 3,402 feet. The depth of the top of cement may be field adjusted as field data is gathered at the time of plugging. The 4.5" casing will be cut at a depth of 3,000 feet which is 496 feet below the 8.625 casing seat. The following plugs will be placed to cover all required intervals:

- 450 foot cement plug (37 sacks) to cover the injection interval (5,170 – 5,188 feet) from a depth of 5,420 to 4,970 feet. To be tagged.
- 2,466 foot Gel spacer (38 Bbl) from a depth of 4970 to 2504 feet.
- 1,489 foot cement plug (487 sacks) to cover the 4.5 inch stub at 3,000 feet, 8.625 inch casing seat, and shallow oil / gas production zones (3,000 – 1,511 feet).
- 986 foot Gel spacer (63 Bbl) from a depth of 1,511 to 525 feet.
- 200 foot cement plug (67 sacks) to cover the 11.75 inch casing seat. Depth of 525 to 325 feet.
- 225 foot Gel spacer (14 Bbl) from a depth of 325 to 100 feet.
- 100 foot cement plug (14 sacks) from 100 feet to surface.

Any remaining equipment will be removed and the location will be restored and seeded.

The information on Form 7520-19 may be modified prior to plugging in order to meet the requirements at the time of the plugging activity. Based on the attached service company estimates, the total contractor estimate to plug and abandon the well according to the above procedures is $40,100.

Exhibit 5 A

EPA Plugging and Abandonment Form

OMB No. 2040-0042 Approval Expires 4/30/2022

United States Environmental Protection Agency

WELL REWORK RECORD, PLUGGING AND ABANDONMENT PLAN, OR PLUGGING AND ABANDONMENT AFFIDAVIT

Name and Address, Phone Number and/or Email of Permittee

Catalyst Energy, Inc.
1112 S Braddock Ave, Suite 201
Pittsburgh, PA 15218
412.325.4350

Permit or EPA ID Number	API Number	Full Well Name
	37-083-46237	Lot 580-1

State	County
Pennsylvania	McKean

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

Latitude 41.830586°

Surface Location

Longitude -78.58174°

[ ] 1/4 of [ ] 1/4 of Section [ ] Township [ ] Range [ ]

[ ] ft. from (N/S) [ ] Line of quarter section

[ ] ft. from (E/W) [ ] Line of quarter section.

Well Class	Timing of Action (pick one)	Type of Action (pick one)
[ ] Class I	[✓] Notice Prior to Work	[ ] Well Rework
[✓] Class II	Date Expected to Commence	[✓] Plugging and Abandonment
[ ] Class III	[ ] Report After Work	[ ] Conversion to a Non-Injection Well
[ ] Class V	Date Work Ended	

Provide a narrative description of the work planned to be performed, or that was performed. Use additional pages as necessary. See instructions.

This well will be plugged using the tubing balanced plug placement method. All plugs will be set through tubing at the desired locations with a gel spacer between each plug. The cement to be used will be class A common cement mixed to 15.6 #/gal with a yield of 1.18 cubic feet per sack. An excess of 10% will be pumped for each plug.

The cement top in the annulus between the 4.5 inch pipe and the 7.875 hole was calculated to be 3,402 feet. The depth of the top of cement may be field adjusted as field data is gathered at the time of plugging. The 4.5" casing will be cut at a depth of 3,000 feet which is 496 feet below the 8.625 casing seat. The following plugs will be placed to cover all required intervals.

- 450 foot cement plug (37 sacks) to cover the injection interval (5,170 – 5,188 feet) from a depth of 5,420 to 4,970 feet. To be tagged.
- 2,466 foot Gel spacer (38 Bbl) from a depth of 4970 to 2504 feet.
- 1,489 foot cement plug (487 sacks) to cover the 4.5 inch stub at 3,000 feet, 8.625 inch casing seat, and shallow oil / gas production zones (3,000 – 1,511 feet).
- 986 foot Gel spacer (63 Bbl) from a depth of 1,511 to 525 feet.
- 200 foot cement plug (67 sacks) to cover the 11.75 inch casing seat. Depth of 525 to 325 feet.
- 225 foot Gel spacer (14 Bbl) from a depth of 325 to 100 feet.
- 100 foot cement plug (14 sacks) from 100 feet to surface.

Any remaining equipment will be removed and the location will be restored and seeded.

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
Paul Ryan Rodgers, CEO		3/20/2021

Exhibit 5-B

Service Company Plugging Estimate

Exhibit 5-B

For assistance epa.gov

Allshouse Excavating

allshouseexc@aol.com

Estimate

ADDRESS
Catalyst Energy
108 S. Forest St, Apt 8
PO Box 534
Marienville, PA 16239
United States

ESTIMATE # 1013
DATE 07/07/2020

DATE	ACTIVITY	QTY	RATE	AMOUNT
07/07/2020	**Service Rig** plugging bid for 37-083-46237 Pull pipe and set cement plugs where necessary.. see attachment	1	10,500.00	10,500.00
07/07/2020	**Plugging Wells** 605 sacs of cement any additional cement will be 20.00 a sac	605	20.00	12,100.00
07/07/2020	**Plugzilla** circulate wellbore and then use 130 bbl of gel to fill entire well, pull pipe and displacement of cement plugs where necessary cement pump charge includded and gel	1	8,500.00	8,500.00
07/07/2020	**Roustabout** cut off wellhead and backfill w pea gravel and put monument on well with api numbers	1	2,000.00	2,000.00
07/07/2020	**Dozer** make rig location and dress location up after plugging well and reclaim and seed/mulch, make pit if neccessary	1	1,800.00	1,800.00
07/07/2020	**Vac Truck** Haul water for plug job and disposal of waste water	1	3,000.00	3,000.00
07/07/2020	**Semi** haul pipe to and from locationand water tanks	1	2,200.00	2,200.00

plugging estimate for 37-083-46237
cyclone pa

TOTAL **$40,100.00**

6.0 ATTACHMENT F - FINANCIAL ASSURANCE (40 CFR § 144.52)

Catalyst will provide a Letter of Credit to meet financial assurance requirements for properly plugging and abandoning the well per the cost estimate provided in Section 5.0 Attachment E – Plugging and Abandonment Plan. This documentation will be provided under a separate cover at a later date.

7.0 ATTACHMENT G - SITE SECURITY AND MANIFEST REQUIREMENTS (COMMERCIAL WELLS ONLY)

7.1 Site Security

The Catalyst UIC Well facility will be surrounded by an 6 foot high chain link fence with a locking gate as depicted in the facility layout drawing in Section 4.0 Injection Operation and Monitoring Program. In addition security cameras will monitor the facility. Catalyst staff will be onsite during operational hours anticipated to be 7AM to 5 PM Monday through Friday.

7.2 Manifest Requirements

Catalyst will maintain a record of every load of fluid received. The record will include the following:

- Hauler's name
- Producing well operator's name
- Location from which the load was obtained
- Volume of the load
- Whether the load was delivered as a split load
- If the load was a split load, each operator's name and location will be listed and the volumes from each operator documented.
- Specific gravity of the load

8.0 ATTACHMENT I - EXISTING EPA PERMITS (40 CFR § 144.31)

Catalyst is not applying for any other federal permits or construction approvals related to the Lot 580-1 UIC Class IID well and facility. Catalyst is applying for a state UIC permit for the Lot 580-1 well under the Pennsylvania Department of Environmental Protection (PADEP) UIC well program.

9.0 ATTACHMENT J – DESCRIPTION OF BUSINESS (40 CFR § 144.31)

Catalyst Energy, Inc. (Catalyst) plans to construct and operate a commercial UIC Class IID facility in McKean County, Pennsylvania to dispose of wastewater associated with the production of oil and gas. Wastewater from conventional and unconventional wells from Catalyst operations and Third Party's operations will be accepted at this facility. Catalyst produces hydrocarbons from conventional Upper Devonian wells and unconventional wells within the Commonwealth of Pennsylvania in McKean and other various counties in Pennsylvania. It is anticipated that the disposed wastewater will be primarily produced water associated with the extraction of oil and gas conventional and unconventional wells. It is expected that the wastewater will be trucked to this facility by third party trucking companies.

TABLES

Table 1-1
Oil and Gas Wells Within the 1/4 Mile Area of Review (AOR)
Catalyst Energy Lot 580-1 (API# 37-083-46237)
McKean County, PA

Table 1A - Oil and Gas Wells to the Proposed Injection Interval in the AOR

Permit No.	Well Name	Operator	Type	Drilling Completed	Total Depth	Casings and Depths	Perforations (Ft.)	Completed Interval	Approx. Cum. Production
083-46237	Lot 580-1 (Proposed UIC Well)	Catalyst Energy, Inc.	Gas	5/19/90	5420 ft	11 3/4 to 426 ft 8 5/8 to 2504 ft 4 ½ to 5396 ft	5170 – 5188 ft	Onondaga	2.6 BCF gas 6500 bbl oil
083-30629	Amoco – Witco #1	Catalyst Energy, Inc.	Gas	2/18/1974	7015 ft Plugged back to 6448 ft	11 3/4 to 410 ft 8 5/8 to 2540 ft 5 ½ to 7015 ft	5184 – 5270 ft 2520 – 2522 ft* 4386 – 4388 ft* 6868 – 6933 ft*	Onondaga	2.9 BCF gas 11,500 bbl oil
083-40667	Lot 581-ON-1	Enervest	Dry Hole Plugged	Re-Drill	5439 ft	11 3/4 to 530 ft 8 5/8 to 2390 ft	None	None	None

***Perforated interval subsequently squeezed with cement.**

Table 1- 1B – Plugged Shallow Oil and Gas Wells in the AOR

Permit No.	Well Name	Operator	Type (Injection, Oil, etc.)	Producing Sand Top	TD	Date Plugged
37-083-00865	Bingham Satterfield - #197	Pennzoil Products Company	Oil	Bradford -2026 ft	2088 ft	12/7/1989
37-083-00866	Bingham Satterfield - #198	Pennzoil Products Company	Oil	Bradford -2012 ft	2075 ft	12/13/1989
37-083-00868	Bingham Satterfield - #200	Pennzoil Products Company	Oil	Bradford -2025 ft	2085 ft	12/28/1989
37-083-00870	Bingham Satterfield - #203	Pennzoil Products Company	Oil	Bradford -2033 ft	2090 ft	12/20/1989
37-083-00871	Bingham Satterfield - #204	Pennzoil Products Company	Oil	Bradford -2021 ft	2082 ft	12/29/1989
37-083-00874-P	Bingham Satterfield - #02	Pennzoil Company	Intake	2030 ft	2085 ft	4/2/1987
37-083-00875-P	Bingham Satterfield - #014	Pennzoil Company	Injection	2023 ft	2095 ft	4/28/1987
37-083-00876-P	Bingham Satterfield - #014	Pennzoil Company	Intake	2018 ft	2077 ft	4/16/1987
37-083-00877-P	Bingham Satterfield - #021	Pennzoil Company	Intake	2024 ft	2092 ft	3/3/ 1987
37-083-00880-P	Bingham Satterfield - #024	Pennzoil Company	Injection	2025 ft	2085 ft	4/29/1987
37-083-00882-P	Bingham Satterfield - #026	Pennzoil Company	Intake	2026 ft	2088 ft	4/13/1987
37-083-00885-P	Bingham Satterfield - #030	Pennzoil Company	Intake	2032 ft	2029 ft	6/12/1987
37-083-07868	Bingham Satterfield - #03	Pennzoil Products Company	Injection	Bradford -2025 ft	2078 ft	1/15/1990
37-083-07869	Bingham Satterfield - #013	Pennzoil Products Company	Injection	Bradford -2032 ft	2104 ft	1/19/1990
37-083-07870	Bingham Satterfield - #017	Pennzoil Products Company	Injection	Bradford -2030 ft	2089 ft	1/16/1990
37-083-07871	Bingham Satterfield - #201	Pennzoil Products Company	Oil	Bradford -2018 ft	2079 ft	1/25/1990
37-083-21471	Bingham Satterfield - #207	Pennzoil Products Company	Oil	Bradford -2032 ft	2099 ft	12/5/1989
37-083-23477	Bingham Satterfield - #227	Pennzoil Products Company	Oil	Bradford -2002 ft	2077 ft	1/3/1990
37-083-45560-P	Bingham Satterfield - #016	Pennzoil Company	Intake	2020 ft	2091 ft	6/30/1987

Table 1-2
Landowners within 1/4 mile of Proposed Injection Well
Catalyst Energy Lot 580-1 Well (API# 37-083-46237)
McKean County, PA

Tax Parcel ID	Township	County	Owners	Acreage	Contact Address
24-022-153	Keating	McKean	Delmar L. and Sharon S. Work	0.73	PO Box 265, Cyclone, PA 16726
24-022-152	Keating	McKean	Warren Capenos	0.61	
24-022-151	Keating	McKean	Hamlin Bank and Trust Co.	0.54	333 West Main Street, Smethport, PA 16749
24-022-150	Keating	McKean	Dustin M. and Jamie L. Sweeley	0.74	PO Box 81, Cyclone, PA 16726
24-022-149	Keating	McKean	Ronald H. and Helen E. Smith	0.74	
24-022-147	Keating	McKean	Timothy R. and Cindy A. Wright	0.55	PO Box 111, Cyclone, PA 16726
24-022-146	Keating	McKean	Robert G. and Janet H. Swick	0.63	PO Box 154, Cyclone, PA 16726
24-022-145	Keating	McKean	Michael R. and Angeline Ackerson	0.53	PO Box 442, Shinglehouse, PA 16748
24-022-144	Keating	McKean	Augustine and Anna Okosun	0.39	4391 Route 646, Cyclone, PA 16726
24-022-113	Keating	McKean	Joseph E. and Laura M. Null, Jr.	0.23	PO Box 359, Cyclone, PA 16726
24-022-143	Keating	McKean	Curtis D. Wackwitz	0.47	449 Woodard Rd., Cyclone, PA 16726
24-022-139	Keating	McKean	Mark and Ronda L. Shontz	0.88	411 Woodard Rd., Cyclone, PA 16726
24-022-139.1	Keating	McKean	Paul J. and Beth A. Lewis	1.64	399 Woodard Rd., Cyclone PA 16726
24-008-400	Keating	McKean	Collins Pine Company	541.05	95 Hardwood Drive, Kane, PA 16735
24-022-135	Keating	McKean	Kevin P. Slocum	1.04	410 Woodard Rd., Cyclone, PA 16726
24-022-133	Keating	McKean	Richard J. and Barbara Anderson	7.54	242 Pithole Road, Cyclone, PA 16726
24-022-134	Keating	McKean	Amy L. Irons	0.44	PO Box 43, Cyclone, PA 16726
24-008-112.1	Keating	McKean	Kevin E. and Anita L. Sluga	0.93	4563 Route 646, Cyclone, PA 16726
24-008-112	Keating	McKean	Seneca Resources Corp	155.3	5601 Rte. 6, Kane, PA 16735
24-022-130	Keating	McKean	Mark E. Amsler	0.53	PO Box 1, Cyclone, PA 16726
24-022-126	Keating	McKean	Charles Jones Jr.	0.29	PO Box 35, Cyclone, PA 16726
24-022-125	Keating	McKean	Gerald K. Kohler	0.36	PO Box 143, Cyclone, PA 16726
24-022-124	Keating	McKean	James R. Fitzsimmons	0.27	PO Box 36, Cyclone, PA 16726
24-022-123	Keating	McKean	Jessica M. Simms	0.37	PO Box 268, Cyclone PA 16726
24-022-122	Keating	McKean	Wayne G. Martin, et al	0.35	PO Box 161, Cyclone, PA 16726
24-022-121	Keating	McKean	John R. and Pamela J. Anderson	0.54	49 Pithole Road, Cyclone, PA 16726
24-022-120	Keating	McKean	Tyler R. Saulter	0.52	39 Pithole Road, Cyclone, PA 16726
24-022-119	Keating	McKean	Robert and Sandra Schermerhorn	0.36	PO Box 132, Cyclone, PA 16726
24-022-164	Keating	McKean	Laurie H. Smith	0.76	
24-022-163	Keating	McKean	Timothy R. Wright, et al	8.46	PO Box 111, Cyclone, PA 16726
24-022-162	Keating	McKean	Charles E. Hendrickson	0.93	PO Box 263, Cyclone, PA 16726
24-022-158	Keating	McKean	Scott Freer	1.16	4438 Route 646, Cyclone, PA 16726
24-022-157	Keating	McKean	Scott, Dennis and Eunice R. Freer	0.48	4438 Route 646, Cyclone, PA 16726
24-022-156	Keating	McKean	Miranda J. Lanager	0.49	PO Box 97, Cyclone, PA 16726
24-022-155	Keating	McKean	Scott Freer	0.14	4438 Route 646, Cyclone, PA 16726
24-022-154	Keating	McKean	Francis L. Kramer, Jr.	0.55	PO Box 38, Cyclone, PA 16726
24-008-409	Keating	McKean	Chagrin Land, LP	39.04	128 Gilfoyle Road, Marienville, PA 16239
24-008-407	Keating	McKean	Scott H. and Lisa M. Rice	3.01	4649 Route 646, Cyclone, PA 16726
24-008-403	Keating	McKean	Lauri A. Bennett	0.4	PO Box 105, Cyclone, PA 16726
24-008-404	Keating	McKean	Jeff E. Bennett	0.6	PO Box 266, Cyclone, PA 16726
24-008-402	Keating	McKean	Keith A. and Christon L. Young	0.42	242 Woodard Road, Cyclone, PA 16726
24-008-401	Keating	McKean	Kimberly A. Fox	0.27	PO Box 133, Rew, PA 16744
24-022-104.2	Keating	McKean	Richard E. and Carolyn Sue Brown	11	PO Box 15, Cyclone, PA 16726
24-022-117	Keating	McKean	Lester J. Et Al Lapp	1.13	PO Box 61, Cyclone, PA 16726
24-022-127	Keating	McKean	Jerry L. and Susan A. Gorrell	0.7	PO Box 134, Cyclone, PA 16726
24-022-131	Keating	McKean	Nancy A. Kohler	0.79	PO Box 92, Cyclone, PA 16726
24-022-132	Keating	McKean	Richard J. and Barbara Anderson	0.58	PO Box 52, Cyclone, PA 16726
24-022-141	Keating	McKean	Jonathan Green	0.52	437 Woodard Road, Cyclone, PA 16726

Table 1-3
Drinking Water Wells Within ½ Mile of the Proposed Injection Well
Catalyst Energy Lot 580-1 Well(API# 37-083-46237)
McKean County, PA

Permit No.	Well Owner	Well Type	Date Drilled	Total Depth	Formation	Flow Rate	Casing Depth
PA ID# 130920	Mrs. C. Neyerlin	Residential	Not Reported	172 ft	Pottsville	10 gpm	13 ft
PWSID # 6420031 APS ID # 850193	Pithole Water Association	Municipal Water Supply	2014	265 ft		30 gpm	20ft

FIGURES

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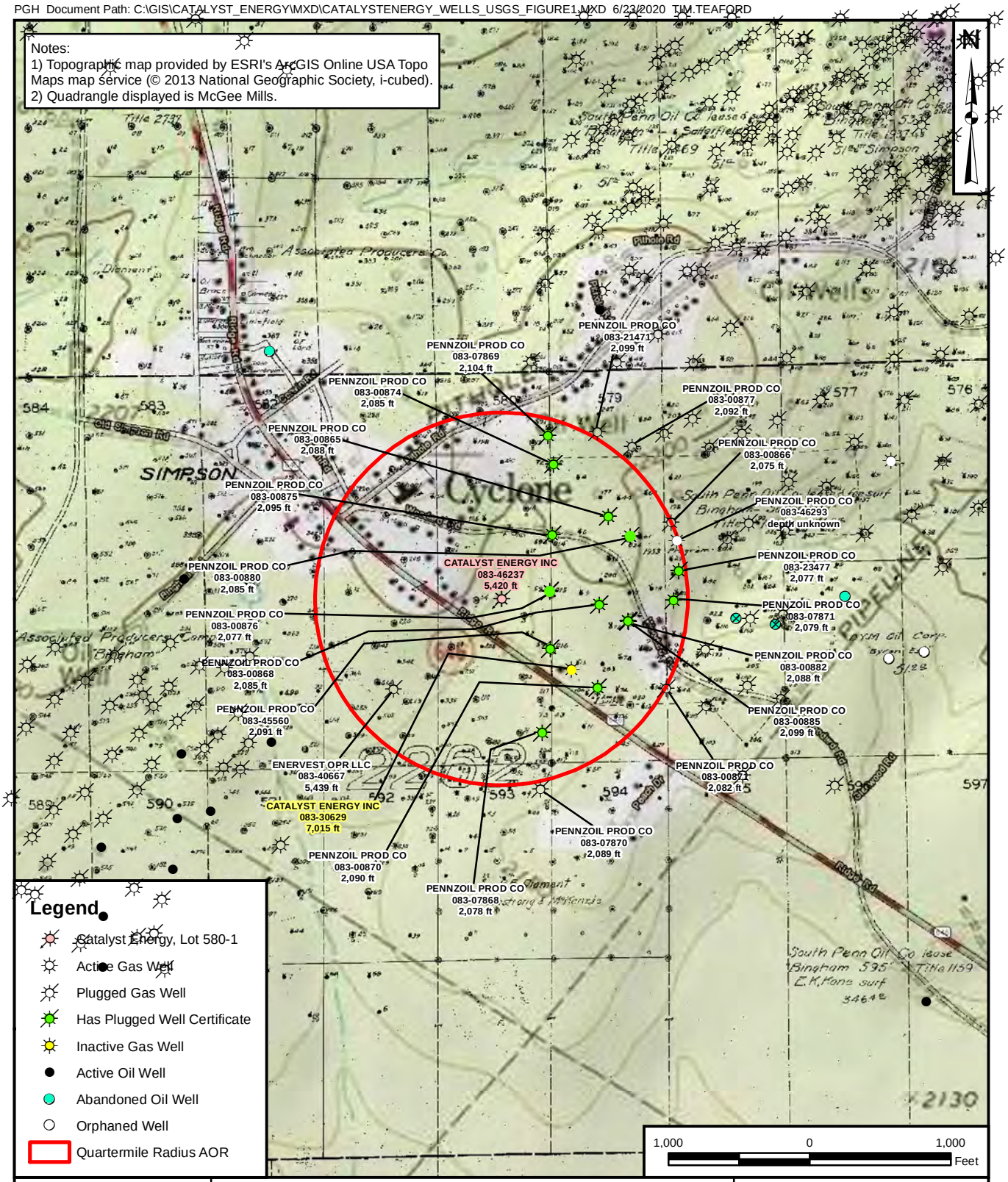

TETRA TECH

OIL AND GAS WELL LOCATIONS IN AOR
CATALYST ENERGY LOT 580-1

CATALYST ENERGY, INC.
MCKEAN COUNTY, PENNSYLVANIA

DRAWN BY: T. TEAFORD 06/23/20
CHECKED BY: D. SKOFF 06/23/20
APPROVED BY: D. SKOFF 06/23/20

CONTRACT NUMBER: 212C-PB-01530

FIGURE NUMBER	REV
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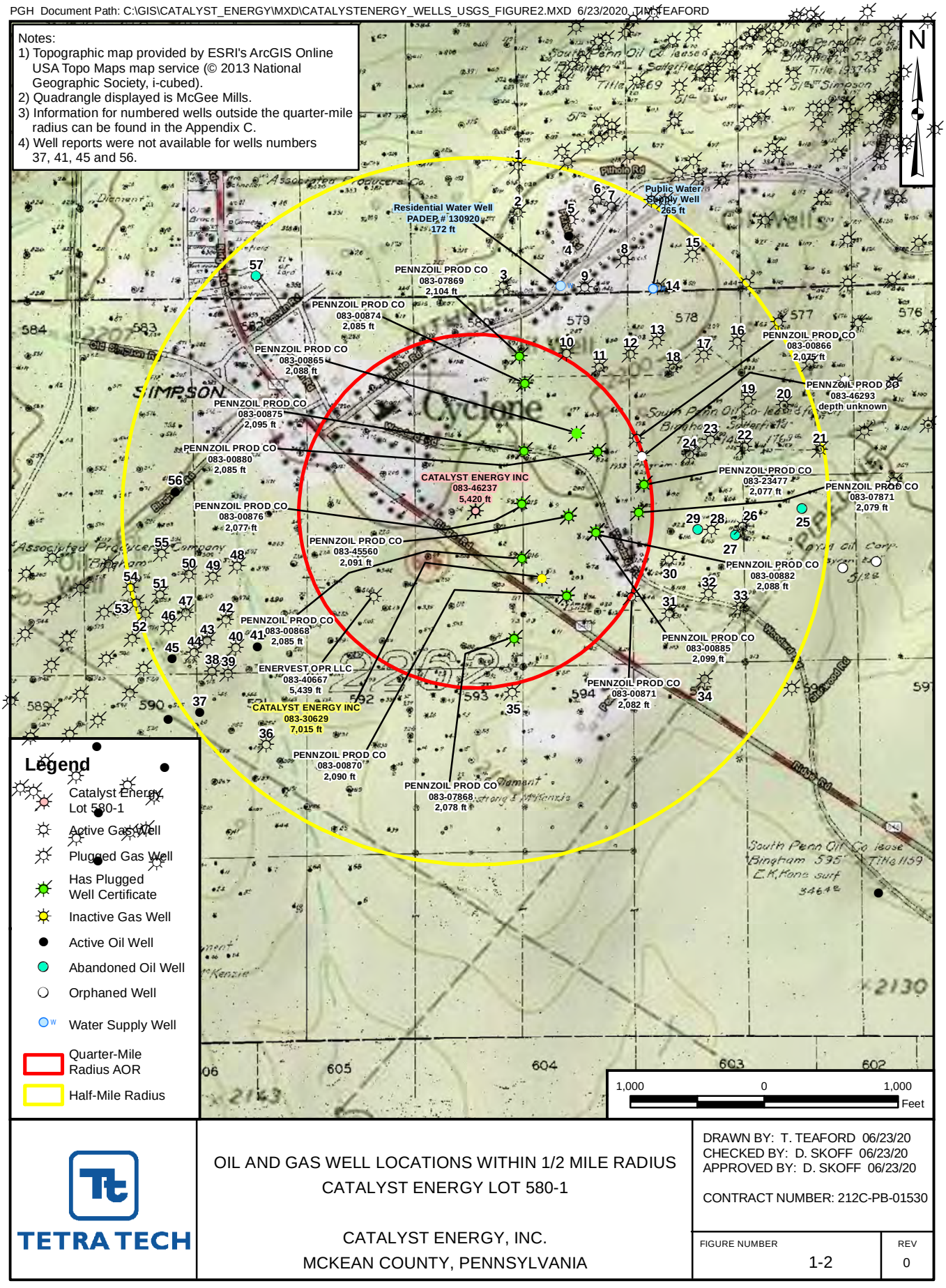

TETRA TECH

OIL AND GAS WELL LOCATIONS WITHIN 1/2 MILE RADIUS
CATALYST ENERGY LOT 580-1

CATALYST ENERGY, INC.
MCKEAN COUNTY, PENNSYLVANIA

DRAWN BY: T. TEAFORD 06/23/20
CHECKED BY: D. SKOFF 06/23/20
APPROVED BY: D. SKOFF 06/23/20

CONTRACT NUMBER: 212C-PB-01530

FIGURE NUMBER	REV
1-2	0

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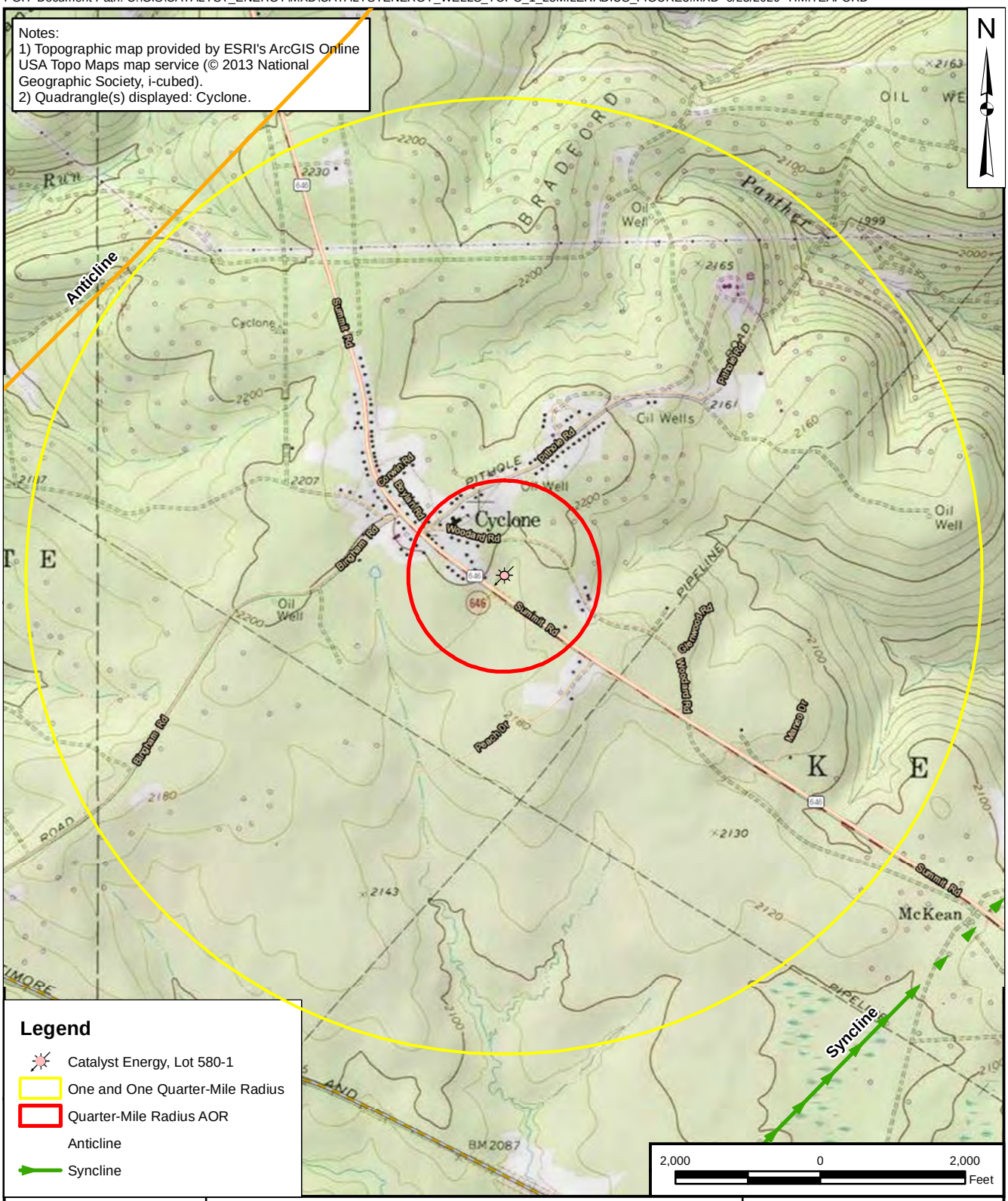

TETRA TECH

TOPOGRAPHIC MAP EXTENDING 1.25 MILES
FROM INJECTION WELL
CATALYST ENERGY LOT 580-1

CATALYST ENERGY, INC.
MCKEAN COUNTY, PENNSYLVANIA

DRAWN BY: T. TEAFORD 06/23/20
CHECKED BY: D. SKOFF 06/23/20
APPROVED BY: D. SKOFF 06/23/20

CONTRACT NUMBER: 212C-PB-01530

FIGURE NUMBER	REV
1-3	0

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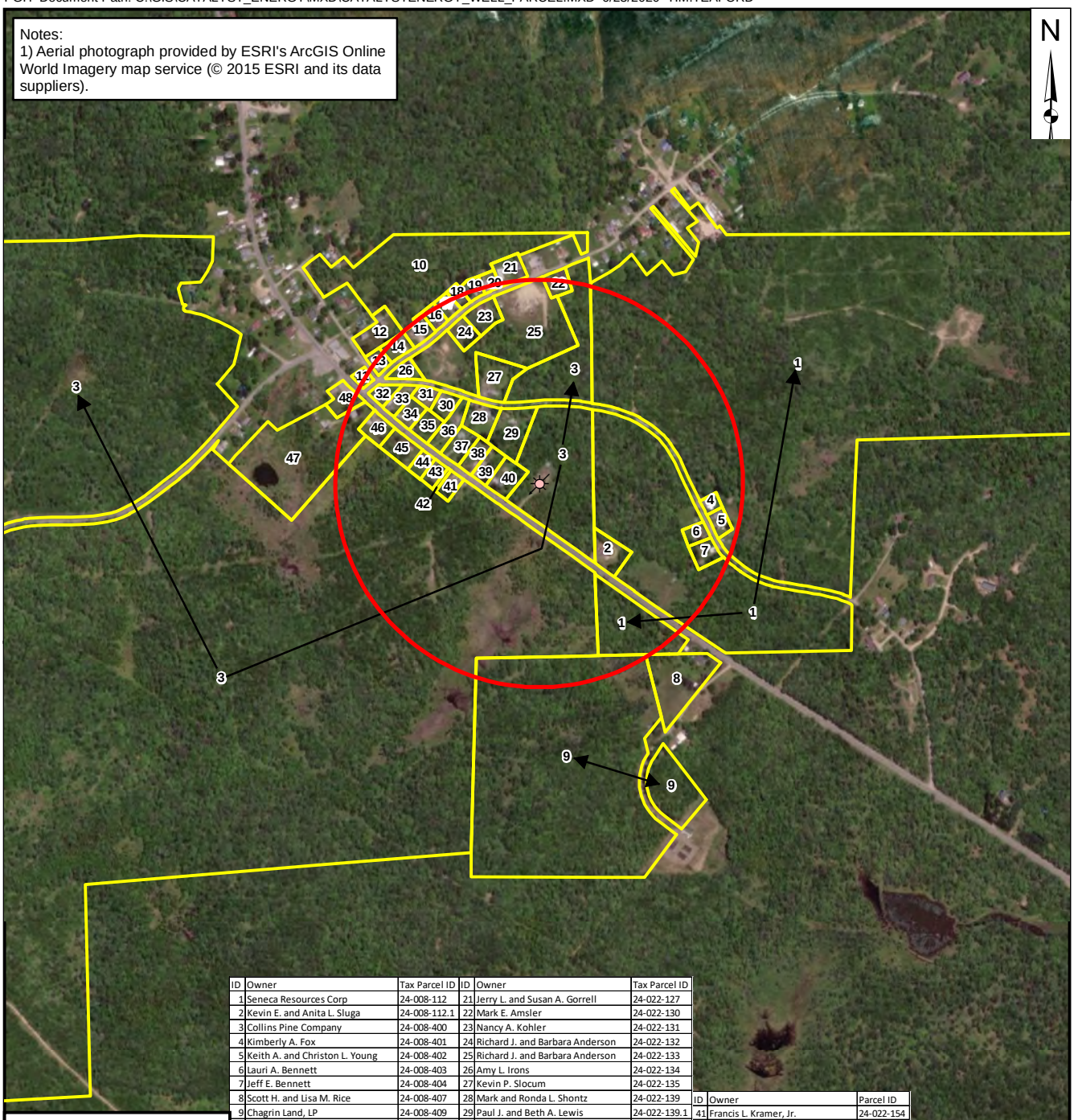
Notes:
1) Aerial photograph provided by ESRI's ArcGIS Online World Imagery map service (© 2015 ESRI and its data suppliers).



ID	Owner	Tax Parcel ID	ID	Owner	Tax Parcel ID
1	Seneca Resources Corp	24-008-112	21	Jerry L. and Susan A. Gorrell	24-022-127
2	Kevin E. and Anita L. Sluga	24-008-112.1	22	Mark E. Amsler	24-022-130
3	Collins Pine Company	24-008-400	23	Nancy A. Kohler	24-022-131
4	Kimberly A. Fox	24-008-401	24	Richard J. and Barbara Anderson	24-022-132
5	Keith A. and Christon L. Young	24-008-402	25	Richard J. and Barbara Anderson	24-022-133
6	Lauri A. Bennett	24-008-403	26	Amy L. Irons	24-022-134
7	Jeff E. Bennett	24-008-404	27	Kevin P. Slocum	24-022-135
8	Scott H. and Lisa M. Rice	24-008-407	28	Mark and Ronda L. Shontz	24-022-139
9	Chagrin Land, LP	24-008-409	29	Paul J. and Beth A. Lewis	24-022-139.1
10	Richard E. and Carolyn Sue Brown	24-022-104.2	30	Jonathan Green	24-022-141
11	Joseph E. and Laura M. Null, Jr.	24-022-113	31	Curtis D. Wackwitz	24-022-143
12	Lester J. Et Al Lapp	24-022-117	32	Augustine and Anna Okosun	24-022-144
13	Robert and Sandra Schermerhorn	24-022-119	33	Michael R. and Angeline Ackerson	24-022-145
14	Tyler R. Saulter	24-022-120	34	Robert G. and Janet H. Swick	24-022-146
15	John R. and Pamela J. Anderson	24-022-121	35	Timothy R. and Ciindy A. Wright	24-022-147
16	Wayne G. Martin, et al	24-022-122	36	Ronald H. and Helen E. Smith	24-022-149
17	Jessica M. Simms	24-022-123	37	Dustin M. and Jamie L. Sweeley	24-022-150
18	James R. Fitzsimmons	24-022-124	38	Hamlin Bank and Trust Co.	24-022-151
19	Gerald K. Kohler	24-022-125	39	Warren Capenos	24-022-152
20	Charles Jones Jr.	24-022-126	40	Delmar L. and Sharon S. Work	24-022-153

ID	Owner	Parcel ID
41	Francis L. Kramer, Jr.	24-022-154
42	Scott Freer	24-022-155
43	Miranda J. Lanager	24-022-156
44	Scott, Dennis and Eunice R. Freer	24-022-157
45	Scott Freer	24-022-158
46	Charles E. Hendrickson	24-022-162
47	Timothy R. Wright, et al	24-022-163
48	Laurie H. Smith	24-022-164

Legend

- Catalyst Energy Well API# 37-083-46237
- Quartermile Radius
- Parcel Boundary

1,000 0 1,000 Feet

TETRA TECH

PARCELS WITHIN ONE-QUARTER MILE
CATALYST ENERGY LOT 580-1

CATALYST ENERGY, INC.
MCKEAN COUNTY, PENNSYLVANIA

DRAWN BY: T. TEAFORD 06/23/20
CHECKED BY: J. MARLOW 06/23/20
APPROVED BY: D. SKOFF 06/23/20

CONTRACT NUMBER: 212C-PB-01530

FIGURE NUMBER 1-4

REV 0

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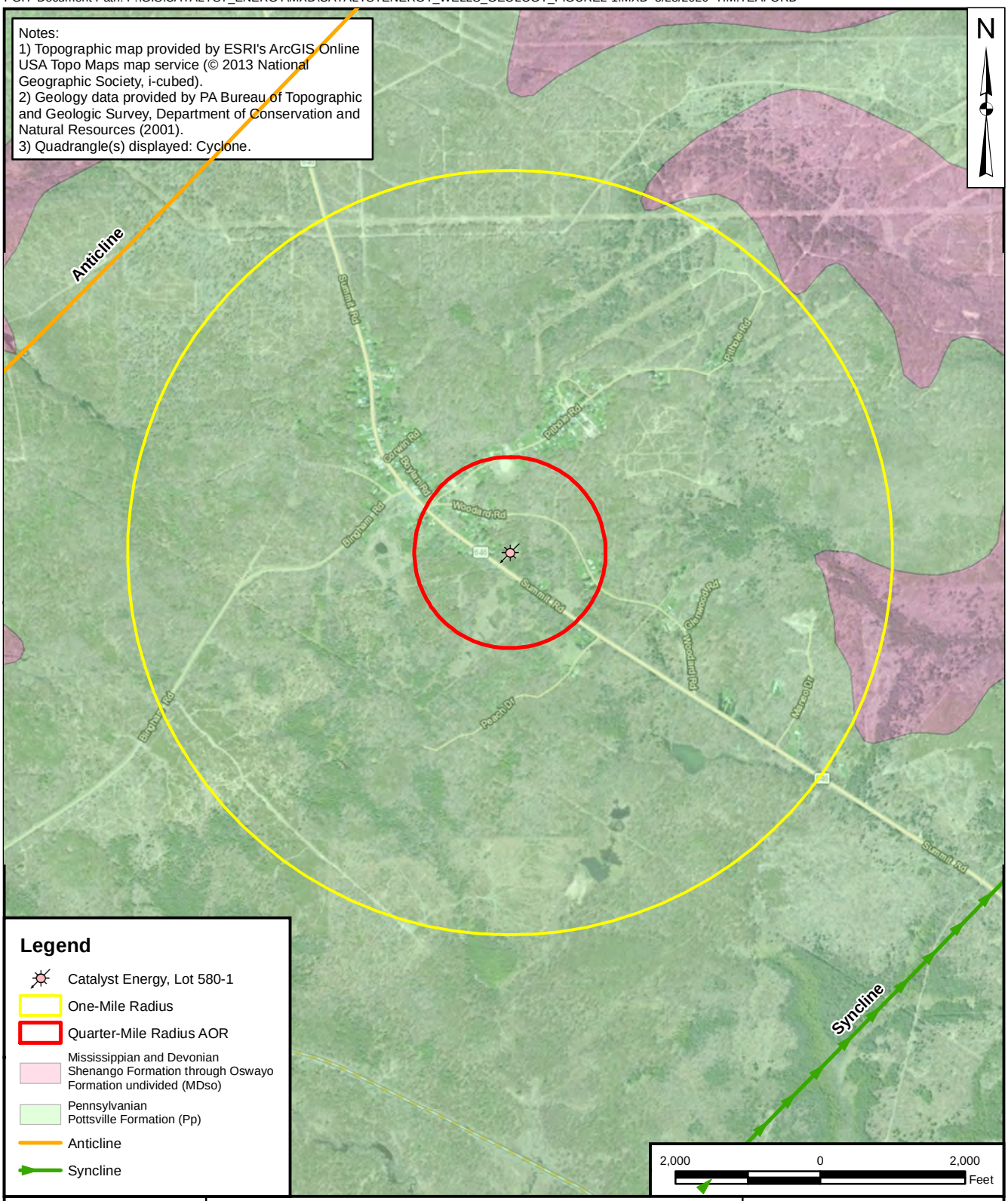

TETRA TECH

GEOLOGIC MAP
CATALYST ENERGY LOT 580-1

CATALYST ENERGY, INC.
MCKEAN COUNTY, PENNSYLVANIA

DRAWN BY: T. TEAFORD 05/28/20
CHECKED BY: D. SKOFF 05/28/20
APPROVED BY: D. SKOFF 05/28/20

CONTRACT NUMBER: 212C-PB-01530

FIGURE NUMBER	REV
2-1	0

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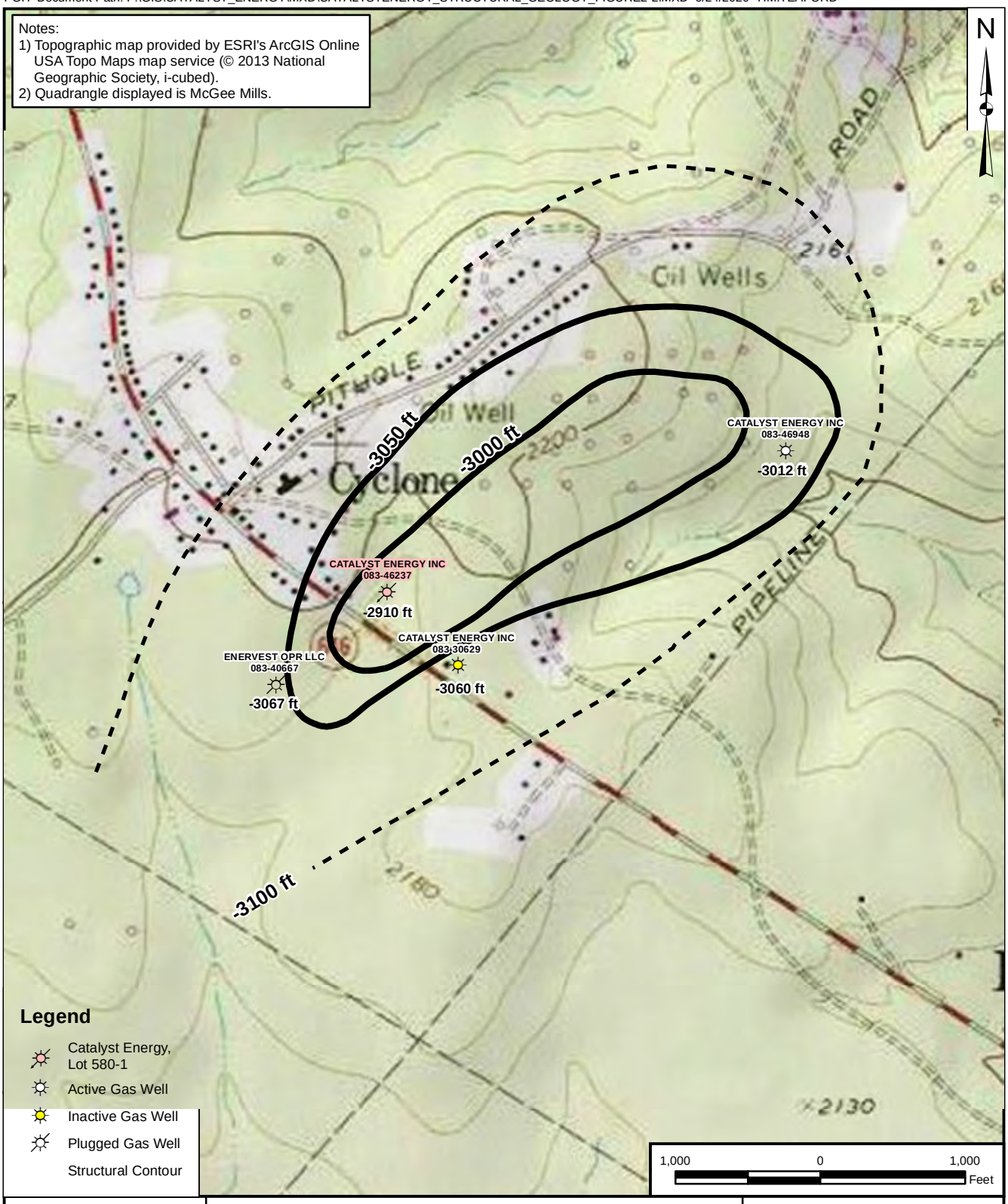


TETRA TECH

STRUCTURAL CONTOUR MAP
TOP OF THE ONONDAGA FORMATION

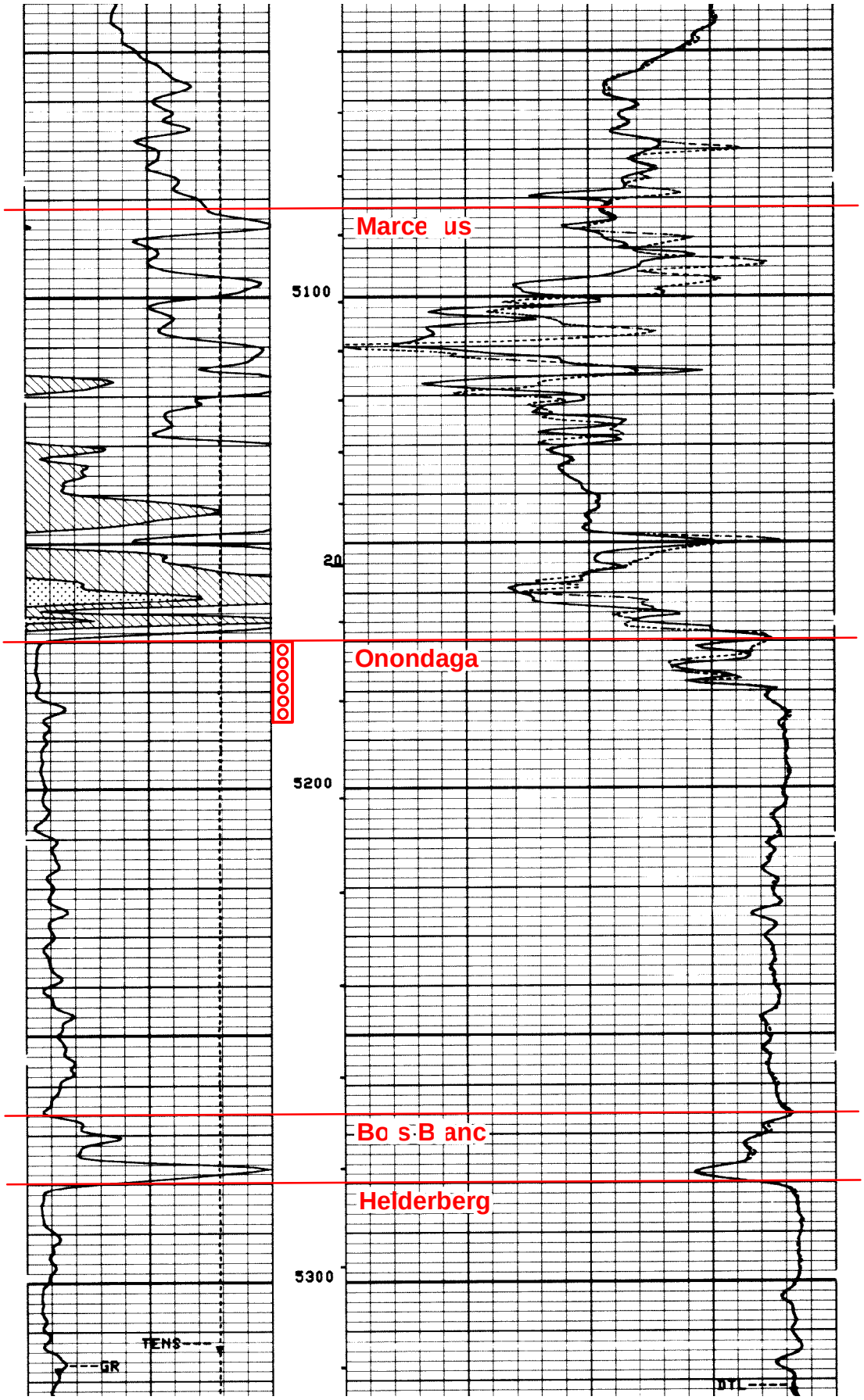
CATALYST ENERGY, INC.
MCKEAN COUNTY, PENNSYLVANIA

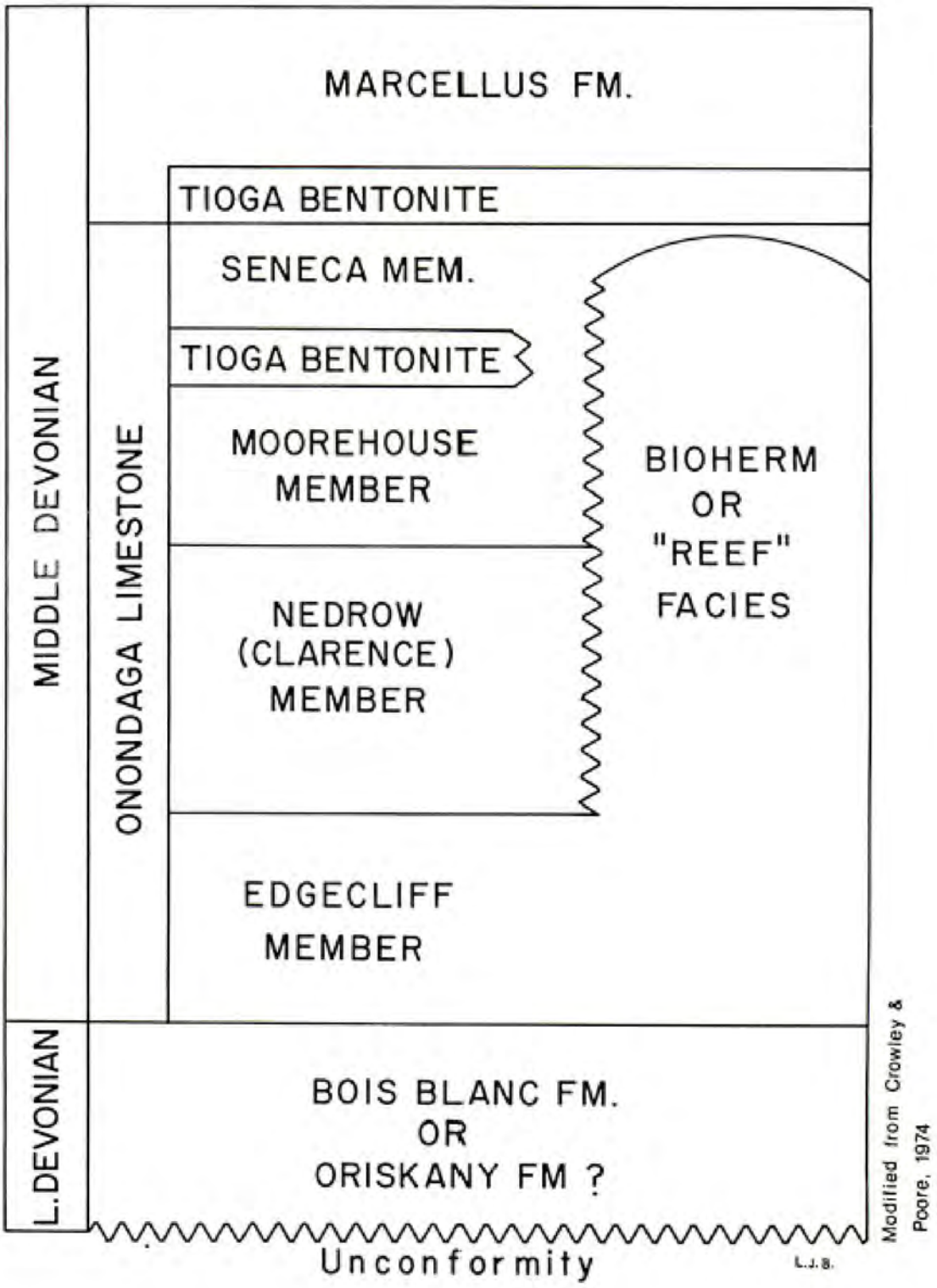
DRAWN BY: T. TEAFORD 06/24/20
CHECKED BY: D. SKOFF 06/24/20
APPROVED BY: D. SKOFF 06/24/20

CONTRACT NUMBER: 212C-PB-01530

FIGURE NUMBER	REV
2-2	0

FIGURE 2-3
CATALYST ENERGY, INC.
LOT 580-1
GAMMA RAY/BOREHOLE COMPENSATED SONIC LOG





TETRA TECH

FIGURE 2-4
CATALYST ENERGY
GENERAL STRATIGRAPHIC COLUMN SHOWING
THE MEMBERS OF THE ONONDAGA FORMATION
IN MCKEAN COUNTY, PENNSYLVANIA

Notes:
1) Source: Figure 12, Oil and Gas Developments in Pennsylvania in 1975. Commonwealth of Pennsylvania, Department of Environmental Resources, Bureau of Topographic and Geologic Survey, Progress Report 1989, 1976.

Drawn: TT 05/28/20	Checked: JM 05/28/20	Approved: DS 05/28/20

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Figure 2-5
Generalized Stratigraphic Column
Catalyst Energy Lot 580-1 Well Area
McKean County, Pennsylvania

Geologic Age	Group or Formation	Predominant Lithology	Approximate Total Depth to Base (Ft)	Approximate Thickness (Ft)	Zone Type
Missippian / Pennsylvanian	Includes Pottsville Sandstone	Sandstone and shale	400	400	Includes USDW
Upper Devonian		Predominantly Shale	2000	1600	
	Bradford Sandstone	Sandstone	2100	100	Oil/Gas Producing
Middle Devonian	Hamilton Group	Predominantly Shale	5081	2981	
	Marcellus Shale	Shale	5169	88	
	Onondaga	Limestone	5266	97	Proposed Injection
Lower Devonian	Bois Blanc	Limestone	5279	13	
	Helderberg	Limestone	5338	59	
Silurian	Bass Islands	Dolomite	5398	60	
	Salina*	Evaporites/Dolomite	6313	915	
	Lockport*	Dolomite	6628	315	
	Clinton*	Sandstone	6738	110	
	Tuscarora*	Sandstone	6868	130	
Ordovician	Queenston*	Shale	6943	75	

Notes:
*Formation not penetrated in Lot 580-1 Well; thickness based on nearby Catalyst Amoco Witco #1 Well
Confining interval
Secondary Confining Interval - interpreted overall low porosity and permeability

SW
A

NE
A'

ENERVEST
LOT 581-1
(#037-083-40667)

PROPOSED INJECTION WELL
CATALYST ENERGY
LOT 580-1
(#037-083-46237)

CATALYST ENERGY
SWEELEY #1
(#037-083-46948)

EXISTING GROUND SURFACE

USDW

PREDOMINANTLY UPPER DEVONIAN SHALES CONFINING INTERVAL

BRADFORD SANDSTONE

PREDOMINANTLY MIDDLE AND UPPER DEVONIAN SHALES CONFINING INTERVAL

MARCELLUS SHALE

ONONDAGA FORMATION (INJECTION INTERVAL)

MARCELLUS
ONONDAGA

MARCELLUS
ONONDAGA

HAMILTON
ONONDAGA

SALINA

T.D.
5439.0

T.D.
5420.0

T.D.
5489.0

SALINA FORMATION (LOWER CONFINING FORMATION)

SILURIAN - CAMBRIAN AGED FORMATIONS

3,000-FT. REMOVED FROM VERTICAL SECTION

PRE-CAMBRIAN BASEMENT

(MEAN SEA LEVEL)

2200, 2000, 1800, 1600, 1400, 1200, 1000, 800, 600, 400, 200, 0, -200, -400, -600, -800, -1000, -1200, -1400, -1600, -1800, -2000, -2200, -2400, -2600, -2800, -3000, -3200, -3400, -3600, -3800, -4000, -4200, -4400, -4600, -4800, -5000, -5200, -5400, -5600, -5800, -6000, -9000, -9200, -9400, -9600, -9800, -10000, -10200, -10400, -10600

0, 500, 1000, 1500, 2000, 2500, 3000, 3500, 4000, 4050

VERTICAL EXAGGERATION = 0.5X

TETRA TECH
www.tetratech.com
661 ANDERSEN DRIVE - SUITE 200
PITTSBURGH, PA 15220
T: (412) 921-7090 | F: (412) 921-4040

CATALYST ENRGY

CLIENT LOCATION

GEOLOGIC CROSS-SECTION A-A'

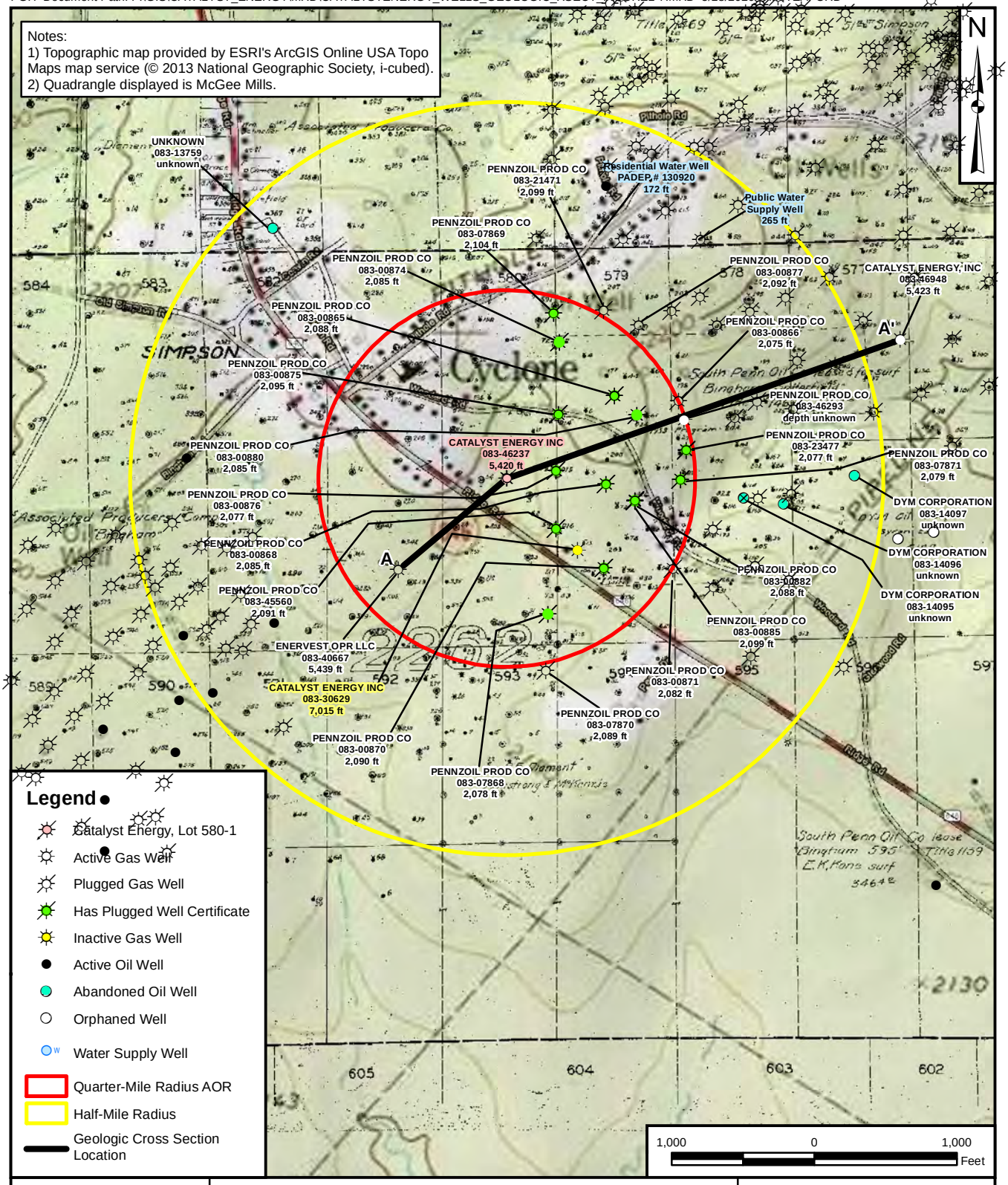
MCKEAN COUNTY, PENNSYLVANIA

DATE:	5/22/20
PROJECT NO.:	212C-PB-01530
DESIGNED BY:	JM
DRAWN BY:	BH
CHECKED BY:	DS

FIGURE 2-6

SHEET 1 OF 1

PGH Document Path: P:\GIS\CATALYST_ENERGY\MXD\CATALYSTENERGY_WELLS_GEOLOGIC_XSECT_FIGURE2-7.MXD 5/28/2020 TIM TEAFORD



TETRA TECH

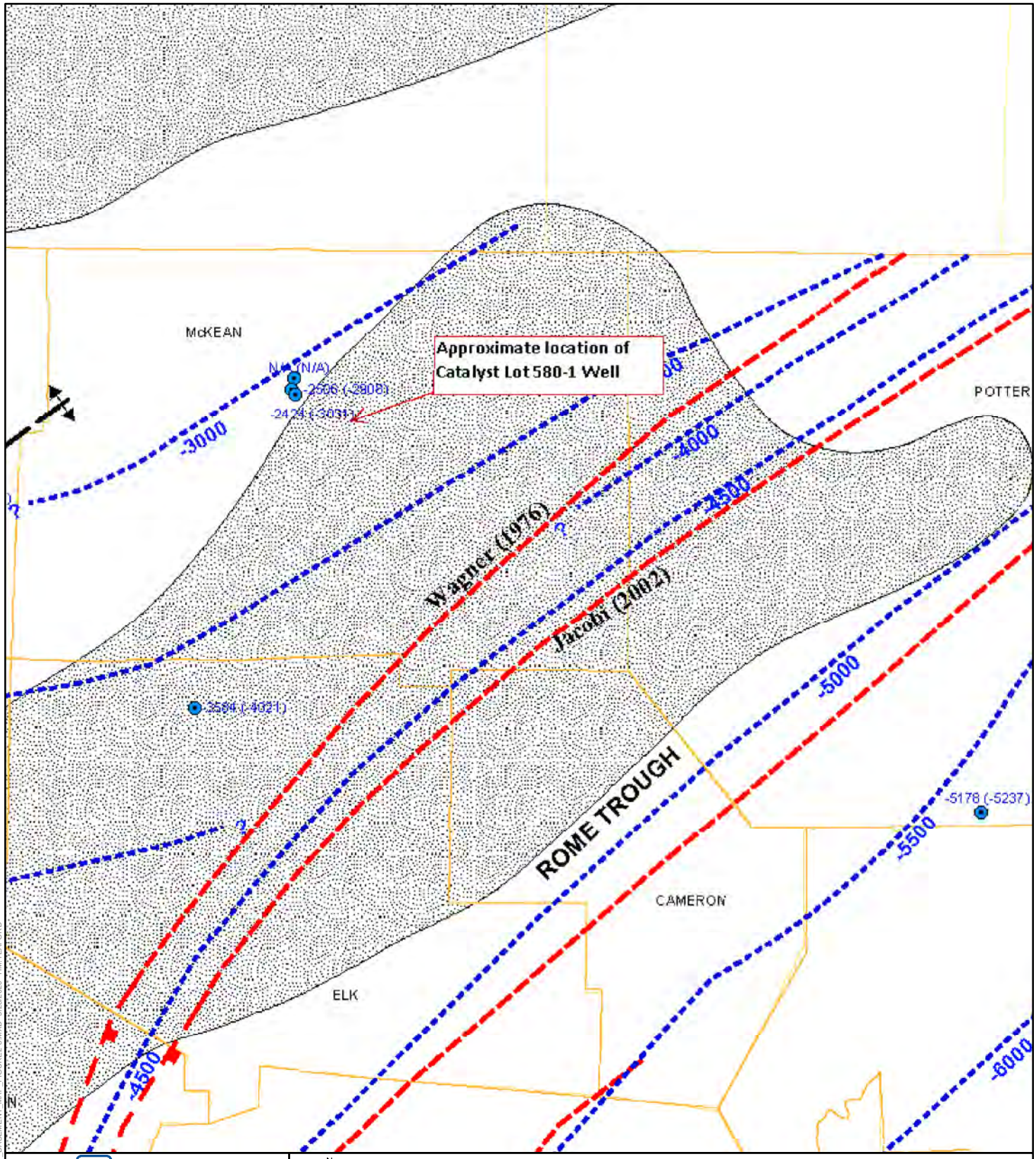
GEOLOGIC CROSS SECTION LOCATION
CATALYST ENERGY LOT 580-1

CATALYST ENERGY, INC.
MCKEAN COUNTY, PENNSYLVANIA

DRAWN BY: T. TEAFORD 05/28/20
CHECKED BY: J. MARLOW 05/28/20
APPROVED BY: D. SKOFF 05/28/20

CONTRACT NUMBER: 212C-PB-01530

FIGURE NUMBER	REV
2-7	0



TETRA TECH

N

1 inch = 9 miles

9 0 9 Miles

FIGURE 2-8
CATALYST ENERGY
LOT 580-1 WELL LOCATION
PRECAMBRIAN BASEMENT MAP
OF PENNSYLVANIA

Notes:
1) Prepared by D.P. Gold (1) in collaboration with S.S. Alexander, R. Cakir, A. G. Doden and S. I. Root.
2) Portion of Open-File General Geology (OFGG) Report OFGG 05-01.0

Drawn: TT 05/28/20 | Checked: JM 05/28/20 | Approved: DS 05/28/20

Legend

Pennsylvania database
- Fault (bar indicates dip direction)
- Fault, inferred
- Fault, mapped
- Seismic fault (barb indicates inferred dip direction)
- Lineament
- Basement contours: depths in meters below sea level
- Structural trough, inferred
- Structural arch, inferred
- -1811 (-2098) Deep drill hole in Paleozoic cover rocks; bottom elevation of hole in meters below sea level (estimated depth to basement)
- ND or N/A Elevation not determined or not available
- -5414 (-5172) Deep drill hole to basement; bottom elevation of hole in meters below sea level (estimated depth to basement contact)
- -5150 Seismic depth in meters (Alexander, Lavin, and Parrish)
- -7990 Seismic depth in meters (Scanlin and Engelder, 2003)

- Ordovician alkaline dike
- Jurassic diabase dike
- Jurassic kimberlite dike
- Lower Paleozoic granite pegmatite dike
- Precambrian metadiabase dike

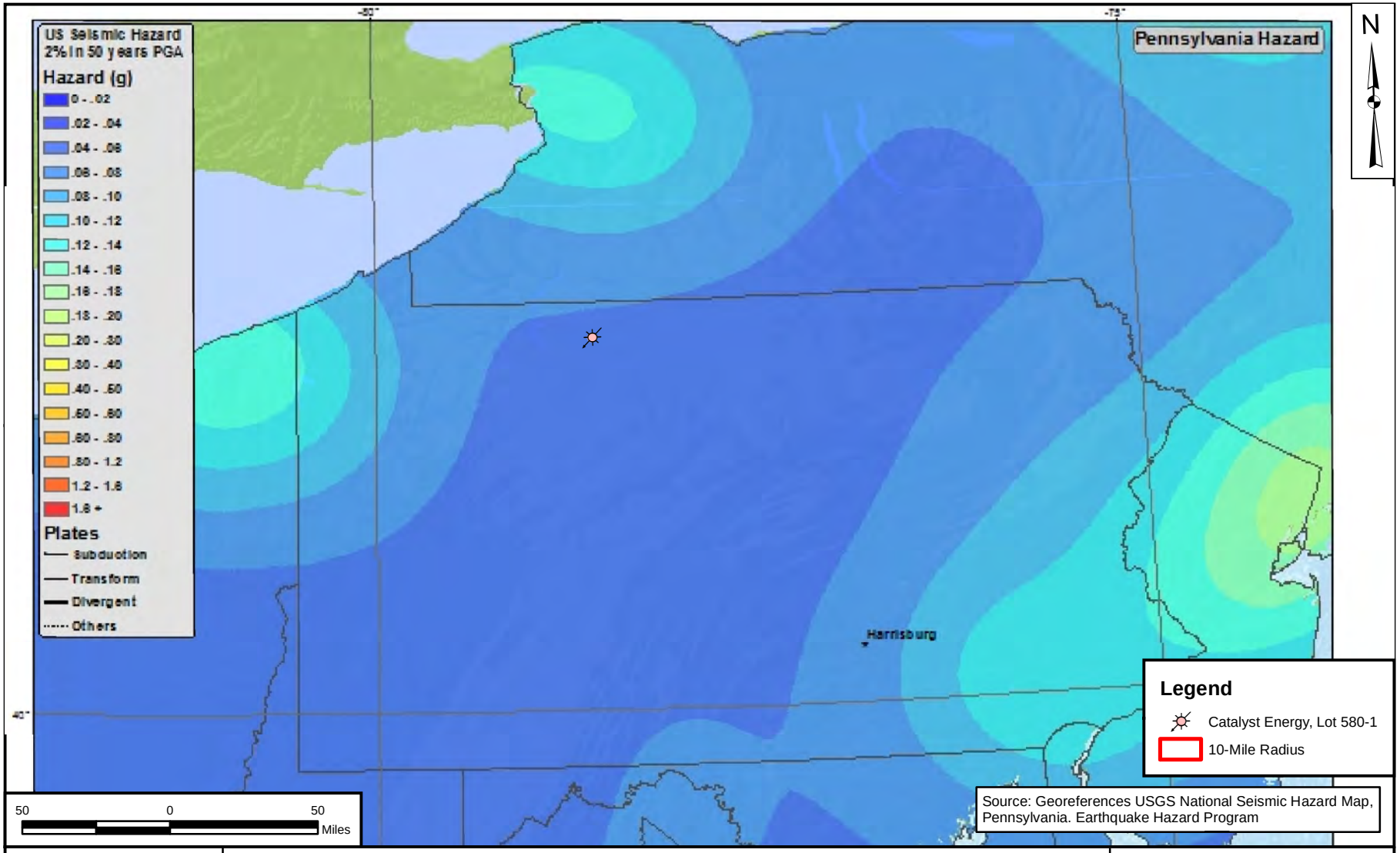
West Virginia database
- Normal fault; tab on downthrown side
- Thrust fault; barbs on upthrown side
- Basement contours; depths in feet and meters below sea level

Ohio database
- -1832 Drill hole, depth in meters below sea level
- Fault, inferred
- Basement contours; depths in feet and meters below sea level

New York database
- Fault (Jacobi, 2002)

PGH Document Path: P:\GIS\CATALYST_ENERGY\MXD\CATALYSTENERGY_BASEMENT_MAP_FIGURE2-8.MXD 5/28/2020 TIM.TEAFORD

PGH Document Path: P:\GIS\CATALYST_ENERGY\MXD\CATALYSTENERGY_SEISMIC_HAZARD_MAP_FIGURE9.MXD 5/28/2020 TIM.TEAFORD



TETRA TECH

USGS SEISMIC HAZARDS MAP FOR PENNSYLVANIA

CATALYST ENERGY, INC.

MCKEAN COUNTY, PENNSYLVANIA

DRAWN BY: T. TEAFORD 05/28/20
CHECKED BY: J. MARLOW 05/28/20
APPROVED BY: D. SKOFF 05/28/20

CONTRACT NUMBER: 212C-PB-01530

FIGURE NUMBER 2-9

REV 0

Figure 3-1
Construction Diagram - Existing Conditions
Catalyst Energy
Lot 580-1
Keating Township
McKean County, PA
API# 37-083-46237

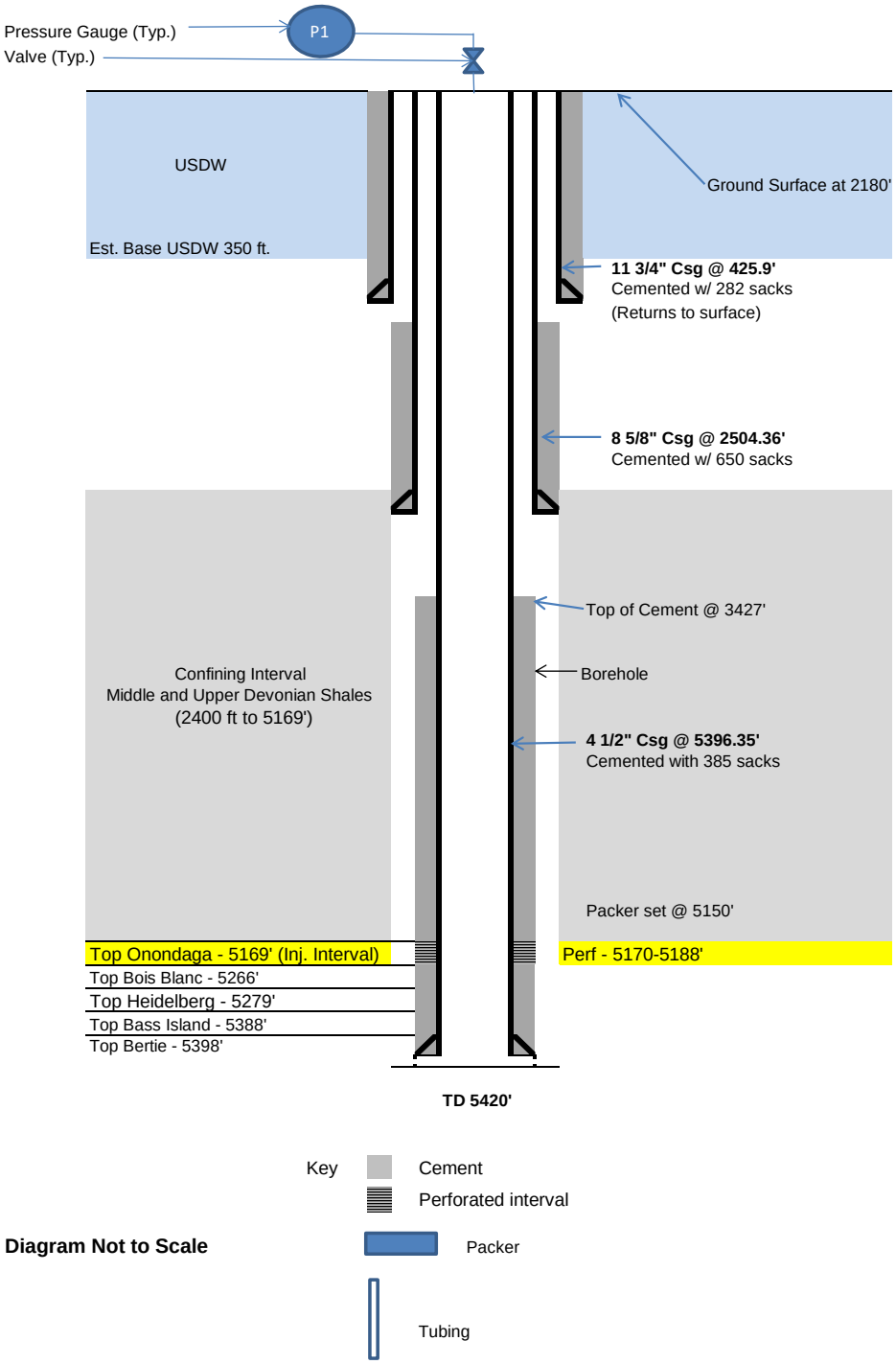


Diagram Not to Scale

Figure 3-2
Construction Diagram - Proposed Injection Well
Catalyst Energy
Lot 580-1
Keating Township
McKean County, PA
API# 37-083-46237

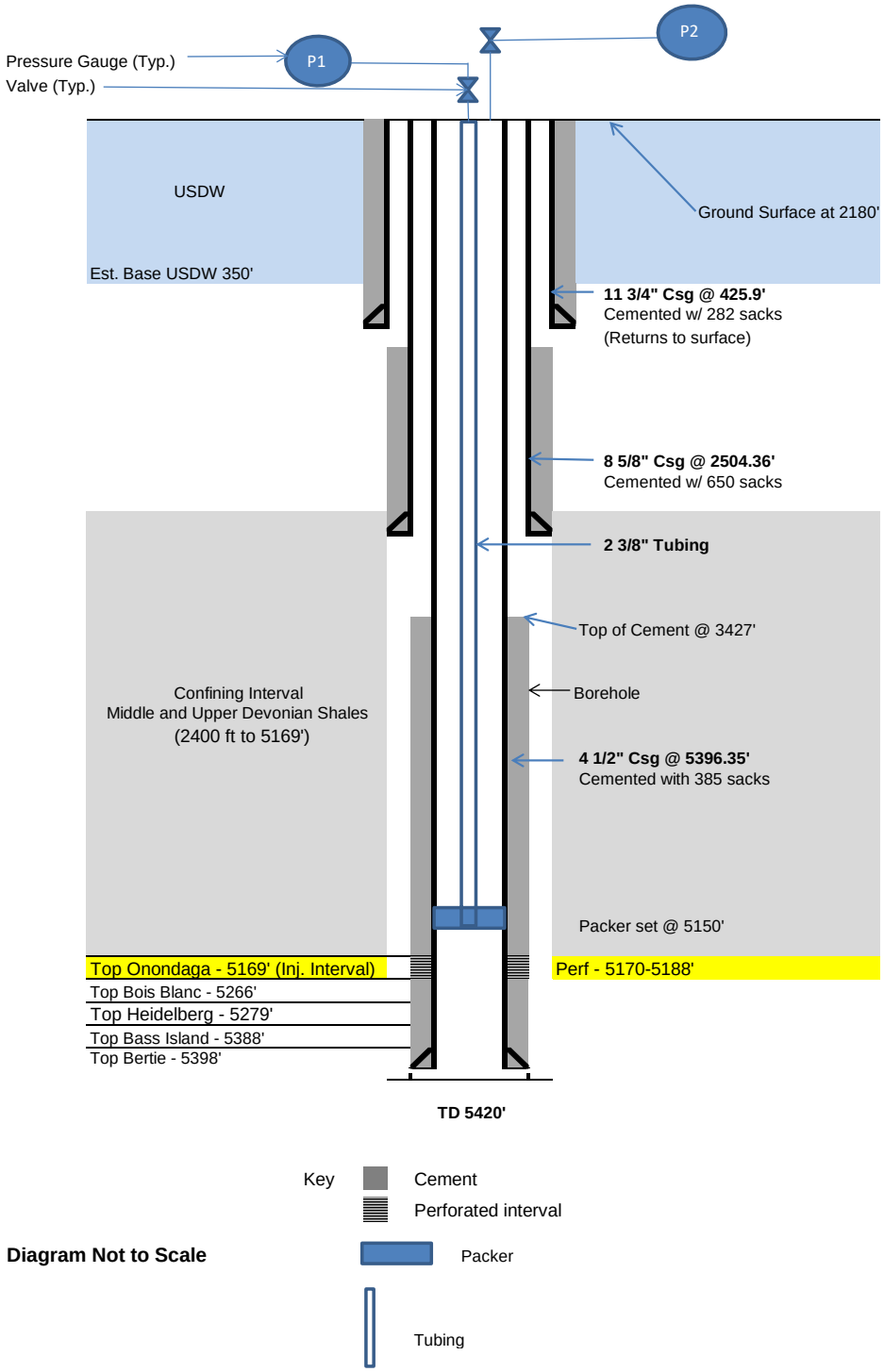


Diagram Not to Scale

Figure 4-1
Facility Layout Drawing

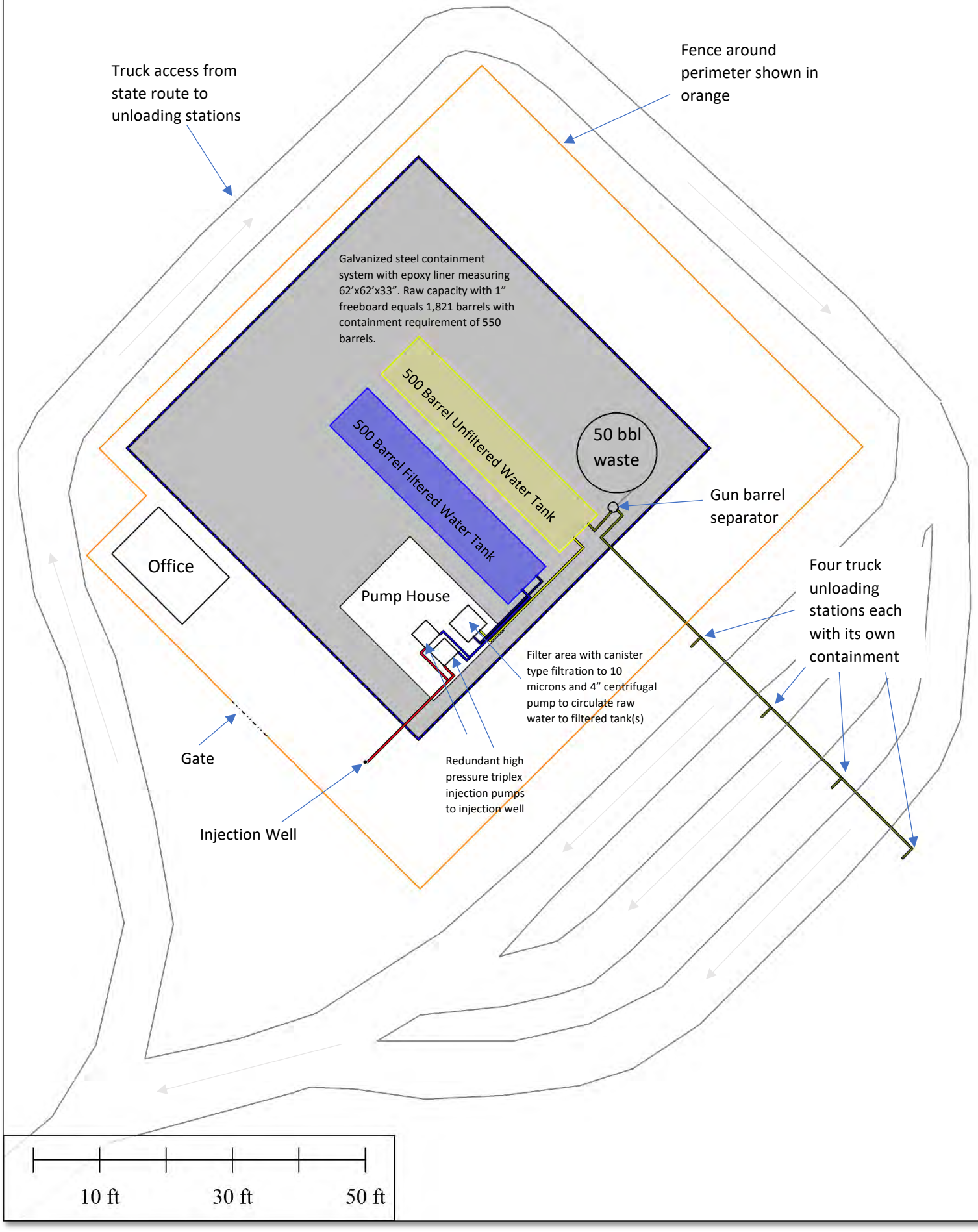


Figure 4-2
Construction Diagram - Proposed Monitoring Well
Catalyst Energy
Amoco Witco #1
Keating Township
McKean County, PA
API# 37-083-30629

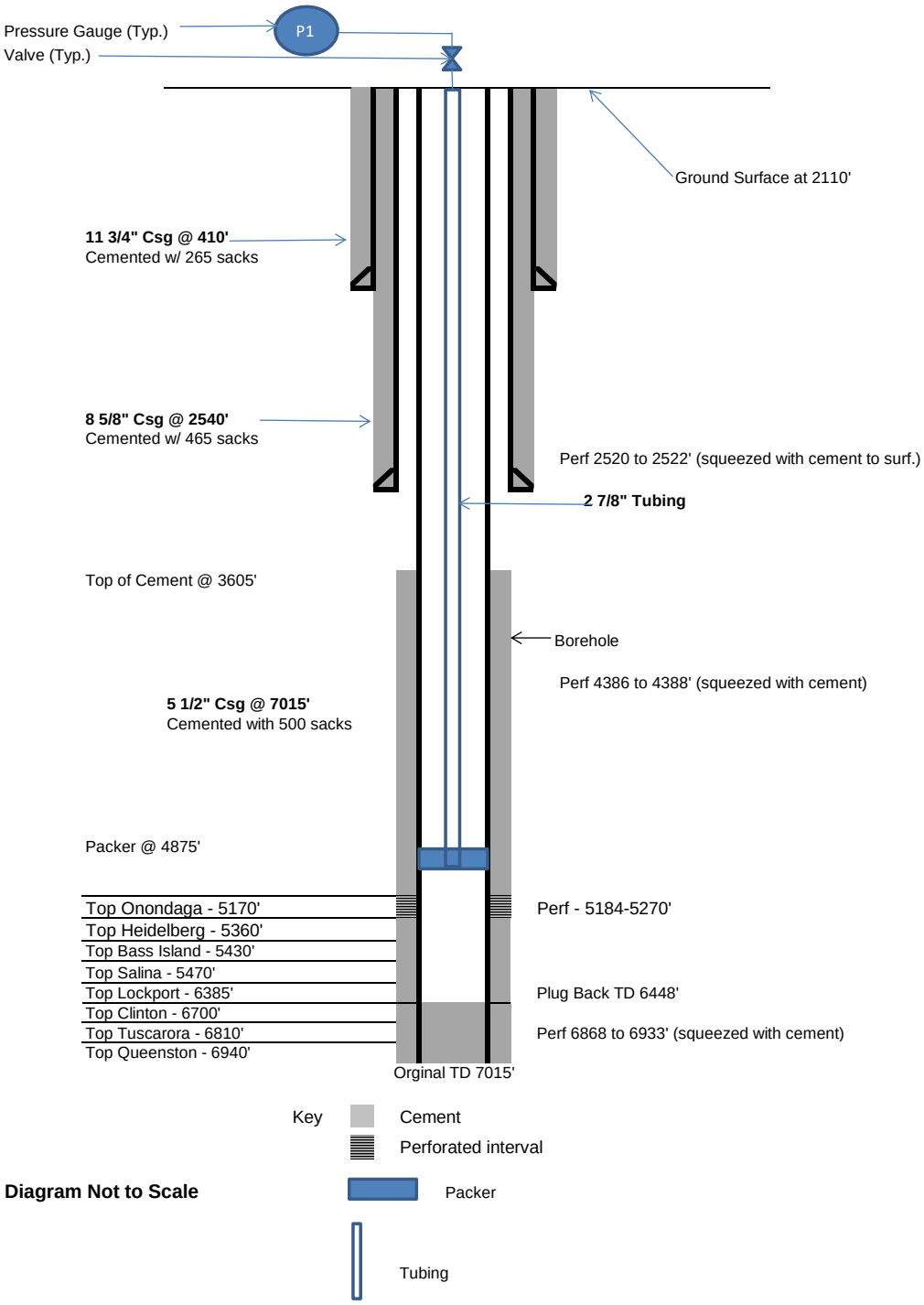


Diagram Not to Scale

APPENDICES

APPENDIX A

COMPLETION REPORTS – WELLS TO INJECTION INTERVAL IN AOR

ER-OG-4: Rev. 3/89

Cyclone
083-46237

RE
1000' S 41°50'00"
11000' W 78°32'30"
(E)

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

DEEP

CONFIDENTIAL

WELL RECORD AND COMPLETION REPORT

1. In accordance with 25 Pa. Code 78.122(a), a Well Record must be submitted to the Department within 30 calendar days of cessation of drilling or altering a well.
2. In accordance with 25 Pa. Code 78.122(b), a Completion Report must be submitted within 30 calendar days after completion of the well. In addition, the information on land application of tophole water and disposal of residual waste (including contaminated drill cuttings) in a pit is to be filed with the Completion Report (see ER-OG-75).

BRADFORD FIELD, CYCLONE POOL DEV

Well Operator: Belden & Blake Corporation		Telephone Number: (814) 368-1660	
Address: 14 North Third Street, Bradford, PA 16701			Zip
Permit Number: 37-083-46237-00	Project Number		
Farm Name: Lot 580	Farm Number: 580-1	Serial Number	Acres: 52
Township: Keating	County: McKean		
Type of Well: ☒ Gas ☐ Oil ☐ Injection ☐ Storage ☐ Disposal ☐ Other (Specify)			

ATTACH

WELL RECORD
(Include Driller's Log on Reverse Side)

Drilling Method: Rotary (Air ☒ Mud ☒ Cable Tool ☐ Other ☐ (Specify)		Date Drilling Started: 5-11-90	Date Drilling Completed: 5-19-90
Elevation: 2180'	Total Depth: 5420' BI	7½' Quadrangle: Cyclone	

CASING AND TUBING RECORD

Hole Size	Pipe Size	Amount In Well	Material Behind Pipe: Type and Amount	Packer/Hardware: Type	Size	Depth	Date Run
17"	16"	31'					5-11-90
15"	11 3/4"	425.9'	282 sks cement 3% $CaCl_2$ ¼# flocele				5-12-90
11"	8 5/8"	2504.36'	420 sks cement 3% $CaCl_2$ ¼# flocele 230 sks cement Thixotropic ¼# flocele				5-15-90
7 7/8"	4 ½"	5396.35'	385 sks cement 3% KCL ¼# flocele				5-20-90

Cement return on surface casing? ☒ yes ☐ no

COMPLETION REPORT CONFIDENTIAL

Perforation Record: Date	Interval Perforated: From	To	Stimulation Record: Date	Interval Treated	Fluid: Type	Amount	Propping Agent: Type	Amount	Average Injection Rate
7/3/90	perf. 20 holes 5170	0.36" 5188	7/3/90	5170-5188	15% HCL	500 gal			

T.D.	D.D.	D.P.I.	Class	O	G	Lease
5420		5188	D	0	1	3

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Natural Open Flow	Natural Rock Pressure	Hours	Days
0	not gauged		
After Treatment Open Flow	**After Treatment Rock Pressure**	**Hours**	**Days**
not gauged	1440 psig	24	

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ONONDAGA
PA GEOLOGICAL SURVEY
Oil & Gas Geology Division

Name, Address, and Telephone Number of Well Service Companies	
Schlumberger Well Service	Halliburton Services
95 Rutherford Run	350 High Street
Bradford, PA 16701	Bradford, PA 16701
(814) 362-7441	(814) 362-4523

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FEB 22 1991
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RECEIVED
FEB 20 1991
Bureau of Oil & Gas Management
Environmental Resources

DRILLER'S LOG OF FORMATIONS

Name	Top	Bottom	Gas At	Oil At	Water At (Fresh or Brine)	Source of Data
Clay, Shale, Sandstone	0	42				Driller's Log
Shale	42	87				Gamma Ray Log
Shale, Hard Sandstone	87	470				
Red Shale, Sandstone	470	1278				
Shale, Sandstone	1278	2367				
Shale	2367	4773				
Tully	4773	4790				
Moscow	4790	4842				
Tichner	4842	4852				
Ludlowville	4852	5030				
Skantanteles	5030	5081				
Marcellus	5081	5169				
Onondaga ONESQUETHAW	5169	5266				
Bois Blanc	5266	5279				
Helderberg	5279	5338				
Bass Island	5388	5398				
Bertie	5398	—				
T.D.	5420					

Bernard R. Klumpp — Operator's Signature

Senior Geologist — Title

10/26/90 — Date

FOR OFFICIAL USE ONLY

25 Feb 91 — Date

Reviewed By

Comments

ER-OG-4:71

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
DIVISION OF OIL AND GAS
PITTSBURGH, PENNSYLVANIA 15222

1500' S 41°50' 00"
10,500' W 78°32' 30" (E)
Deeper Pool Discovery
COMPUTERIZED
map checked
DEEP
Keating Pool
Bradford Field

Office Use Only
CMC

WELL RECORD

PERMIT NO. ~~McK~~ 083-20629

PROJECT NO. ______

CSO TYPE OF WELL (GAS) Oil
[redacted]

WELL OPERATOR	Amoco Production Company				
ADDRESS	P. O. Box 691, Kalkaska, Michigan			ZIP	49646
FARM NAME:	Bingham Satterfield (Surface) @Pennzoil Oil Co.	FARM NO.	Amoco Witco #1	SERIAL NO.	ACRES 1095
TOWNSHIP:	Keating	COUNTY:	McKean		
DRILLING COMMENCED	12-12-73	DRILLING COMPLETED	2-18-74		
ELEVATION	2110' (Ground)	QUADRANGLE	CYCLONE ~~Bradford~~	[X] 7 ½'	[ ] 15'

Casing and Tubing Record

Pipe Size	Amt. In Well	Material Behind Pipe Cement (Sks.)	Gel (Sks.)	Packer Type	Size	Depth	Date Run
16"	53'	40 Sks	None				12-13-73
11-3/4"	410'	265 Sks	"				12-17-74
8-5/8"	2540'	465 Sks	"				12-26-73
5-1/2"	7015'	500 Sks	"				2-11-74
2-7/8"	Tubing Landed 4875'		"	Baker Model R	2-7/8" 5-1/2"	4875'	2-18-74

T.D.	D.D.	O.P.I.	Class	O	G	Lease
7015		5270	E	X		

Perforation Record Date	Interval Perforated From	To	Stimulation Record Date	Interval Treated	Amt. Fluid	Amt. Sand	Injection Rate
2-14-74	4386'	4388'	2-14-74	350 Sks Cement squeezed under 4500# Pressure			
2-14-74	2520'	2522'	2-14-74	450 Sks Cemented Back to Surface			
2-18-74	6868'	6933'	2-26-74	6868-6933	20,000 gal Wtr		9500# 13.7 BPM
			4-1-74	6868-6933	75 sks cement squeezed 3400 psi		
4-4-74	5184' (OVERALL)	5270'	4-4-74	5184-5194, 5212-5220, 5226-5240, 5258-5270	See Remarks		
			4-22-74				

Natural Open Flow: 200 MCFD @ 60 psi — Natural Rock Pressure: 2841 psi ___ hrs. ~~days~~

After Treatment Open Flow: 3,000 MCFD — After Treatment Rock Pressure 2841 psi 79 Hr Bottom Hole Build Up hrs. ~~days~~

REMARKS: Interval 5184' thru 5270': Treated with 3000 Gal 28% HCL, 4.5 BPM, 4-4-74.

Retreated with 10,000 Gal 28% HCL, 10,000 Gal 15% HCL, 8.0 BPM, 4-22-74.

Plug Back Depth: 6448'

Interval 7015' thru 6448': Plug back accomplished with 75 sacks cement (35 sacks in formation, 40 sacks in casing)

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Oil & Gas Division

7015
1760
5330

Producing Formation: Onondaga Limestone

Formation on Reverse Side

052874

WAS
6/11/74

083-20629

FORMATIONS

Name	Top	Bottom	Gas At	Oil At	WATER AT (Fresh or Salt Water)	Source of Data
Interbedded SS - lt.-m. gry., v.f.-f.gr., Sh-M. dk gry.-brn. & SLTS. gry-brn.	Surface	4200				Samples and E-Log.
Sh-Gry-Dk. Gry.	4200	4800				
Tully Limestone	4800	4865				
Ls-Lt-Dk Gry, ARG, CRPxL, Sh-Dk Gry - Blk	4865	5170				
Onondaga Limestone	5170	5360	5184' Thru 5270'			
Ls-Lt-M. Gry, F,XLN.						
Helderberg Limestone	5360	5420				
Ls-Lt-M. Gry, V.F., XLN						
Bass Island	5430	5470				
Dol. Lt-M. Gry and Tan, V.F., XLN, Sl. suc.						
Silurian Salina	5470	5700				
Dol. Lt. Gry-Brn. F-V.F. XLN w/ANYH-Amber, Trans.						
Salt	5696	6385				
Salt-CL w/Dol - Lt. Gry. M. Brn, F. XLN, Sh. - Lt. Gry-Grn, Soft, Anhy.						
Lockport	6385	6700				
Dol.-Dk. Gry-Brn, SLTY in Pt., Interbed Sh.-Lt.Gry-Brn, Soft						
Clinton	6700	6810				
Sh. Lt. Brn-Gry, Soft w/Dol. Interbeds, Lt.Brn, V.F., XLN						
Tuscarora	6810	6940				
SS- WH-Lt. Gry, F-M Gr w/Sh Interbeds - Lt.-M.Gry						
Queenston	6940	7015 TD				
Sh - Rd-Lt. Rd., SLTY, SDY, HEM.						

Date May 17, , 19 74

Approved Amoco Production Company Operator

By _____

Title
R. E. Strong, Supervisor In Charge

DRILLER'S RECORD
FOR WITCO #1
(31-083-40667)

35-70	Sand	CSG Record	
70-150	Shale		
150-195	Sand & Shale	40'-16"	Set in
195-220	Shale	530'-11 3/4"	Cemented
220-357	Sand & Shale	2390'-8 5/8"	Cemented
357-753	No Record		
753-785	Shale & Sand		
785-1186	Shale		
1186-1590	Sand & Shale		
1590-1595	Red Rock		
1595-2476	Sand & Shale (hole wet)		
2476-2920	No Record		
2920-3607	Shale		
3607-4230	Sand & Shale		
4230-5250	No Record		
5250-5443	Lime		

Logger's T.D. - 5439

5500-FM-OG0004a 2/2011

For assistance in accessing this document, contact: R3_UIC_Mailbox@epa.gov

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

Well Record

DEP USE ONLY	
Site ID	Primary Fac ID
Client Id	Subfacility Id

WELL INFORMATION

Well Operator: TRIANA ENERGY LLC	DEP ID#: 279489	Well API # (Permit / Reg): 37-083-55072-00-00		Project Number	Acres
Address: 900 VIRGINIA ST E		Well Farm Name: MROC Pad B		Well #: 4H(A)	Serial #:
City: CHARLESTON	State: WV / Zip Code: 25301	County: McKean		Municipality: Bradford	
Phone: 304-205-8560	Fax: 304-205-8560	Email: rking@trianaenergy.com		USGS 7.5 min. quadrangle map: Derrick City	

Check the appropriate Submission: ☐ Original Well Record ☐ Amended Well Record

Well Type	☒ Gas	☐ Oil	☐ Combination Oil & Gas	☐ Injection	☐ Storage	☐ Disposal
Well Orientation	☐ Vertical	☒ Deviated from Vertical (Side view and Deviated Survey must be attached)				
Drilling Method	☒ Rotary – Air	☒ Rotary – Mud	☐ Cable Tool			

Date Drilling Started	Date Drilling Completed	Surface Elevation	Total Depth – Driller	Total Depth – Logger	Depth of Deepest Fresh Groundwater
5/11/11	5/31/11	2232 ft.	8783 ft.	n/a ft.	230 ft.

CEMENT

Cement returned on surface casing?	☒ Yes ☐ No	If No, provide top of cement and method used to determine:
Cement returned on coal protective casing?	☐ Yes ☐ No	If No, provide top of cement and method used to determine: ☒ N/A
Cement returned on intermediate casing?	☒ Yes ☐ No	If No, provide top of cement and method used to determine: ☐ N/A

Casing String	Type of Cement	Amount of Cement	Gas Block (or equivalent) Used
Conductor	Sacrete	75 sks	
Surface	Type I	844 cf	☐ Yes ☒ No ☐ N/A
Coal Protective			☐ Yes ☐ No ☒ N/A
Intermediate	Lead-65/35 poz, Tail-Type I	953 cf	☐ Yes ☐ No ☐ N/A
Production			☐ Yes ☐ No ☒ N/A
			☐ Yes ☐ No ☐ N/A
			☐ Yes ☐ No ☐ N/A
			☐ Yes ☐ No ☐ N/A

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CASING AND TUBING

Hole Size	Pipe Size	Wt.	Thread / Weld	Casing / Tubing Type	Amount in Well (ft.)	*Packer / Hardware / Centralizers* Type	Size	Depth	Date Run
24"	20"	55	Weld	LS	60'				5/11/11
17.5"	13-3/8"	48	Thread	H-40	866'				5/14/11
12.37 5"	9-5/8"	40	Thread	K-55	2530'				5/20/11

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If any casing is welded, provide the name of the welder:

Also complete the Log of Formations on back (page 2)

5500-FM-OG0004a 2/2011

LOG OF FORMATIONS

Well API#: 37-083-55072-00-00

(If you will need more space than this page, please photocopy the blank form before filling it in.)

Formation Name or Type	Top (feet)	Bottom (feet)	Gas at (feet)	Oil at (feet)	Water at (fresh / brine; ft.)	Source of Data
Subfloor	0	10				Drillers Log
Sand and Shale	10	75				
Shale	75	175				
Sand and Shale	175	890			FW @ 230'	
Silty Shale	890	1201				
Sand	1201	1208				
Sand and Shale	1208	1396				
Bradford 1st	1396	1462				GR - Pilot Hole on Pad
Shale	1462	1495				
Watsonville	1495	1511				
Shale	1511	1525				
Dew Drop	1525	1565				
Shale	1565	1614				
Chipmunk	1614	1660				
Silty Shale	1660	1702				
Bradford 2nd	1702	1754				
Shale	1754	1822				
Harrisburg Run	1822	1909				
Silty Shale	1909	2000				
Bradford 3rd	2000	2084				
Silty Shale	2084	2126		2089		
Lewis Run	2126	2156				
Silt and Shale	2156	3874		2563		
Siltstone	3874	3958				Mudlog/MWD GR
Burket	3958	4695				
Tully	4695	4827				
Shale	4827	5329				
Marcellus	5329	8783				
	DTD	8784				

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I do hereby certify to the best of my knowledge, information and belief that the well identified on this Well Record has been properly cased and cemented in accordance with the requirements of 25 Pa. Code Chapter 78 and any conditions contained in the permit for this well. In addition, I do hereby certify that any casing which is attached to a blow-out preventer with a pressure rating greater than 3,000 psi has passed a pressure test in accordance with 25 Pa. Code §78.84(f). I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Well Operator's Signature

Rachael A. Long 6-15-11

Title: Director of Regulatory Affairs Date:

DEP USE ONLY

Reviewed by: T. Cuny Date: 8-5-11

5500-FM-OG0004a 2/2011

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

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DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

Well Record

DEP USE ONLY	
Site ID	Primary Fac ID
Client Id	Subfacility Id

WELL INFORMATION

Well Operator	DEP ID#	Well API # (Permit / Reg)	Project Number	Acres
TRIANA ENERGY LLC	279489	37-083-55072-00-00		

Address	Well Farm Name	Well #	Serial #
900 VIRGINIA ST E	MROC Pad B	4H-A	

City	State	Zip Code	County	Municipality
CHARLESTON	WV	25301	McKean	Bradford

Phone	Fax	Email	USGS 7.5 min. quadrangle map
304-205-8560	304-205-8560	rking@trianaenergy.com	Derrick City

Check the appropriate Submission: ☒ Original Well Record ☒ Amended Well Record

Well Type	☒ Gas	☐ Oil	☐ Combination Oil & Gas	☐ Injection	☐ Storage	☐ Disposal
Well Orientation	☐ Vertical	☒ Deviated from Vertical (Side view and Deviated Survey must be attached)				
Drilling Method	☒ Rotary – Air	☒ Rotary – Mud	☐ Cable Tool			

Date Drilling Started	Date Drilling Completed	Surface Elevation	Total Depth – Driller	Total Depth – Logger	Depth of Deepest Fresh Groundwater
5/11/11	6/22/11	2232 ft.	8664 ft.	n/a ft.	230 ft.

CEMENT

Cement returned on surface casing? ☒ Yes ☐ No — If No, provide top of cement and method used to determine:

Cement returned on coal protective casing? ☐ Yes ☐ No — If No, provide top of cement and method used to determine: ☒ N/A

Cement returned on intermediate casing? ☒ Yes ☐ No — If No, provide top of cement and method used to determine: ☐ N/A

Casing String	Type of Cement	Amount of Cement	Gas Block (or equivalent) Used
Conductor	Sacrete	75 sks	
Surface	Type I	844 cf	☐ Yes ☒ No ☐ N/A
Coal Protective			☐ Yes ☐ No ☒ N/A
Intermediate	Lead-65/35 poz, Tail-Type I	953 cf	☐ Yes ☒ No ☐ N/A
Production	Lead-Varicem, Tail-Fraccem	1653 cf	☐ Yes ☒ No ☐ N/A
			☐ Yes ☐ No ☐ N/A
			☐ Yes ☐ No ☐ N/A
			☐ Yes ☐ No ☐ N/A

CASING AND TUBING

Hole Size	Pipe Size	Wt.	Thread / Weld	Casing / Tubing Type	Amount in Well (ft.)	Packer / Hardware / Centralizers Type	Size	Depth	Date Run
24"	20"	55	Weld	LS	60'				5/11/11
17-1/2"	13-3/8"	48	Thread	H-40	866'				5/14/11
12-3/8"	9-5/8"	40	Thread	K-55	2530'				5/20/11
8-1/2"	5-1/2"	20	Thread	P110	8585'				6/25/11

See Letter on this

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ENVIRONMENTAL PROTECTION
WARREN DISTRICT OFFICE

If any casing is welded, provide the name of the welder:

Also complete the Log of Formations on back (page 2)

5500-FM-OG0004a 2/2011

LOG OF FORMATIONS

Well API#: 37-083-55072-00-00

(If you will need more space than this page, please photocopy the blank form before filling it in.)

Formation Name or Type	Top (feet)	Bottom (feet)	Gas at (feet)	Oil at (feet)	Water at (fresh / brine; ft.)	Source of Data
Subfloor	0	10				Drillers Log
Sand and Shale	10	75				
Shale	75	175				
Sand and Shale	175	890			FW @ 230'	
Silty Shale	890	1201				
Sand	1201	1208				
Sand and Shale	1208	1396				
Bradford 1st	1396	1462				GR - Pilot Hole on Pad
Shale	1462	1495				
Watsonville	1495	1511				
Shale	1511	1525				
Dew Drop	1525	1565				
Shale	1565	1614				
Chipmunk	1614	1660				
Silty Shale	1660	1702				
Bradford 2nd	1702	1754				
Shale	1754	1822				
Harrisburg Run	1822	1909				
Silty Shale	1909	2000				
Bradford 3rd	2000	2084				
Silty Shale	2084	2126		2089		
Lewis Run	2126	2156				
Silt and Shale	2156	3874		2563		
Siltstone	3874	4708				Mudlog/MWD GR
Burket	4708	4745				
Tully	4745	4750				
Shale	4750	5281				
Marcellus	5281	8664				
	TMD	8664				

RECEIVED

NOV 10 2011

ENVIRONMENTAL PROTECTION
WARREN DISTRICT OFFICE

I do hereby certify to the best of my knowledge, information and belief that the well identified on this Well Record has been properly cased and cemented in accordance with the requirements of 25 Pa. Code Chapter 78 and any conditions contained in the permit for this well. In addition, I do hereby certify that any casing which is attached to a blow-out preventer with a pressure rating greater than 3,000 psi has passed a pressure test in accordance with 25 Pa. Code §78.84(f). I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Well Operator's Signature	DEP USE ONLY
Rachel A. King 11-1-11	Reviewed by: Date: 11-15-11
Title: Director Regulatory Affairs Date:	Comments:

5500-FM-OG0004b 3/2011

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

Completion Report

DEP USE ONLY	
Site ID	Primary Fac ID
Client	Subfacility Id

Well Information

If you are submitting this Completion Report attached to the Well Record, you only need to enter the well API # in this section.

Well Operator	DEP ID#	Well API # (Permit / Reg)	Project Num	Acres
TRIANA ENERGY, LLC	279489	37 - 083-55072-00-00		

RECEIVED NOV 07 2011 ENVIRONMENTAL PROTECTION NORTHWEST REGIONAL OFFICE

Address	Well Farm Name	Well #	Serial #
900 Virginia Street East Suite 600	MROC Pad B	4H	

City	State	Zip Code	County	Municipality
Charleston	WV	25301	McKean	Bradford Township

Phone	Fax	Email	USGS 7.5 Quadrangle map
304-205-8560	304-205-8560	rking@trianaenergy.com	Derrick City

Check the appropriate submission: ☒ Original Completion Report ☐ Amended Completion Report

STIMULATION BASE FLUID

List Water Management Plan Approved Water Source(s) that were used	Water Management Plan ID No.	Volume (Gallons)
1. Port Allegheny Borough; Hydrant	WMP-279489-6	
2. Village of Limestone Cattaraugus, NY; Hydrant	WMP-279489-6	
3. Johnson Quarry; Interconnection	WMP-279489-04	
4. MROC -1 Groundwater Well	WMP-279489-6	
5. MROC -3 Groundwater Well	WMP-279489-6	
6. Total Volume Used From All 5 Sources		3,535,056 Gals
	Recycled Water Used	0
Other Base Fluid(s)Components Used		
1. NA		
2.		
	Total Base Fluid(s)/Components Used	

PERFORATION RECORD

Stage No.	Perforation Date	Stage Perforated From	Stage Perforated To	Perf. Orientation (Vertical, Horizontal, Radial)	Formation
1	09/16/2011	8572	8245	Vertical	Marcellus
2	09/21/2011	8156	7818	Vertical	Marcellus
3	09/22/2011	7740	7401	Vertical	Marcellus
4	09/23/2011	7323	6985	Vertical	Marcellus
5	09/24/2011	6907	6569	Vertical	Marcellus
6	09/25/2011	6591	6153	Vertical	Marcellus
7	09/26/2011	6075	5736	Vertical	Marcellus
8	09/27/2011	5658	5320	Vertical	Marcellus

RECEIVED DEC 01 2011 ENVIRONMENTAL PROTECTION WARREN DISTRICT OFFICE

RECEIVED NOV 10 2011 ENVIRONMENTAL PROTECTION WARREN DISTRICT OFFICE

Well API# 37-083-55072-00-00

STIMULATION STUDS/ADDITIVES

Note: Trade secret or confidential proprietary information should be clearly identified as such and should be submitted on a separate sheet attached to this report.

Descriptive Additive Type	Chemical Component(s) listed on Material Safety Data Sheet of the Additive	CAS No. of Chemical Component	Chemical Component % By Volume in Additive	Chemical Component % By Volume used in Each Stage					
				Stage No.	Stage No.	Stage No.	Stage No.	Stage No.	Stage No.
			Stages	1	2	3	4	5	6
HCl Acid	Hydrocloric Acid 31-37%	7647-01-0	15%	0.3665%	0.3489%	0.3127%	0.3709%	0.3542%	0.3051%
Biocide	Chlorine Dioxide ClO2	10049-04-4	100%	0.000011 %	0.000017 %	0.000008 %	0.000017 %	0.000011 %	0.000006 %
Scale Inhibitor	Terrascale (TM) TS-30	7789-20-0	30%	0.0099%	0.0098%	0.0096%	0.0098%	0.0094%	0.0096%
Friction Reducer	Unislik ST 50	64742-47-8	30%	0.0481%	0.0470%	0.0430%	0.0485%	0.0450%	0.0542%
			Stages	7	8				
HCl Acid	Hydrocloric Acid 31-37%	7647-01-0	15%	0.3907%	0.4294%				
Biocide	Chlorine Dioxide ClO2	10049-04-4	100%	0.000009 %	0.000005 %				
Scale Inhibitor	Terrascale (TM) TS-30	7789-20-0	30%	0.0106%	0.0107%				
Friction Reducer	TerrasUnislik ST 50cale (TM) TS-30	64742-47-8	30%	0.0259%	0.0330%				

Please insert additional copies of this page if additional rows/stages are needed.

Well API# 37 -083-55072-00-00

STIMULATION INFORMATION (WELL)

Open Flow Production:	24 Hr. Open Flow Production:	24 Hr. Shut-in Pressure:	Flow Back Date:

STIMULATION INFORMATION (STAGE)

Complete a separate record for each stimulation stage. (Please insert additional copies of this page for additional stages).

Stage No.: 1	Stimulation Date: 09/21/2011	Pump Rate: 75.3
Pressure (psi): 5323	Shut-in Surface Pressure: 3317	5 Minute Shut-in Surface Pressure: 2757
Propping Agent Type: Sand	Propping Agent Amount: 282,500 236,100	Propping Agent Size: 80/100 40/70
Stage No.: 2	Stimulation Date: 09/22/2011	Pump Rate: 76.7
Pressure (psi): 5626	Shut-in Surface Pressure: 3435	5 Minute Shut-in Surface Pressure: 2922
Propping Agent Type: Sand	Propping Agent Amount: 239,500 258,700	Propping Agent Size: 80/100 40/70
Stage No.: 3	Stimulation Date: 09/23/2011	Pump Rate: 75.6
Pressure (psi): 5547	Shut-in Surface Pressure: 3483	5 Minute Shut-in Surface Pressure: 2939
Propping Agent Type: Sand	Propping Agent Amount: 245,800 206,500	Propping Agent Size: 80/100 40/70
Stage No.: 4	Stimulation Date: 09/24/2011	Pump Rate: 76.2
Pressure (psi): 5587	Shut-in Surface Pressure: 3609	5 Minute Shut-in Surface Pressure: 2968
Propping Agent Type: Sand	Propping Agent Amount: 239,000 214,100	Propping Agent Size: 80/100 40/70
Stage No.: 5	Stimulation Date: 09/25/2011	Pump Rate: 77.4
Pressure (psi): 5430	Shut-in Surface Pressure: 4118	5 Minute Shut-in Surface Pressure: 3302
Propping Agent Type: Sand	Propping Agent Amount: 235,100 234,400	Propping Agent Size: 80/100 40/70
Stage No.: 6	Stimulation Date: 09/26/2011	Pump Rate: 76.7
Pressure (psi): 5047	Shut-in Surface Pressure: 4180	5 Minute Shut-in Surface Pressure: 3476
Propping Agent Type: Sand	Propping Agent Amount: 230,000 235,400	Propping Agent Size: 80/100 40/70

WELL SERVICE COMPANIES (Provide the name, address, and telephone number of all well service companies involved)

Name: J-W Wireline	Name: Universal Well Services Inc	Name: Terra Services LLC
Address: 376 Hope Station	Address: 124 Industrial Dr	Address: 395 Route 33 East
City – State- Zip: Weston, WV 26452	City – State – Zip: Bradford, PA 16701	City – State – Zip: Weston, WV 26452
Phone: 304-269-0633	Phone: 814-368-6175	Phone: 304-269-0600

I do hereby certify to the best of my knowledge, information and belief that the information contained on this Completion Report is true and correct. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment..

Well Operator's Signature	DEP USE ONLY
Rachelle A King	Reviewed by: Date: 11-15-11
Title: Director of Regulatory Affairs Date: 11-3-11	Comments: RECEIVED

Well API# 37 -083-55072-00-00

STIMULATION INFORMATION (WELL)

Open Flow Production:	24 Hr. Open Flow Production:	24 Hr. Shut-In Pressure:	Flow Back Date:

STIMULATION INFORMATION (STAGE)

Complete a separate record for each stimulation stage. (Please insert additional copies of this page for additional stages).

Stage No.: 7	Stimulation Date: 09/27/2011	Pump Rate: 75.8
Pressure (psi): 5090	Shut-In Surface Pressure: 3808	5 Minute Shut-In Surface Pressure: 3294
Propping Agent Type: Sand	Propping Agent Amount: 218,500 239,000	Propping Agent Size: 80/100 40/70
Stage No.: 8	Stimulation Date: 09/28/2011	Pump Rate: 75.6
Pressure (psi): 5272	Shut-In Surface Pressure: 3828	5 Minute Shut-In Surface Pressure: 3345
Propping Agent Type: Sand	Propping Agent Amount: 220,400 249,000	Propping Agent Size: 80/100 40/70
Stage No.:	Stimulation Date:	Pump Rate:
Pressure (psi):	Shut-In Surface Pressure:	5 Minute Shut-In Surface Pressure:
Propping Agent Type:	Propping Agent Amount:	Propping Agent Size:
Stage No.:	Stimulation Date:	Pump Rate:
Pressure (psi):	Shut-In Surface Pressure:	5 Minute Shut-In Surface Pressure:
Propping Agent Type:	Propping Agent Amount:	Propping Agent Size:
Stage No.:	Stimulation Date:	Pump Rate:
Pressure (psi):	Shut-In Surface Pressure:	5 Minute Shut-In Surface Pressure:
Propping Agent Type:	Propping Agent Amount:	Propping Agent Size:
Stage No.:	Stimulation Date:	Pump Rate:
Pressure (psi):	Shut-In Surface Pressure:	5 Minute Shut-In Surface Pressure:
Propping Agent Type:	Propping Agent Amount:	Propping Agent Size:

WELL SERVICE COMPANIES (Provide the name, address and telephone number of all well service companies involved)

Name Weatherford Wellhead Systems	Name	Name
Address 106 Blose Rd	Address	Address
City – State- Zip Punxsutawney, PA 15767	City – State – Zip	City – State – Zip
Phone 814-938-9662	Phone	Phone

I do hereby certify to the best of my knowledge, information and belief that the information contained on this Completion Report is true and correct. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment..

Well Operator's Signature	**DEP USE ONLY**
	Reviewed by: Date: [illegible]-11
Title: Director of Regulatory Affairs Date: 11-3-11	Comments:

5500-FM-OG0004a 2/2011

For assistance in accessing this document, contact: R3_UIC_Mailbox@epa.gov

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

Well Record

DEP USE ONLY	
Site ID	Primary Fac ID
Client Id	Subfacility Id

WELL INFORMATION

Well Operator	DEP ID#	Well API # (Permit / Reg)	Project Number	Acres
TRIANA ENERGY LLC	279489	37-083-55072-00-00		

Address	Well Farm Name	Well #	Serial #
900 VIRGINIA ST E	MROC Pad B	4H-A	

City	State	Zip Code	County	Municipality
CHARLESTON	WV	25301	McKean	Bradford

Phone	Fax	Email	USGS 7.5 min. quadrangle map
304-205-8560	304-205-8560	rking@trianaenergy.com	Derrick City

Check the appropriate Submission: ☒ Original Well Record ☒ Amended Well Record

Well Type	☒ Gas	☐ Oil	☐ Combination Oil & Gas	☐ Injection	☐ Storage	☐ Disposal
Well Orientation	☐ Vertical	☒ Deviated from Vertical (Side view and Deviated Survey must be attached)				
Drilling Method	☒ Rotary – Air	☒ Rotary – Mud	☐ Cable Tool			

Date Drilling Started	Date Drilling Completed	Surface Elevation	Total Depth – Driller	Total Depth – Logger	Depth of Deepest Fresh Groundwater
5/11/11	6/22/11	2232 ft.	8664 ft.	n/a ft.	230 ft.

CEMENT

Cement returned on surface casing? ☒ Yes ☐ No — If No, provide top of cement and method used to determine:

Cement returned on coal protective casing? ☐ Yes ☐ No — If No, provide top of cement and method used to determine: ☒ N/A

Cement returned on intermediate casing? ☒ Yes ☐ No — If No, provide top of cement and method used to determine: ☐ N/A

Casing String	Type of Cement	Amount of Cement	Gas Block (or equivalent) Used
Conductor	Sacrete	75 sks	
Surface	Type I	844 cf	☐ Yes ☒ No ☐ N/A
Coal Protective			☐ Yes ☐ No ☒ N/A
Intermediate	Lead-65/35 poz, Tail-Type I	953 cf	☐ Yes ☒ No ☐ N/A
Production	Lead-Varicem, Tail-Fraccem	1653 cf	☐ Yes ☒ No ☐ N/A
			☐ Yes ☐ No ☐ N/A
			☐ Yes ☐ No ☐ N/A
			☐ Yes ☐ No ☐ N/A

CASING AND TUBING

Hole Size	Pipe Size	Wt.	Thread / Weld	Casing / Tubing Type	Amount in Well (ft.)	*Packer / Hardware / Centralizers* Type	Size	Depth	Date Run
24"	20"	55	Weld	LS	60'				5/11/11
17-1/2"	13-3/8"	48	Thread	H-40	866'				5/14/11
12-3/8"	9-5/8"	40	Thread	K-55	2530'				5/20/11
8-1/2"	5-1/2"	20	Thread	P110	8585'				6/25/11

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ENVIRONMENTAL PROTECTION
WARREN DISTRICT OFFICE

If any casing is welded, provide the name of the welder:

RECEIVED
FEB 21 2012
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

Also complete the Log of Formations on back (page 2)

LOG OF FORMATIONS

Well API#: 37-083-55072-00-00

(If you will need more space than this page, please photocopy the blank form before filling it in.)

Formation Name or Type	Top (feet)	Bottom (feet)	Gas at (feet)	Oil at (feet)	Water at (fresh / brine; ft.)	Source of Data
Subfloor	0	10				Drillers Log
Sand and Shale	10	75				
Shale	75	175				
Sand and Shale	175	890			FW @ 230'	
Silty Shale	890	1201				
Sand	1201	1208				
Sand and Shale	1208	1396				
Bradford 1st	1396	1462				GR - Pilot Hole on Pad
Shale	1462	1495				
Watsonville	1495	1511				
Shale	1511	1525				
Dew Drop	1525	1565				
Shale	1565	1614				
Chipmunk	1614	1660				
Silty Shale	1660	1702				
Bradford 2nd	1702	1754				
Shale	1754	1822				
Harrisburg Run	1822	1909				
Silty Shale	1909	2000				
Bradford 3rd	2000	2084				
Silty Shale	2084	2126		2089		
Lewis Run	2126	2156				
Silt and Shale	2156	3874		2563		
Siltstone	3874	4708				Mudlog/MWD GR
Burket	4708	4745				
Tully	4745	4750				
Shale	4750	5281				
Marcellus	5281	8664				
	TMD	8664				

I do hereby certify to the best of my knowledge, information and belief that the well identified on this Well Record has been properly cased and cemented in accordance with the requirements of 25 Pa. Code Chapter 78 and any conditions contained in the permit for this well. In addition, I do hereby certify that any casing which is attached to a blow-out preventer with a pressure rating greater than 3,000 psi has passed a pressure test in accordance with 25 Pa. Code §78.84(f). I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Well Operator's Signature

Rachelle A. King 11-1-11

Title: Director Regulatory Affairs Date:

DEP USE ONLY

Reviewed by: T Curry Date: 11-15-11

Comments:

5500-FM-OG0004b 3/2011

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
OIL AND GAS MANAGEMENT PROGRAM

Completion Report

DEP USE ONLY	
Site ID	Primary Fac ID
Client	Subfacility Id

Well Information

If you are submitting this Completion Report attached to the Well Record, you only need to enter the well API # in this section.

Well Operator	DEP ID#	Well API # (Permit / Reg)	Project Number	Acres
TRIANA ENERGY, LLC	279489	37 - 083-55072-00-00		

Address	Well Farm Name	Well #	Serial #
900 Virginia Street East Suite 600	MROC Pad B	4H (A)	

City	State	Zip Code	County	Municipality
Charleston	WV	25301	McKean	Bradford Township

Phone	Fax	Email	USGS 7.5 min. quadrangle map
304-205-8560	304-205-8560	rking@trianaenergy.com	Derrick City

Check the appropriate submission: ☐ Original Completion Report ☒ Amended Completion Report

STIMULATION BASE FLUID

List Water Management Plan Approved Water Source(s) that were used	Water Management Plan ID No.	Volume (Gallons)
1. Port Allegheny Borough; Hydrant	WMP-279489-6	
2. Village of Limestone Cattaraugus, NY; Hydrant	WMP-279489-6	
3. Johnson Quarry; Interconnection	WMP-279489-04	
4. MROC -1 Groundwater Well	WMP-279489-6	
5. MROC -3 Groundwater Well	WMP-279489-6	
6. Total Volume Used From All 5 Sources		3,535,056 Gals
	Recycled Water Used	0
Other Base Fluid(s)Components Used		
1. NA		
2.		
	Total Base Fluid(s)/Components Used	

PERFORATION RECORD

Stage No.	Perforation Date	Stage Perforated From	Stage Perforated To	Perf. Orientation (Vertical, Horizontal, Radial)	Formation
1	09/16/2011	8572	8245	Vertical	Marcellus
2	09/21/2011	8156	7818	Vertical	Marcellus
3	09/22/2011	7740	7401	Vertical	Marcellus
4	09/23/2011	7323	6985	Vertical	Marcellus
5	09/24/2011	6907	6569	Vertical	Marcellus
6	09/25/2011	6591	6153	Vertical	Marcellus
7	09/26/2011	6075	5736	Vertical	Marcellus
8	09/27/2011	5658	5320	Vertical	Marcellus

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MAR 09 2012
ENVIRONMENTAL PROTECTION
WARREN DISTRICT OFFICE

RECEIVED
JAN 10 2012
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

STIMULATION FLUID ADDITVES

Note: Trade secret or confidential proprietary information should be clearly identified as such and should be submitted on a separate sheet attached to this report.

Descriptive Additive Type	Chemical Component(s) listed on Material Safety Data Sheet of the Additive	CAS No. of Chemical Component	Chemical Component % By Volume in Additive	Chemical Component % By Volume used in Each Stage					
				Stage No.	Stage No.	Stage No.	Stage No.	Stage No.	Stage No.
			Stages	1	2	3	4	5	6
HCl Acid	Hydrocloric Acid 31-37%	7647-01-0	15%	0.3665%	0.3489%	0.3127%	0.3709%	0.3542%	0.3051%
Biocide	Chlorine Dioxide ClO2	10049-04-4	100%	0.000011 %	0.000017 %	0.000008 %	0.000017 %	0.000011 %	0.000006 %
Scale Inhibitor	Terrascale (TM) TS-30	7789-20-0	30%	0.0099%	0.0098%	0.0096%	0.0098%	0.0094%	0.0096%
Friction Reducer	Unislik ST 50	64742-47-8	30%	0.0481%	0.0470%	0.0430%	0.0485%	0.0450%	0.0542%
			Stages	7	8				
HCl Acid	Hydrocloric Acid 31-37%	7647-01-0	15%	0.3907%	0.4294%				
Biocide	Chlorine Dioxide ClO2	10049-04-4	100%	0.000009 %	0.000005 %				
Scale Inhibitor	Terrascale (TM) TS-30	7789-20-0	30%	0.0106%	0.0107%				
Friction Reducer	TerrasUnislik ST 50cale (TM) TS-30	64742-47-8	30%	0.0259%	0.0330%				

Please insert additional copies of this page if additional rows/stages are needed.

Well API# 37 -083-55072-00-00

STIMULATION INFORMATION (WELL)

Open Flow Production:	24 Hr. Open Flow Production:	24 Hr. Shut-in Pressure:	Flow Back Date: 12/10/11

STIMULATION INFORMATION (STAGE)

Complete a separate record for each stimulation stage. (Please insert additional copies of this page for additional stages).

Stage No.: 1	Stimulation Date: 09/21/2011	Pump Rate: 75.3
Pressure (psi): 5323	Shut-in Surface Pressure: 3317	5 Minute Shut-in Surface Pressure: 2757
Propping Agent Type: Sand	Propping Agent Amount: 282,500 236,100	Propping Agent Size: 80/100 40/70
Stage No.: 2	Stimulation Date: 09/22/2011	Pump Rate: 76.7
Pressure (psi): 5626	Shut-in Surface Pressure: 3435	5 Minute Shut-in Surface Pressure: 2922
Propping Agent Type: Sand	Propping Agent Amount: 239,500 258,700	Propping Agent Size: 80/100 40/70
Stage No.: 3	Stimulation Date: 09/23/2011	Pump Rate: 75.6
Pressure (psi): 5547	Shut-in Surface Pressure: 3483	5 Minute Shut-in Surface Pressure: 2939
Propping Agent Type: Sand	Propping Agent Amount: 245,800 206,500	Propping Agent Size: 80/100 40/70
Stage No.: 4	Stimulation Date: 09/24/2011	Pump Rate: 76.2
Pressure (psi): 5587	Shut-in Surface Pressure: 3609	5 Minute Shut-in Surface Pressure: 2968
Propping Agent Type: Sand	Propping Agent Amount: 239,000 214,100	Propping Agent Size: 80/100 40/70
Stage No.: 5	Stimulation Date: 09/25/2011	Pump Rate: 77.4
Pressure (psi): 5430	Shut-in Surface Pressure: 4118	5 Minute Shut-in Surface Pressure: 3302
Propping Agent Type: Sand	Propping Agent Amount: 235,100 234,400	Propping Agent Size: 80/100 40/70
Stage No.: 6	Stimulation Date: 09/26/2011	Pump Rate: 76.7
Pressure (psi): 5047	Shut-in Surface Pressure: 4180	5 Minute Shut-in Surface Pressure: 3476
Propping Agent Type: Sand	Propping Agent Amount: 230,000 235,400	Propping Agent Size: 80/100 40/70

WELL SERVICE COMPANIES (Provide the name, address, and telephone number of all well service companies involved.)

Name **J-W Wireline**	Name Universal Well Services Inc	Name Terra Services LLC
Address 376 Hope Station	Address 124 Industrial Dr	Address 395 Route 33 East
City – State- Zip Weston, WV 26452	City – State – Zip Bradford, PA 16701	City – State – Zip Weston, WV 26452
Phone 304-269-0633	Phone 814-368-6175	Phone 304-269-0600

I do hereby certify to the best of my knowledge, information and belief that the information contained on this Completion Report is true and correct. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment..

Well Operator's Signature	DEP USE ONLY
Rachelle M. Hoffman	Reviewed by: T. Curry Date: 3-21-12
Title: Director of Regulatory Affairs Date: 1/9/12	Comments:

STIMULATION INFORMATION (WELL)

Open Flow Production:	24 Hr. Open Flow Production:	24 Hr. Shut-in Pressure:	Flow Back Date: 12/10/11

STIMULATION INFORMATION (STAGE)

Complete a separate record for each stimulation stage. (Please insert additional copies of this page for additional stages).

Stage No.: 7	Stimulation Date: 09/27/2011	Pump Rate: 75.8
Pressure (psi): 5090	Shut-in Surface Pressure: 3808	5 Minute Shut-in Surface Pressure: 3294
Propping Agent Type: Sand	Propping Agent Amount: 218,500 239,000	Propping Agent Size: 80/100 40/70

Stage No.: 8	Stimulation Date: 09/28/2011	Pump Rate: 75.6
Pressure (psi): 5272	Shut-in Surface Pressure: 3828	5 Minute Shut-in Surface Pressure: 3345
Propping Agent Type: Sand	Propping Agent Amount: 220,400 249,000	Propping Agent Size: 80/100 40/70

Stage No.:	Stimulation Date:	Pump Rate:
Pressure (psi):	Shut-in Surface Pressure:	5 Minute Shut-in Surface Pressure:
Propping Agent Type:	Propping Agent Amount:	Propping Agent Size:

Stage No.:	Stimulation Date:	Pump Rate:
Pressure (psi):	Shut-in Surface Pressure:	5 Minute Shut-in Surface Pressure:
Propping Agent Type:	Propping Agent Amount:	Propping Agent Size:

Stage No.:	Stimulation Date:	Pump Rate:
Pressure (psi):	Shut-in Surface Pressure:	5 Minute Shut-in Surface Pressure:
Propping Agent Type:	Propping Agent Amount:	Propping Agent Size:

Stage No.:	Stimulation Date:	Pump Rate:
Pressure (psi):	Shut-in Surface Pressure:	5 Minute Shut-in Surface Pressure:
Propping Agent Type:	Propping Agent Amount:	Propping Agent Size:

WELL SERVICE COMPANIES (Provide the name, address, and telephone number of all well service companies involved.)

Name Weatherford Wellhead Systems	Name	Name
Address 106 Blose Rd	Address	Address
City – State- Zip Punxsutawney, PA 15767	City – State – Zip	City – State – Zip
Phone 814-938-9662	Phone	Phone

I do hereby certify to the best of my knowledge, information and belief that the information contained on this Completion Report is true and correct. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment..

Well Operator's Signature	**DEP USE ONLY**
	Reviewed by: Date:
Title: Director of Regulatory Affairs Date: 1/9/12	Comments:

APPENDIX B

PLUGGING AND ABANDONMENT DOCUMENTATION – WELLS IN AOR

ER-OG . 8· Rev. 6/86

DER Office Use Only

Code PNCP	
Oil & Gas Inspector RJH	
Date Approved 1-29-90	
INV	EXA

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS MANAGEMENT

AEB 115 41° 50' 30"
12,25 W 78° 32' 30"
(E)

CERTIFICATE OF WELL PLUGGING

12-20-89

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

COMPLETE ABOVE SECTION IF APPLICABLE

Oil
Type of Well

Pennzoil Products Company
Operator Name

54 Boylston Street
Address

Bradford, PA 16701

Keating
Municipality

McKean
County

37-083-00865 SPO-29
Permit/Registration Number Project Number

Bingham Satterfield
Farm Name

197
Well Number Serial Number

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started December 1, 1989 19 ___, and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO	Casing and Tubing SIZE	PULLED	LEFT
			8"	--	21'
40sks cmt.	2080'	1825'	6-5/8"	--	366'
Aquagel	1825'	491'	2"	2075'	--
			5/8"Rods	2050'	--
Casing bridge w/gravel	491'	476'			
20sks cmt.	476'	356'			
			Depth of Coal Seam(s), If Any		
Mud & gravel	356'	30'			
5sks cmt.	30'	0			
			Description of Monument		
			Pipe Marker		
Producing Sand (Top) Bfd. 3rd - 2026'			Total Depth 2088'		

RECEIVED
JAN 31 1990
Bureau of Oil & Gas Management
Department of Environmental Resources

I certify that the work of plugging and filling said well was completed on the 7th day of December, 1989 and that the above information is true and accurate.

T. R. Jackson 12-20-89
(Well Operator) Date

Jim Jackson (Contractor)
Box 32
Bradford, PA 16701

L B Dunn
(Qualified Participant)

(Qualified Participant)

One copy of this certificate to be mailed to each coal operator, lessee, or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

ER - OG 8: Rev. 6/86

DER Office Use Only

Code PNCP	
Oil & Gas Inspector RBH	
Date Approved 1-29-90	
INV	EXA

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS MANAGEMENT

AEB 9,300 S 41° 50' 00" W 73° 30' 30" (E)

CERTIFICATE OF WELL PLUGGING

12-20-89

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

COMPLETE ABOVE SECTION IF APPLICABLE

Oil
Type of Well

Pennzoil Products Company
Operator Name

54 Boylston Street
Address

Bradford, PA 16701

Keating
Municipality

McKean
County

37-083-00866 SPO-29
Permit/Registration Number Project Number

Bingham Satterfield
Farm Name

198
Well Number Serial Number

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started December 7, 1989 19 ___ , and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO	Casing and Tubing SIZE	PULLED	LEFT
			8"	--	20'
40sks cmt.	2070'	1800'	6-5/8"	--	400'
Aquagel	1800'	525'	2"	2050'	--
			5/8"Rods	2025'	--
Casing bridge w/gravel	525'	510'			
20sks cmt.	510'	390'			
			Depth of Coal Seam(s) If Any		
Mud & gravel	390'	30'			
5sks cmt.	30'	0			
			Pipe Marker		
Producing Sand (Top) Bfd. 3rd - 2012			Total Depth 2075'		

JAN 31 1990
Bureau Oil & Gas Management
Environmental Resources

I certify that the work of plugging and filling said well was completed on the 13th day of December, 1989 and that the above information is true and accurate.

T.A. Andrews 12-20-89
(Well Operator) Date

Jim Jackson (Contractor)
Box 32
Bradford, PA 16701

L.B. Davis
(Qualified Participant)

D.M. Swanson
(Qualified Participant)

One copy of this certificate to be mailed to each coal operator, lessee, or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

ER-OG-6: Rev. 6/88

10355 41°50'0"
10305 78°32'30"

AEB

(5)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS MANAGEMENT

CERTIFICATE OF WELL PLUGGING

DER Office Use Only	
Code PNCP	
Oil & Gas Inspector RBA	
Date Approved 1-22-90	
INV	EXA

1-05-90

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

COMPLETE ABOVE SECTION IF APPLICABLE

Oil
Type of Well

Pennzoil Products Company
Operator Name

54 Boylston Street
Address

Bradford, PA 16701

Keating
Municipality

McKean
County

37-083-00868 SPO-29
Permit/Registration Number Project Number

Bingham Satterfield
Farm Name

200
Well Number Serial Number

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started December 20, 1989 19 ___, and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO	Casing and Tubing SIZE	PULLED	LEFT
			8"	--	20'
40sks cmt.	1990'	1750'	6-5/8"	--	238'
Aquagel	1750'	510'	4¼"	385'	--
			2"	1965'	--
Casing bridge w/gravel	510'	495'	5/8"Rods	1925'	--
20sks cmt.	495'	375'			
			Depth of Coal Seam(s), If Any		
Mud & Gravel	375'	30'			
5sks cmt.	30'	0			
			Description of Monument		
			Bureau Oil & Gas Management		
			Environmental Resources		
			Pipe Marker		
Producing Sand (Top) Bfd. 3rd - 2025'			Total Depth 2085'		

RECEIVED
JAN 12 1990

I certify that the work of plugging and filling said well was completed on the 28th day of December, 19 89 and that the above information is true and accurate.

T.A. Ontraman 1-05-90
(Well Operator) Date

John Stark (Contractor)
498 Summit Road
Bradford, PA 16701

(Qualified Participant)

RECEIVED
JAN 24 1990

(Qualified Participant)

One copy of this certificate to be mailed to each coal operator, lessee, or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

ER – OG – 6: Rev. 6/86

(5)

16265 41°50'
AEB 10315 78°32'

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS MANAGEMENT

DER Office Use Only

Code PNCP	
Oil & Gas Inspector RBA	
Date Approved 1-22-90	
INV	EXA

CERTIFICATE OF WELL PLUGGING

1-05-90

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

COMPLETE ABOVE SECTION IF APPLICABLE

Oil
Type of Well

Pennzoil Products Company
Operator Name

54 Boylston Street
Address

Bradford, PA 16701

Keating
Municipality

McKean
County

37-083-00870 — Permit/Registration Number
SPO-29 — Project Number

Bingham Satterfield
Farm Name

203
Well Number — Serial Number

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started December 14, 1989 19 ___, and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO
40sks cmt.	2051'	1811'
Aquagel	1811'	395'
Casing bridge w/gravel	395'	380'
20sks cmt.	380'	260'
Mud & gravel	260'	30'
5sks cmt.	30'	0
Producing Sand (Top) Bfd. 3rd - 2033'		

Casing and Tubing

SIZE	PULLED	LEFT
8"	--	21'
6-5/8"	--	270'
2"	2080'	--
5/8" Rods	2025'	--

Depth of Coal Seam(s), If Any

RECEIVED
JAN 12 1990

Description of Monument

Bureau Oil & Gas Management
Environmental Resources
Pipe Marker

Total Depth 2090'

I certify that the work of plugging and filling said well was completed on the 20th day of December, 19 89 and that the above information is true and accurate.

T.A. Andreassi — 1-05-90
(Well Operator) — Date

John Stark (Contractor)
498 Summit Road
Bradford, PA 16701

(Qualified Participant)

(Qualified Participant)

RECEIVED
JAN 24 1990
Bureau of Oil & Gas Management

One copy of this certificate to be mailed to each coal operator, lessee, or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

ER-OG-8: Rev. 6/86

(5)

16285 41°50'0"

AEB 97280 78°32'30"

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS MANAGEMENT

CERTIFICATE OF WELL PLUGGING

DER Office Use Only	
Code PNCP	
Oil & Gas Inspector ABM	
Date Approved 1-22-90	
INV	EXA

1-11-90

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

COMPLETE ABOVE SECTION IF APPLICABLE

Oil
Type of Well

Pennzoil Products Company
Operator Name

54 Boylston Street
Address

Bradford, PA 16701

Keating
Municipality

McKean
County

37-083-00871 SPO-29
Permit/Registration Number Project Number

Bingham Satterfield
Farm Name

204
Well Number Serial Number

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started December 19, 1989 19 ___, and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO	Casing and Tubing SIZE	PULLED	LEFT
			8"	--	22'
40sks cmt.	2060'	1820'	6-5/8"	--	380'
Aquagel	1820'	525'	5½"	550'	1548'
			2"	2034'	--
Casing bridge w/gravel	525'	510'	5/8"Rods	2025'	--
20sks cmt.	510'	390'			
			Depth of Coal Seam(s), If Any		
Mud & gravel	390'	30'			
5sks cmt.	30'	0			
			Description of Monument		
			Pipe Marker		
Producing Sand (Top) Bfd. 3rd - 2021'			Total Depth 2082'		

RECEIVED JAN 24 1990 WARREN DISTRICT OFFICE ENVIRONMENTAL RESOURCES

I certify that the work of plugging and filling said well was completed on the 29th day of December, 1989 and that the above information is true and accurate.

T.A. Andrews 1-11-90
(Well Operator) Date

Pennzoil Products Company TR# 852042014

(Qualified Participant)

(Qualified Participant)

RECEIVED JAN 24 1990

One copy of this certificate to be mailed to each coal operator, lessee, or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

ER-OG-6: Rev. 3.85

NC

44'S 41°50'0"

106 78°37'30"

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS REGULATION

DER Office Use Only	
Code	PNCP
Oil & Gas Inspector	
Date Approved	

CERTIFICATE OF PLUGGING WELL

Cyclone 00874-P

☐ Coal Operator ☐ Owner ☐ Lessee

Address

☐ Coal Operator ☐ Owner ☐ Lessee

Address

☐ Coal Operator ☐ Owner ☐ Lessee

Address

COMPLETE ABOVE SECTION IF APPLICABLE

Type of Well InTake

Name of Well Operator Pennzoil Company

54 Boylston Street, Bradford, PA 16701
Address

April 13 19 87
Date

Keating Township
Political Subdivision, Borough, City or Township

McKean County

Farm Bingham Satterfield

Well (Farm) No. 02 Serial No.

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started 27 March 19 87, and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO	Casing and Tubing SIZE	PULLED	LEFT
5 Sacks cmt in 2" tubing	2027'	1932'			
15 Sks cmt on Flood Packer	2028'	1775'	6¼"	--	342'
30 sks cmt	1775'	1545'	2"	1700'	325'
Aqua Gel	1545'	407'	1"	1900'	-
Casing Bridge	407'				
Gravel	407'	387'	Depth of Coal Seam, If Any		
20 sks cement	387'	280'			
Aqua Gel	280'	15'			
5 sks cmt.	15'	0'			
			Description of Monument		
			2" Pipe Marker		
Producing Sand (Top) 2030'			Total Depth 2085'		

I certify that the work of plugging and filling said well was completed on the 2 day of April, 19 87 and that the above information is true and accurate.

T. A. Andreassi
(Well Operator)
Tom Andreassi (Eng. Dept.)

[signature]
(Qualified Participant)

L. D. McClimans
(Qualified Participant)

PERMIT/REGISTRATION NO. 37-083-00874-P

PROJECT NO. SPO-29

Pennzoil Company (Contractor)
(Qualified Participant)
Tr. #62-21712

One copy of this certificate to be mailed to each coal operator, lessee, or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

Street 54 Boylston Street City Bradford State PA Zip 16701
(Address of Plugging Contractor)

Remarks:

RECEIVED ... 1 1987
BUREAU OF OIL & GAS MANAGEMENT
ENVIRONMENTAL RESOURCES

REC... APR 15 1987
DEPARTMENT OF ENVIR...
BUREAU OF OIL & GAS MANAGEMENT

Appr. 5-22-87

Farm No. 10-04202 Foreman G. M. Swanson

NB

550' 41° 50' 0"
0 640' 78° 32' 30"
(5)

DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS REGULATION

Oil & Gas Inspector PNCP

Date Approved

CERTIFICATE OF PLUGGING WELL

Cyclone 00875-P

None
☐ Coal Operator ☐ Owner ☐ Lessee
Address

☐ Coal Operator ☐ Owner ☐ Lessee
Address

☐ Coal Operator ☐ Owner ☐ Lessee
Address

COMPLETE ABOVE SECTION IF APPLICABLE

RECEIVED
JUL 07 1987
BUREAU OF OIL & GAS MANAGEMENT
ENVIRONMENTAL RESOURCES

Type of Well Injection

Name of Well Operator Pennzoil Company

54 Boylston St., Bradford, Pa. 16701
Address

May 26, 1987 19 ___
Date

Keating Twp.
Political Subdivision, Borough, City or Township

McKean County

Farm Bingham Satterfield

Well (Farm) No. 014 Serial No. ___

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started April 21, 1987 19 ___, and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO	Casing and Tubing SIZE	PULLED	LEFT
10sks Cement in 2" tubing	2000'	1363'			
10sks Cement on Flood Packer	2022'	1861'	6-1/4"	None in Well	
60sks Cement	1861'	1390'	4-1/4"	363'	
Aqua Gel	1390'	500'	2"	471'	1549'
			1"	2000'	--
Casing Bridge	500'				
Gravel	500'	475'	Depth of Coal Seam, If Any		
93sks Cement	475'	0'			
			Description of Monument		
			2" Pipe Marker		
Producing Sand (Top) 2023'			Total Depth 2095'		

I certify that the work of plugging and filling said well was completed on the 28th day of April, 19 87 and that the above information is true and accurate.

T. T. Andreassi
(Well Operator)
Tom Andreassi (Eng. Dept.)

PERMIT/REGISTRATION NO. 37-083-00875-P

PROJECT NO. SPO-29

D. F. Field
(Qualified Participant)

L. B. Davis
(Qualified Participant)

Pennzoil Company (Contractor)
Tr. #62-21734 (Qualified Participant)

One copy of this certificate to be mailed to each coal operator, lessee, or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

Street 54 Boylston St. City Bradford State PA Zip 1670
(Address of Plugging Contractor)

Remarks:

RWA-7-1-87

Form No. 10-04202

Form by G.M. Swanson

RE

945's 41°50'0"
10[illegible] 78°28'30"

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS REGULATION

Dist. PNCP
Oil & Gas Inspector
Date Approved

Cyclone
00876-P

CERTIFICATE OF PLUGGING WELL

None
☐ Coal Operator ☐ Owner ☐ Lessee
Address

☐ Coal Operator ☐ Owner ☐ Lessee
Address

☐ Coal Operator ☐ Owner ☐ Lessee
Address

COMPLETE ABOVE SECTION IF APPLICABLE

Type of Well Intake

Name of Well Operator Pennzoil Company

54 Boylston St., Bradford, Pa. 16701
Address

April 28, 1987 19
Date

Keating Township
Political Subdivision, Borough, City or Township

McKean County

Farm Bingham Satterfield

Well ~~(Farm)~~ No. 015 Serial No.

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started April 13, 1987 19 , and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO	Casing and Tubing SIZE	PULLED	LEFT
10sks Cement in 2" Tubing	2060'	1550'			
10sks Cement on Flood Packer	2018'	1675'	No Casing in Well		
30sks Cement	1675'	1324'			
Aqua Gel	1324'	355'	2"	1485'	531'
Casing Bridge	365'		1"	2014'	--
Gravel	365'	340'	Depth of Coal Seam, If Any		
126 Sks Cement	340'	0'			
			2" Pipe Marker		
			Description of Monument		
Producing Sand (Top) 2018'			Total Depth 2077'		

I certify that the work of plugging and filling said well was completed on the 16 day of April , 1987 and that the above information is true and accurate.

T.A. Andreassi
(Well Operator)
Tom Andreassi (Eng. Dept.)

(Qualified Participant)

PERMIT/REGISTRATION NO. 37-083-00876-P

(Qualified Participant)

PROJECT NO. SPO-29

Pennzoil Company (Contractor)
(Qualified Participant)

Tr. #62-21712

One copy of this certificate to be mailed to each coal operator, lessee,or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

Street 54 Boylston St. City Bradford State Pa. Zip 16701
(Address of Plugging Contractor)

Remarks:

RECEIVED
MAY 11 1987
[illegible]

BM-5-7-87 X

Form No. 10-04202 Foreman G.M. Swanson

RE

15 100's 41°52'30"
100's 78°32'30"
(2)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS REGULATION

Code	PNCY
Oil & Gas Inspector	
Date Approved	

Cyclone 00877-P

CERTIFICATE OF PLUGGING WELL

☐ Coal Operator ☐ Owner ☐ Lessee

Address

☐ Coal Operator ☐ Owner ☐ Lessee

Address

☐ Coal Operator ☐ Owner ☐ Lessee

Address

COMPLETE ABOVE SECTION IF APPLICABLE

Type of Well InTake

Name of Well Operator Pennzoil Company

54 Boylston Street Bradford, PA 16701
Address

14 April 19 87
Date

Keating Township
Political Subdivision, Borough, City or Township

McKean County

Farm Bingham Satterfield

Well ~~(Farm)~~ No. 021 Serial No. _____

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started 24 February 19 87, and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO	Casing and Tubing SIZE	PULLED	LEFT
10 sacks cement on Flood packer	2010'	1827'	8"	--	20'
Bottom bridge	1827'				
30 sacks cement	1827'	1560'	No csg	in well	
Aqua Gel	1560'	440'			
Casing bridge	450'		2"	1800'	219'
Gravel	450'	395'			
105 sacks cement	395'	0'	Depth of Coal Seam, If Any		
			2" Pipe Marker		
			Description of Monument		
Producing Sand (Top) 2024'			Total Depth 2092'		

I certify that the work of plugging and filling said well was completed on the 3 day of March, 19 87 and that the above information is true and accurate.

T. P. Andreassi
(Well Operator)
Tom Andreassi (Eng. Dept.)

L K Davis
(Qualified Participant)

W F Deuell
(Qualified Participant)

PERMIT/REGISTRATION NO. 37-083-00877-P

PROJECT NO. SPO-29

Pennzoil Company (Contractor)
Tr. #62-21819
(Qualified Participant)

One copy of this certificate to be mailed to each coal operator, lessee, or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

Street 54 Boylston Street City Bradford State PA Zip 16701
(Address of Plugging Contractor)

Remarks:

RECEIVED
APR 11 1987
BUREAU OF OIL & GAS MANAGEMENT
ENVIRONMENTAL RESOURCES

RECEIVED
APR 16 1987
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL & GAS MANAGEMENT

BK 5-22-87

Farm No. 10-04219

Foreman G.M. Swanson

RE (5)

DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS REGULATION

Date PNCP
Oil & Gas Inspector
Date Approved
CG Clark

CERTIFICATE OF PLUGGING WELL

00880-P

None
☐ Coal Operator ☐ Owner ☐ Lessee
Address

☐ Coal Operator ☐ Owner ☐ Lessee
Address

☐ Coal Operator ☐ Owner ☐ Lessee
Address

COMPLETE ABOVE SECTION IF APPLICABLE

Type of Well Injection

Name of Well Operator Pennzoil Company

54 Boylston St., Bradford, Pa. 16701
Address

May 26, 1987 19 ___
Date

Keating Twp.
Political Subdivision, Borough, City or Township

McKean County

Farm Bingham Satterfield

Well (Farm) No. 024 Serial No. ___

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started April 16, 1987 19 ___, and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO	Casing and Tubing SIZE	PULLED	LEFT
10sks Cement in 2" Tubing	2045'	1430'	8"	--	25'
10sks Cement on Flood Pkr.	2000'	1735'	6-1/4"	None in Well	
30sks Cement	1735'	1235'	4-1/2"	360'	--
Aqua Gel	1235'	400'	2"	1420'	580'
			1"	1995'	--
Casing Bridge	400'				
Gravel	400'	375'	Depth of Coal Seam, If Any		
126 Sks Cement	375'	0'			
			Description of Monument		
			2" Pipe Marker		
Producing Sand (Top) 2025'			Total Depth 2085'		

I certify that the work of plugging and filling, said well was completed on the 29th day of April, 19 87 and that the above information is true and accurate.

T. A. Andreassi
Tom Andreassi (Eng. Dept.)
(Well Operator)

PERMIT/REGISTRATION NO. 37-083-00880-P

PROJECT NO. SPO-29

D. L. Dale
(Qualified Participant)

L. B. Davis
(Qualified Participant)

Pennzoil Company (Contractor)
Tr. #62-21712 (Qualified Participant)

One copy of this certificate to be mailed to each coal operator, lessee, or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

Street 54 Boylston St. City Bradford State PA Zip 16701
(Address of Plugging Contractor)

Remarks:

RECEIVED
JUL 07 1987

BM-7-1-87

Form No. 10-04202 Foreman G.M. Swanson

1E
1150' W 600"
1040' 78°32'30"
(5)

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS REGULATION

Date PNCP
Oil & Gas Inspector
Date Approved
Cyclone 00882-P

CERTIFICATE OF PLUGGING WELL

None
☐ Coal Operator ☐ Owner ☐ Lessee
Address

☐ Coal Operator ☐ Owner ☐ Lessee
Address

☐ Coal Operator ☐ Owner ☐ Lessee
Address

COMPLETE ABOVE SECTION IF APPLICABLE

Type of Well Intake

Name of Well Operator Pennzoil Company

54 Boylston St., Bradford, Pa. 16701
Address

April 29, 1987 19 ___
Date

Keating Township
Political Subdivision, Borough, City or Township

McKean County County

Farm Bingham Satterfield

Well (Farm) No. 026 Serial No. ___

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started April 3, 1987 19 ___, and that the well was plugged as follows.

FILLING MATERIAL AND PLUGS	FROM	TO	Casing and Tubing SIZE	PULLED	LEFT
10sks Cement in 2" Tubing	2078'	1850'	8"	--	21'
10sks Cement on Flood Packer	2021'	1700'	6-1/4"	None in Well	
30sks Cement	1700'	1050'	4-1/2"	365'	--
Aqua Gel	1050'	395'	2"	1700'	321'
			1"	2020'	--
Casing Bridge	395'				
Gravel	395'	380'	Depth of Coal Seam, If Any		
120sks Cement	380'	0'			
			Description of Monument		
			2" Pipe Marker		
Producing Sand (Top) 2026'			Total Depth 2088'		

I certify that the work of plugging and filling said well was completed on the 13th day of April, 19 87 and that the above information is true and accurate.

T. G. Andreassi
(Well Operator)
Tom Andreassi (Eng. Dept.)

H. F. Hartle
(Qualified Participant)

L. B. Dunn
(Qualified Participant)

PERMIT/REGISTRATION NO. 37-083-00882-P

PROJECT NO. SPO-29

Pennzoil Company (Contractor)
(Qualified Participant)
Tr. #62-21712

One copy of this certificate to be mailed to each coal operator, lessee,or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

Street 54 Boylston St. City Bradford State Pa. Zip 16701
(Address of Plugging Contractor)

Remarks:

MAY 1 1 1987
BUREAU OF OIL & GAS MANAGEMENT

RLH-5-7-87 X

Farm No. 10-04202 Foreman G.M. Swanson

ER-OG-6: Rev. 3.85

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS REGULATION

RE 1150'S 41°50'0" 10100 78°32'30"

(SPO-29)

DER Office Use Only	
Code	BPNCP
Oil & Gas Inspector	
Date Approved	

CERTIFICATE OF PLUGGING WELL

Cyclone 00885-P

None
☐ Coal Operator ☐ Owner ☐ Lessee

Address

☐ Coal Operator ☐ Owner ☐ Lessee

Address

☐ Coal Operator ☐ Owner ☐ Lessee

Address

COMPLETE ABOVE SECTION IF APPLICABLE

Type of Well: Intake

Name of Well Operator: Pennzoil Company

Address: 54 Boylston St., Bradford, Pa. 16701

Date: July 16,1986 19

Political Subdivision, Borough, City or Township: Keating Twp.

County: McKean

Farm: Bingham Satterfield

Well (Farm) No. 030 Serial No.

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started February 2,1987 19 ___, and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO	Casing and Tubing SIZE	PULLED	LEFT
Plug packer in 2" tubing	2016'		8"	--	35'
10sks Cement on Flood packer	2026'	1840'	6-1/4"	None In Well	
40sks Cement	1840'	1539'	2"	1420'	606'
Aqua Gel	1539'	350'	1"	2000'	--
Casing Bridge	350'				
Gravel	350'	325'	Depth of Coal Seam, If Any		
122 sks Cement	325'	0'			
			Description of Monument		
			2" Pipe Marker		
Producing Sand (Top) 2032'			Total Depth 2099'		

I certify that the work of plugging and filling said well was completed on the 12th day of June, 1987 and that the above information is true and accurate.

T. A. Andreassi
(Well Operator)
Tom Andreassi (Eng. Dept.)

PERMIT/REGISTRATION NO. 37-083-00885-P

PROJECT NO. SPO-29

L. B. Davis
(Qualified Participant)

D. F. Dalcto
(Qualified Participant)

Pennzoil Company (Contractor)
(Qualified Participant)

6-01-87 - 6-12-87 Rig #62-21830
2-02-87 - 2-12-87 Rig #62-31819

One copy of this certificate to be mailed to each coal operator, lessee, or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

Street 54 Boylston St. City Bradford State PA Zip 16701

(Address of Plugging Contractor)

Remarks:

RECEIVED
AUG 2 5 1987
BUREAU OF OIL & GAS MANAGEMENT
DEPT. OF ENVIRONMENTAL RESOURCES

Farm No. 10-04219 Foreman G.M. Swanson

ER-OG-6: Rev. 6/86

DER Office Use Only

Code PNCP	
Oil & Gas Inspector RBH	
Date Approved 2-12-90	
INV	EXA

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS MANAGEMENT

AEB 1,950 S 41° 50' 00"
10,700 W 78° 32' 30"
(E)

CERTIFICATE OF WELL PLUGGING

1-24-90

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

COMPLETE ABOVE SECTION IF APPLICABLE

Injection
Type of Well

Pennzoil Products Company
Operator Name

54 Boylston Street
Address

Bradford, PA 16701

Keating
Municipality

McKean
County

37-083-07868 SPO-29
Permit/Registration Number Project Number

Bingham Satterfield
Farm Name

03
Well Number Serial Number

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started January 8, 1990 19 ____, and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO	Casing and Tubing SIZE	PULLED	LEFT
9sks cmt. in 2" tubing	2052'	1427'	6¼"	140'	203'
Flood pkr. w/cmt.	2002'	1672'	2"	1427'	575'
30sks cmt.	1672'	1350'			
Aquagel	1350'	468'			
			Depth of Coal Seam(s), If Any		
Casing bridge w/gravel	468'	453'			
30sks cmt.	453'	273'			
Mud & gravel	273'	140'			
48sks cmt.	140'	0	Description of Monument		
			Pipe Marker		
Producing Sand (Top) Bfd. 3rd - 2025'			Total Depth 2078'		

I certify that the work of plugging and filling said well was completed on the 15th day of January, 19 90 and that the above information is true and accurate.

[signature] 1-24-90
(Well Operator) Date

John Stark (Contractor)
498 Summit Road
Bradford, PA 16701

[signature]
(Qualified Participant)

[signature]
(Qualified Participant)

One copy of this certificate to be mailed to each coal operator, lessee, or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

ER-OG-6 Rev 6/86

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS MANAGEMENT

DER Office Use Only	
Code PNCP	
Oil & Gas Inspector RBA	
Date Approved 2-20-90	
INV	EXA

AEB

CERTIFICATE OF WELL PLUGGING

2-02-90

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

COMPLETE ABOVE SECTION IF APPLICABLE

Injection
Type of Well

Pennzoil Products Company
Operator Name

54 Boylston Street
Address

Bradford, PA 16701

Keating
Municipality

McKean
County

37-083-07869 — SPO-29
Permit/Registration Number — Project Number

Bingham Satterfield
Farm Name

013
Well Number — Serial Number

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started December 22, 1989 19 ___, and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO	Casing and Tubing SIZE	PULLED	LEFT
Flood pkr. w/15sks cmt.	2030'	1558'			
2" plug pkr. w/2sks cmt.	1954'	1854'	6¼"	347'	--
			2"	940'	1085'
Aquagel	1558'	940'			
20sks cmt.	940'	820'			
Aquagel	820'	472'	Depth of Coal Seam(s), If Any		
Casing bridge w/gravel	472'	457'			
30sks cmt.	457'	277'			
Mud & gravel	277'	30'			
			Description of Monument		
5sks cmt.	30'	0			
			Pipe Marker		
Producing Sand (Top) Bfd. 3rd - 2032'			Total Depth 2104'		

I certify that the work of plugging and filling said well was completed on the 19th day of January, 19 90 and that the above information is true and accurate.

T. R. Andreassi — 2-02-90
(Well Operator) — Date

Pennzoil Products Company TR# 852042006

(Qualified Participant)

(Qualified Participant)

One copy of this certificate to be mailed to each coal operator, lessee, or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

ER - OG - 6: Rev. 6/86

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS MANAGEMENT

DER Office Use Only	
Code PNCP	
Oil & Gas Inspector RBA	
Date Approved 2-20-90	
INV	EXA

AEB

13,710 S 41° 50' 30" W 78° 32' 30" (E)

CERTIFICATE OF WELL PLUGGING

2-02-90

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

COMPLETE ABOVE SECTION IF APPLICABLE

Injection
Type of Well

Pennzoil Products Company
Operator Name

54 Boylston Street
Address

Bradford, PA 16701

Keating
Municipality

McKean
County

37-083-07870 SPO-29
Permit/Registration Number Project Number

Bingham Satterfield
Farm Name

017
Well Number Serial Number

RECEIVED FEB 13 1990 OIL & GAS DISTRICT OFFICE ENVIRONMENTAL RESOURCES

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started January 16, 1990 19 ___, and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO	Casing and Tubing SIZE	PULLED	LEFT
2sks cmt. in 2" tubing	2016'	1872'	6¼"	350'	--
Flood pkr. w/15sks cmt.	2028'	1702'	2"	403'	1622'
Aquagel	1702'	403'			
Casing bridge w/gravel	403'	388'			
59sks cmt.	388'	0	Depth of Coal Seam(s), If Any		
			Description of Monument		
			Pipe Marker		
Producing Sand (Top) Bfd. 3rd - 2030'			Total Depth 2089'		

RECEIVED FEB 21 1990 Bureau of Oil & Gas Management Environmental Resources

I certify that the work of plugging and filling said well was completed on the 22nd day of January, 19 90 and that the above information is true and accurate.

T.A. Andrassi 2-02-90
(Well Operator) Date

Jay Swanson
(Qualified Participant)

John Stark (Contractor)
498 Summit Road
Bradford, PA 16701

R B Davis
(Qualified Participant)

One copy of this certificate to be mailed to each coal operator, lessee, or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

ER-OG-28: Rev. 6/86

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS MANAGEMENT

DER Office Use Only	
Code PNCP	
Oil & Gas Inspector RBH	
Date Approved 2-28-90	
INV	EXA

AEB 1,000 S 41° 40' 00"
4,730 W 78° 32' 30"
(E)

CERTIFICATE OF WELL PLUGGING

2-12-90

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

COMPLETE ABOVE SECTION IF APPLICABLE

RECEIVED FEB 21 1990 WARREN DISTRICT OFFICE ENVIRONMENTAL RESOURCES

Oil
Type of Well

Pennzoil Products Company
Operator Name

54 Boylston Street
Address

Bradford, PA 16701

Keating
Municipality

McKean
County

37-083-07871 SPO-29
Permit/Registration Number Project Number

Bingham Satterfield
Farm Name

201
Well Number Serial Number

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started January 16, 1990 19 ___, and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO	Casing and Tubing SIZE	PULLED	LEFT
			8"	--	30'
80sks cmt.	2079'	1660'	6-5/8"	10'	360'
Aquagel	1660'	515'	5½"	680'	1392'
			3½"	1997'	--
Casing bridge w/gravel	515'	500'	3/4"Rods	1997'	--
20sks cmt.	500'	380'			
			Depth of Coal Seam(s), If Any		
Mud & gravel	380'	30'			
5sks cmt.	30'	0			
			Description of Monument		
			Environmental Resources		
			Pipe Marker		
Producing Sand (Top) Bfd. 3rd - 2018'			Total Depth 2079'		

I certify that the work of plugging and filling said well was completed on the 25th day of January, 19 90 and that the above information is true and accurate.

T. R. Anderson 2-12-90
(Well Operator) Date

Pennzoil Products Company TR# 852042078

L B Davis
(Qualified Participant)

Hugh McLaughlin
(Qualified Participant)

One copy of this certificate to be mailed to each coal operator, lessee, or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

ER - OG 8: Rev 8/88

DER Office Use Only

Code PNCP	
Oil & Gas Inspector RBH	
Date Approved 8-12-90	
INV	EXA

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS MANAGEMENT

CB 15,000 S 71°52'30"
10,325 W 79°32'30"
(2)

CERTIFICATE OF WELL PLUGGING

12-20-89

Coal [ ] Operator [ ] Owner [ ] Lessee

Address

Coal [ ] Operator [ ] Owner [ ] Lessee

Address

Coal [ ] Operator [ ] Owner [ ] Lessee

Address

COMPLETE ABOVE SECTION IF APPLICABLE

Oil
Type of Well

Pennzoil Products Company
Operator Name

54 Boylnton Street
Address

Bradford, PA 16701

Keating
Municipality

McKean
County

37-083-21471 SPO-29
Permit/Registration Number Project Number

Bingham Satterfield
Farm Name

207
Well Number Serial Number

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started November 16, 1989 19 , and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO
40sks cmt.	2047'	1751'
Aquagel	1751'	510'
Casing bridge w/gravel	510'	495'
20sks cmt.	495'	375'
Mud & gravel	375'	30'
5sks cmt.	30'	0
Producing Sand (Top) Bfd. 3rd - 2032'		

Casing and Tubing

SIZE	PULLED	LEFT
8"	--	17'
6¼"	--	385'
2"	2089'	--
5/8"Rods	2039'	--

Depth of Coal Seam(s), If Any

Description of Monument

Pipe Marker

Total Depth 2099'

I certify that the work of plugging and filling said well was completed on the 5th day of December , 19 89 and that the above information is true and accurate.

12-20-89
(Well Operator) Date

Pennzoil Products Company TR# 852042004

(Qualified Participant)

(Qualified Participant)

One copy of this certificate to be mailed to each coal operator, lessee, or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

ER-OG-6: Rev. 6/86

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS MANAGEMENT

DER Office Use Only	
Code PNCP	
Oil & Gas Inspector RBH	
Date Approved 1-22-90	
INV	EXA

AEB

CERTIFICATE OF WELL PLUGGING

1-12-90

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

Coal ☐ Operator ☐ Owner ☐ Lessee

Address

COMPLETE ABOVE SECTION IF APPLICABLE

Oil
Type of Well

Pennzoil Products Company
Operator Name

54 Boylston Street
Address

Bradford, PA 16701

Keating
Municipality

McKean
County

37-083-23477 — Permit/Registration Number
SPO-29 — Project Number

Bingham Satterfield
Farm Name

227
Well Number — Serial Number

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started December 27, 1989 19 ___, and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO	Casing and Tubing SIZE	PULLED	LEFT
			8"	--	37'
40sks cmt.	2015'	1800'	7"	75'	294'
Aquagel	1800'	494'	2"	2015'	--
Casing bridge w/gravel	494'	479'			
20sks cmt.	479'	359'			
			Depth of Coal Seam(s), If Any		
Mud & gravel	359'	30'			
5sks cmt.	30'	0			
			Description of Monument		
			Pipe Marker		
Producing Sand (Top) Bfd. 3rd - 2002'			Total Depth 2077'		

I certify that the work of plugging and filling said well was completed on the 3rd day of January, 19 90 and that the above information is true and accurate.

T.P. Andreasso — 1-12-90
(Well Operator) — Date

Jim Jackson (Contractor)
Box 32
Bradford, PA 16701

Hp Swanson
(Qualified Participant)

L B Dann
(Qualified Participant)

RECEIVED
JAN 24 1990
Bureau of Oil and Gas Management
Environmental Resources

One copy of this certificate to be mailed to each coal operator, lessee, or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

RE

Date PNCP

Oil & Gas Inspector

Date Approved

DEPARTMENT OF ENVIRONMENTAL RESOURCES

BUREAU OF OIL AND GAS REGULATION

(SPO-29)

CERTIFICATE OF PLUGGING WELL

Cyclone 455BOP

None
☐ Coal Operator ☐ Owner ☐ Lessee

Address

☐ Coal Operator ☐ Owner ☐ Lessee

Address

☐ Coal Operator ☐ Owner ☐ Lessee

Address

COMPLETE ABOVE SECTION IF APPLICABLE

Type of Well Intake

Name of Well Operator Pennzoil Company

54 Boylston St., Bradford, Pa. 16701
Address

July 17, 1987 19
Date

Keating Twp.
Political Subdivision, Borough, City or Township

McKean County

Farm Bingham Satterfield

Well (Farm) No. 016 Serial No.

We, the undersigned representatives of the Well Operator certify that we participated in the plugging of the above well, and that the work was started June 18, 1987 19 , and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO	Casing and Tubing SIZE	PULLED	LEFT
10sks Cement in 2" tubing	2000'	1620'			
15sks Cement on Flood Packer	2018'	1615'	6-1/4"	--	357'
15sks Cement	1615'	1435'	2"	903'	1112'
Casing Bridge	500'				
Gravel	500'	475'			
20sks Cement	475'	350'	Depth of Coal Seam, If Any		
Mud & Gravel	350'	25'			
4sks Cement	25'	0'			
			Description of Monument		
			2" Pipe Marker		
Producing Sand (Top) 2020'			Total Depth 2091'		

I certify that the work of plugging and filling said well was completed on the 30th day of June, 1987 and that the above information is true and accurate.

T.A. Andreassi
(Well Operator)

Tom Andreassi (Eng. Dept.)

PERMIT/REGISTRATION NO. 37-083-45560-P

L.B. Davis
(Qualified Participant)

D.F. Kolb
(Qualified Participant)

PROJECT NO. SPO-29

Pennzoil Company (Contractor)
(Qualified Participant)

Tr. #62-21734

Gas 11/9/87

One copy of this certificate to be mailed to each coal operator, lessee, or owner, if any, and one to the Bureau of Oil and Gas Management, upon completion of plugging.

Street 54 Boylston St. City Bradford State PA Zip 16701
(Address of Plugging Contractor)

Remarks:

Couldn't pull 6-1/4" casing

RECEIVED
JUL 23 1987
BUREAU OF OIL & GAS MANAGEMENT
ENVIRONMENTAL RESOURCES

RBH-7-22-87 X

Farm No. 10-04219

Foreman G.M. Swanson

APPENDIX C

WELL RECORDS INCLUDING PLUGGING AND ABANDONMENT DOCUMENTATION

WELLS BETWEEN 0.25 AND 0.5 MILES FROM PROPOSED INJECTION WELL

Table C-1
Summary of Oil and Gas Wells in the PA Geologic Survey EDWIN Database - Between 0.25 and 0.5 Miles From Proposed Injection Well
Catalyst Energy Lot 580-1 (API# 37-083-46237)
McKean County, PA

PERMIT_NUM	Map_ID	WELL_NAME	OPERATOR	WELL_TYPE	WELL_STATUS	LATITUDE	LONGITUDE	DATE_PLUGGED	SITE_ID
083-38967	1	BINGHAM SATTERFIELD 253	PENNZOIL PROD CO	OIL	Plugged OG Well	41.83768200000	-78.58066600000	4/28/1988	161634
083-38969	2	BINGHAM SATTERFIELD 255	PENNZOIL PROD CO	OIL	Plugged OG Well	41.83672200000	-78.58066600000	4/21/1988	161636
083-07873	3	BINGHAM SATTERFIELD 012	PENNZOIL PROD CO	INJECTION	Plugged OG Well	41.83521200000	-78.58103300000	3/9/1990	137860
083-21474	4	BINGHAM SATTERFIELD 214	PENNZOIL PROD CO	OIL	Active	41.83623300000	-78.57925600000		144124
083-41080	5	BINGHAM SATTERFIELD 061	PENNZOIL PROD CO	INJECTION	Plugged OG Well	41.83658400000	-78.57919700000	1/9/1990	163749
083-21465	6	BINGHAM SATTERFIELD 039	PENNZOIL PROD CO	INJECTION	Plugged OG Well	41.83699100000	-78.57849200000	10/8/1980	144115
083-38889	7	BINGHAM SATTERFIELD 242	PENNZOIL PROD CO	OIL	Plugged OG Well	41.83685900000	-78.57809600000	4/18/1988	161556
083-21475	8	BINGHAM SATTERFIELD 215	PENNZOIL PROD CO	OIL	Plugged OG Well	41.83576100000	-78.57772900000	12/14/1989	144125
083-21468	9	BINGHAM SATTERFIELD 042	PENNZOIL PROD CO	INJECTION	Plugged OG Well	41.83520600000	-78.57880700000	8/2/1988	144118
083-21471	10	BINGHAM SATTERFIELD 207	PENNZOIL PROD CO	OIL	Plugged OG Well	41.83384000000	-78.57928900000	12/5/1989	144121
083-00877	11	BINGHAM SATTERFIELD 021	PENNZOIL PROD CO	INJECTION	Plugged OG Well	41.83356600000	-78.57838200000	3/3/1987	131355
083-21472	12	BINGHAM SATTERFIELD 208	PENNZOIL PROD CO	OIL	Plugged OG Well	41.83384000000	-78.57754500000	12/7/1989	144122
083-21466	13	BINGHAM SATTERFIELD 040	PENNZOIL PROD CO	INJECTION	Plugged OG Well	41.83411500000	-78.57681100000	1/2/1990	144116
083-21469	14	BINGHAM SATTERFIELD 043	PENNZOIL PROD CO	INJECTION	Plugged OG Well	41.83521200000	-78.57681100000	12/28/1989	144119
083-21476	15	BINGHAM SATTERFIELD 216	PENNZOIL PROD CO	OIL	Plugged OG Well	41.83589800000	-78.57585600000	12/14/1989	144126
083-21467	16	BINGHAM SATTERFIELD 041	PENNZOIL PROD CO	INJECTION	Plugged OG Well	41.83411500000	-78.57460800000	12/21/1989	144117
083-21473	17	BINGHAM SATTERFIELD 209	PENNZOIL PROD CO	OIL	Plugged OG Well	41.83384000000	-78.57552600000	12/18/1989	144123
083-00878	18	BINGHAM SATTERFIELD 022	PENNZOIL PROD CO	INJECTION	Plugged OG Well	41.83356600000	-78.57635900000	3/11/1987	131356
083-00879	19	BINGHAM SATTERFIELD 023	PENNZOIL PROD CO	INJECTION	Plugged OG Well	41.83291200000	-78.57430000000	12/6/1989	131357
083-00864	20	BINGHAM SATTERFIELD 148	PENNZOIL PROD CO	OIL	Plugged OG Well	41.83282100000	-78.57332000000	12/5/1989	131342
083-06896	21	BINGHAM SATTERFIELD 37	PENNZOIL PROD CO	INJECTION	Plugged OG Well	41.83192100000	-78.57231900000	5/4/1987	136889
083-00881	22	BINGHAM SATTERFIELD 025	PENNZOIL PROD CO	INJECTION	Plugged OG Well	41.83196500000	-78.57438400000	4/7/1987	131359
083-00867	23	BINGHAM SATTERFIELD 199	PENNZOIL PROD CO	OIL	Plugged OG Well	41.83210200000	-78.57532000000	11/28/1989	131345
083-00888	24	BINGHAM SATTERFIELD 038	PENNZOIL PROD CO	INJECTION	Plugged OG Well	41.83179200000	-78.57588900000	5/12/1987	131366
083-14097	25	CYCLONE LEASE 3	UNKNOWN OPR	OIL	DEP Abandoned List	41.83069800000	-78.57279600000		535230
083-00884	26	BINGHAM SATTERFIELD 029	PENNZOIL PROD CO	INJECTION	Plugged OG Well	41.83033800000	-78.57441400000	4/30/1987	131362
083-14096	27	CYCLONE LEASE 2	UNKNOWN OPR	OIL	DEP Abandoned List	41.83014300000	-78.57460200000		535229
083-00869	28	BINGHAM SATTERFIELD 202	PENNZOIL PROD CO	OIL	Plugged OG Well	41.83025000000	-78.57526500000	12/20/1989	131347
083-14095	29	CYCLONE LEASE 1	UNKNOWN OPR	OIL	DEP Abandoned List	41.83025400000	-78.57563000000		535228
083-00883	30	BINGHAM SATTERFIELD 028	PENNZOIL PROD CO	INJECTION	Plugged OG Well	41.82963200000	-78.57642100000	12/26/1989	131361
083-00886	31	BINGHAM SATTERFIELD 031	PENNZOIL PROD CO	INJECTION	Plugged OG Well	41.82852900000	-78.57639500000	4/23/1987	131364
083-00872	32	BINGHAM SATTERFIELD 205	PENNZOIL PROD CO	OIL	Plugged OG Well	41.82894600000	-78.57532000000	1/9/1990	131350
083-00887	33	BINGHAM SATTERFIELD 033	PENNZOIL PROD CO	INJECTION	Plugged OG Well	41.82868800000	-78.57445400000	5/4/1987	131365
083-00873	34	BINGHAM SATTERFIELD 206	PENNZOIL PROD CO	OIL	Plugged OG Well	41.82719800000	-78.57541900000	1/5/1990	131351
083-07870	35	BINGHAM SATTERFIELD 017	PENNZOIL PROD CO	INJECTION	Plugged OG Well	41.82688800000	-78.58067700000	1/22/1990	137857
083-34841	36	TIDEWATER BINGHAM 524	RICHARD B HERZOG	INJECTION	Plugged OG Well	41.82576300000	-78.58741300000	6/20/1977	157504
083-34813	37	TIDEWATER BINGHAM 346	RICHARD B HERZOG	OIL	Active	41.82640800000	-78.58924800000		157476
083-34819	38	TIDEWATER BINGHAM 529	RICHARD B HERZOG	OIL	Plugged OG Well	41.82725900000	-78.58891800000	6/7/1977	157482
083-37361	39	TIDEWATER-BINGHAM 74	RICHARD B HERZOG	INJECTION	Plugged OG Well	41.82721700000	-78.58847700000	3/19/1979	160028
083-37364	40	TIDEWATER-BINGHAM 508	RICHARD B HERZOG	INJECTION	Plugged OG Well	41.82773900000	-78.58827500000	3/29/1979	160031
083-34818	41	TIDEWATER BINGHAM 528	RICHARD B HERZOG	OIL	Active	41.82776600000	-78.58768800000		157481
083-37362	42	TIDEWATER-BINGHAM 378	RICHARD B HERZOG	INJECTION	Plugged OG Well	41.82831500000	-78.58855100000	3/22/1979	160029
083-34820	43	TIDEWATER BINGHAM 530	RICHARD B HERZOG	OIL	Plugged OG Well	41.82787600000	-78.58906400000	6/2/1977	157483
083-37367	44	TIDEWATER-BINGHAM 511	RICHARD B HERZOG	INJECTION	Plugged OG Well	41.82762900000	-78.58941300000	5/2/1979	160034
083-34824	45	TIDEWATER BINGHAM 534	RICHARD B HERZOG	OIL	Active	41.82750600000	-78.59001800000		157487
083-37360	46	TIDEWATER-BINGHAM 381	RICHARD B HERZOG	OIL	Plugged OG Well	41.82815100000	-78.59012800000	5/5/1979	160027
083-37366	47	TIDEWATER-BINGHAM 510	RICHARD B HERZOG	INJECTION	Plugged OG Well	41.82845200000	-78.58965100000	4/5/1979	160033
083-37363	48	TIDEWATER-BINGHAM 507	RICHARD B HERZOG	INJECTION	Plugged OG Well	41.82941300000	-78.58825700000	3/26/1979	160030
083-34816	49	TIDEWATER BINGHAM 377	RICHARD B HERZOG	OIL	Plugged OG Well	41.82919300000	-78.58891800000	5/18/1977	157479
083-37365	50	TIDEWATER-BINGHAM 509	RICHARD B HERZOG	INJECTION	Plugged OG Well	41.82923500000	-78.58957800000	4/21/1979	160032
083-34822	51	TIDEWATER BINGHAM 532	RICHARD B HERZOG	OIL	Plugged OG Well	41.82880900000	-78.59036700000	6/6/1977	157485
083-34823	52	TIDEWATER BINGHAM 533	RICHARD B HERZOG	OIL	Plugged OG Well	41.82842500000	-78.59075200000	5/10/1977	157486
083-46941	53	LACERTE LEASE/MESSER OIL CORE 1	PETRO NORTH LTD	OIL	Plugged OG Well	41.82864300000	-78.59101900000	4/1/2004	462266
083-34833	54	TIDEWATER BINGHAM 76	RICHARD B HERZOG	INJECTION	Plugged OG Well	41.82894600000	-78.59117400000	5/12/1977	157496
083-34821	55	TIDEWATER BINGHAM 531	RICHARD B HERZOG	OIL	Plugged OG Well	41.82966000000	-78.59033000000	5/5/1977	157484
083-34817	56	TIDEWATER BINGHAM 488	RICHARD B HERZOG	OIL	Active	41.83092200000	-78.58998200000		157480
083-13759	57	BINGHAM 367	UNKNOWN OPR	OIL	DEP Abandoned List	41.83535700000	-78.58781600000		520699

APPENDIX D

GEOPHYSICAL LOGS

Schlumberger

BOREHOLE COMPENSATED SONIC LOG

COMPANY BELDEN & BLAKE CORPORATION
WELL CYCLONE LOT 580 #1
FIELD KEATING TWP - CYCLONE QUAD
COUNTY MCKEAN STATE PENNSYLVANIA

COUNTY	MCKEAN
FIELD	KEATING TWP - CYCLONE QUAD
LOCATION	1,000' S. OF LATITUDE
WELL	CYCLONE LOT 580 #1
COMPANY	BELDEN & BLAKE CORPORATION

LOCATION 1,000' S. OF LATITUDE 41-50-00
11,000' W. OF LONGITUDE 78-32-30

API SERIAL NO. 37-083-46237 | SECT. - | TWP. KEATI | RANGE -

Other Services: LDT/CNL/GR DLL/GR LSS/GR CYBERLOOK

Permanent Datum	GROUND LEVEL	Elev. 2180.0 F	Elev.: K.B.2192.0 F
Log Measured From	KELLY BUSHING 12.0 F	above Perm. Datum	D.F.2191.0 F
Drilling Measured From	KELLY BUSHING		G.L.2180.0 F
Date	18-MAY-1990		
Run No.	2		
Depth Driller	5420.0 F		
Depth Logger (Sch.)	5418.0 F		
Btm. Log Interval	5404.0 F		
Top Log Interval	2612.0 F		
Casing-Driller	8 5/8 @ 2618.0 F	@	@
Casing-Logger	2612.0 F		
Bit Size	7 7/8"		
Type Fluid in Hole	FRESH MUD		
Dens. / Visc.	8.34 LB/G		
pH / Fld. Loss			
Source of Sample	MUD TANK		
Rm @ Meas. Temp.	1.350 OHMM @ 55.0 DEGF		@
Rmf @ Meas. Temp.	1.010 OHMM @ 55.0 DEGF		@
Rmc @ Meas. Temp.	2.020 OHMM @ 55.0 DEGF		@
Source: Rmf / Rmc	CALC / CALC		
Rm @ BHT	.747 OHMM @ 105. DEGF		@
Time Circulation Ended	5:00 AM 18 MAY		
Time Logger on Bottom	4:00 PM 18 MAY		
Max. Rec. Temp.	105. DEGF		
Equip. / Location	5860 / INDIANA, PA.		
Recorded By	WALT KLEEMEER		
Witnessed By	MR. BOB HENNIGER		

The well name, location and borehole reference data were furnished by the customer.

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 interpretations, 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 interpretations made by any of our officers, agents or employees. These interpretations are also subject to Clause 4 of our General Terms and Conditions as set out in our current Price Schedule.

Run No.	2		
Service Order No.	491006		
Drilling Fluid Level	0.0 F		
Salinity			
Rmf @ BHT	.559 OHMM	@ 105. DEGF	@
Rmc @ BHT	1.118 OHMM	@ 105. DEGF	@
Logging Speed	1800.0 F/HR		
EQUIPMENT DATA			
Tool Number 1	DLE 713		
Tool Number 2	DLS 741		
Tool Number 3	DLC 733		
Tool Number 4	DRSB 1721		

Tool Number 4	DHSB 1721
Tool Number 5	NSCD 868
Tool Number 6	CNC 86
Tool Number 7	SGC 84
Tool Number 8	TCC 90
Tool Number 9	TCM 1143
Tool Number 10	LCM 723
Tool Number 11	GSRJ 6864
Tool Number 12	NSBE 2221

REMARKS:

THANK YOU FOR USING SCHLUMBERGER.
CREW: HENRY DAWLEY, STEVE SHERK.
IPSCO DRILLING RIG #8 ON LOCATION.
DEPTH TIED INTO FIRST RUN.
LONG SPACING SONIC AND GAMMA RAY RUN ON MAY 14.
DTL USED AS SOURCE OF INTEGRATED TRAVEL TIME.

ACCUMULATED INTEGRATION VALUES SUMMARY:

ITT: .219773 S FROM 5422.00 F TO 2437.50 F

EVENT MARK SUMMARY:

OUTPUT	INTERVAL BETWEEN PIPS	DEPTH TRACK EDGE
ITT	.00100000 S	RIGHT EDGE

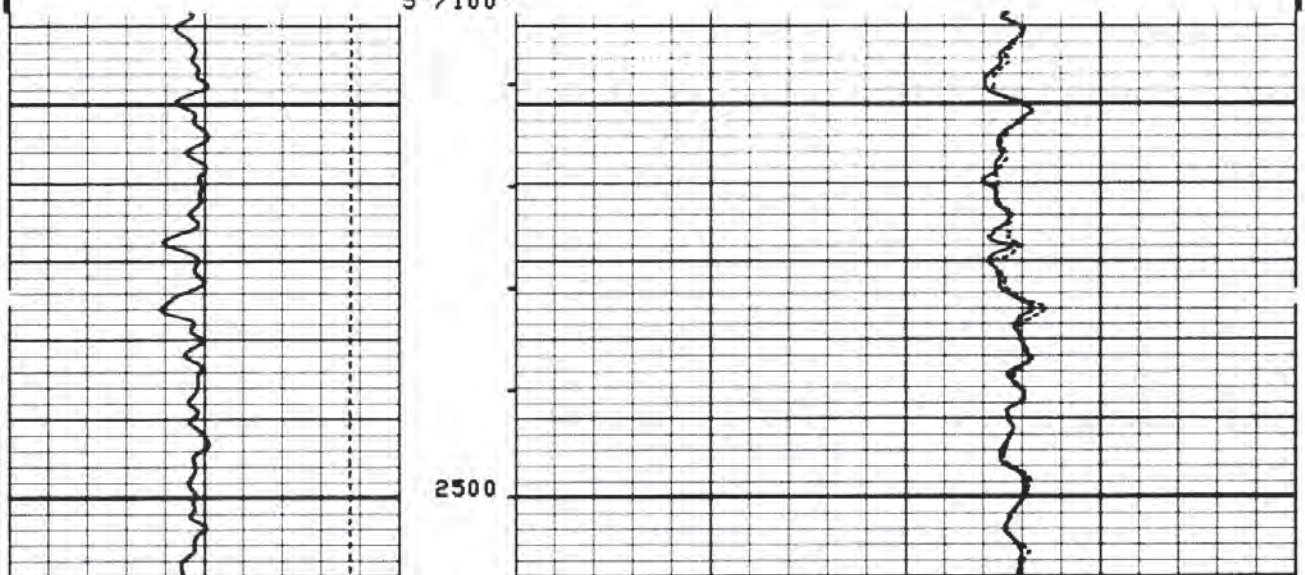
TENS(LBF)			
10000.	0.0		
GR(GAPI)			
0.0	200.00		
GR(GAPI)		DTL(US/F)	
400.00	600.00	140.00	40.000
GR(GAPI)		DT(US/F)	
200.00	400.00	140.00	40.000
GAMMA RAY BACKUP			
GAMMA RAY BACKUP			

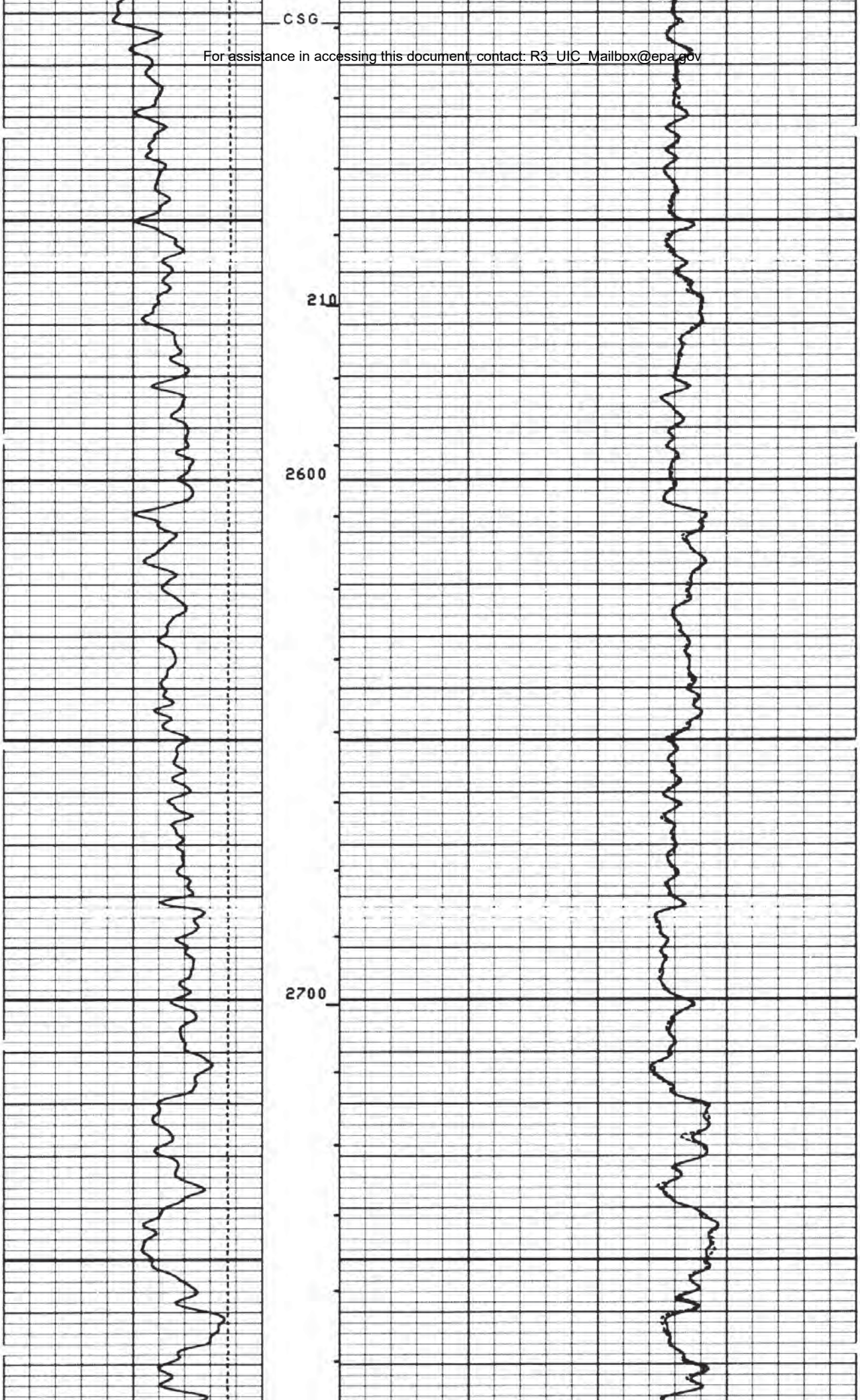
CP 32.39 FILE 2 19-MAY-1990 20:28

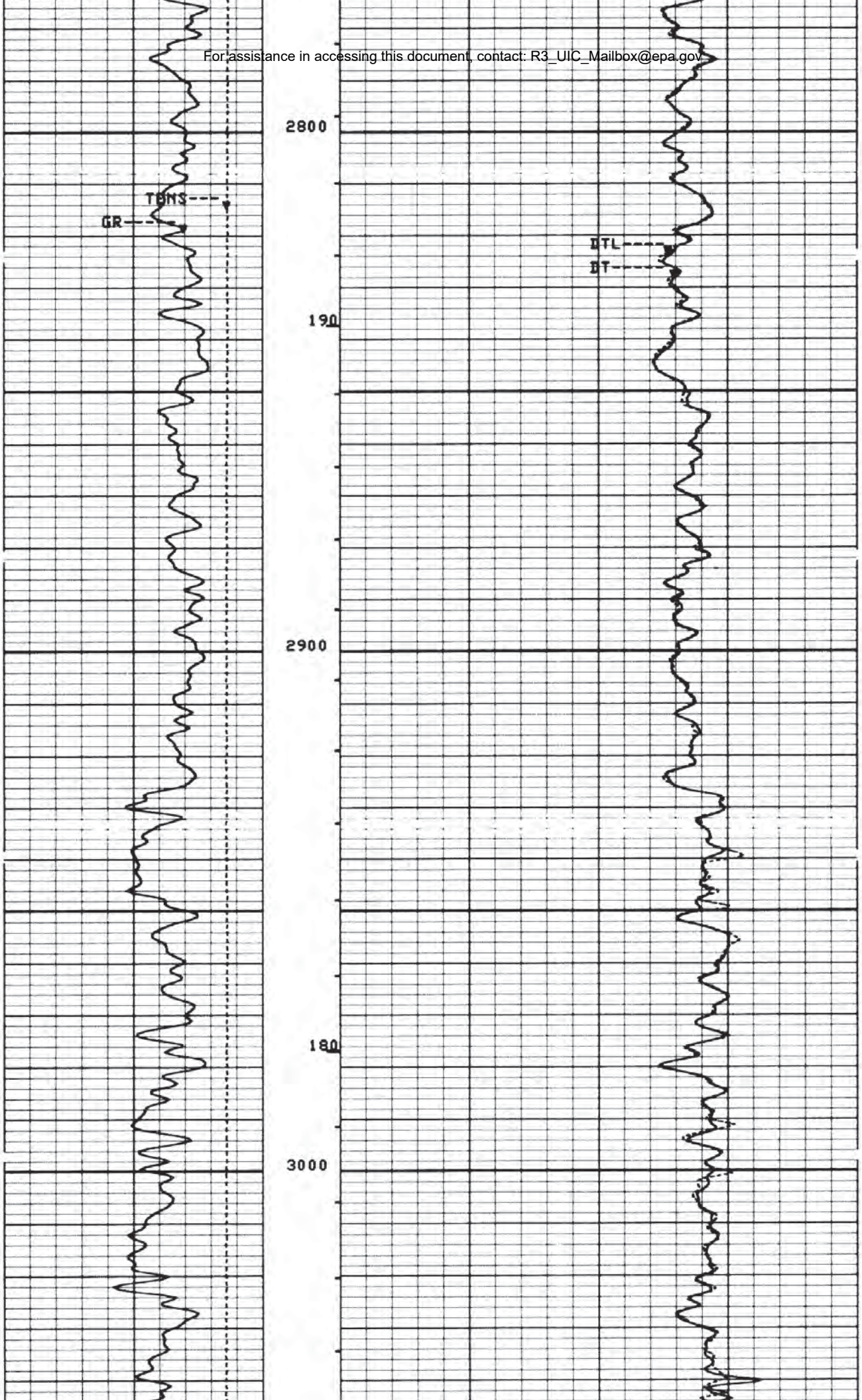
INPUT FILE(S)
10

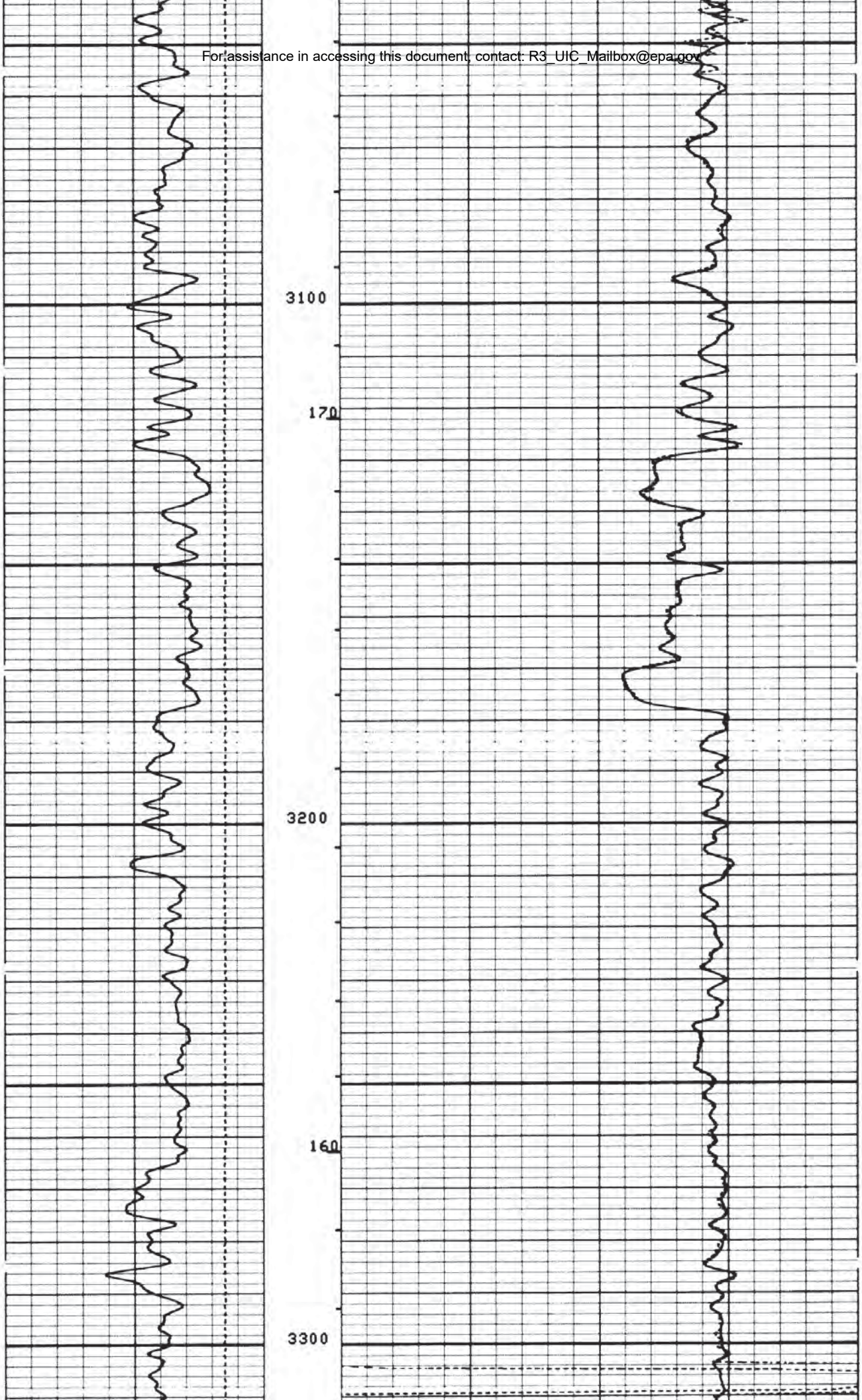
DATA ACQUIRED
19-MAY-1990 18:17

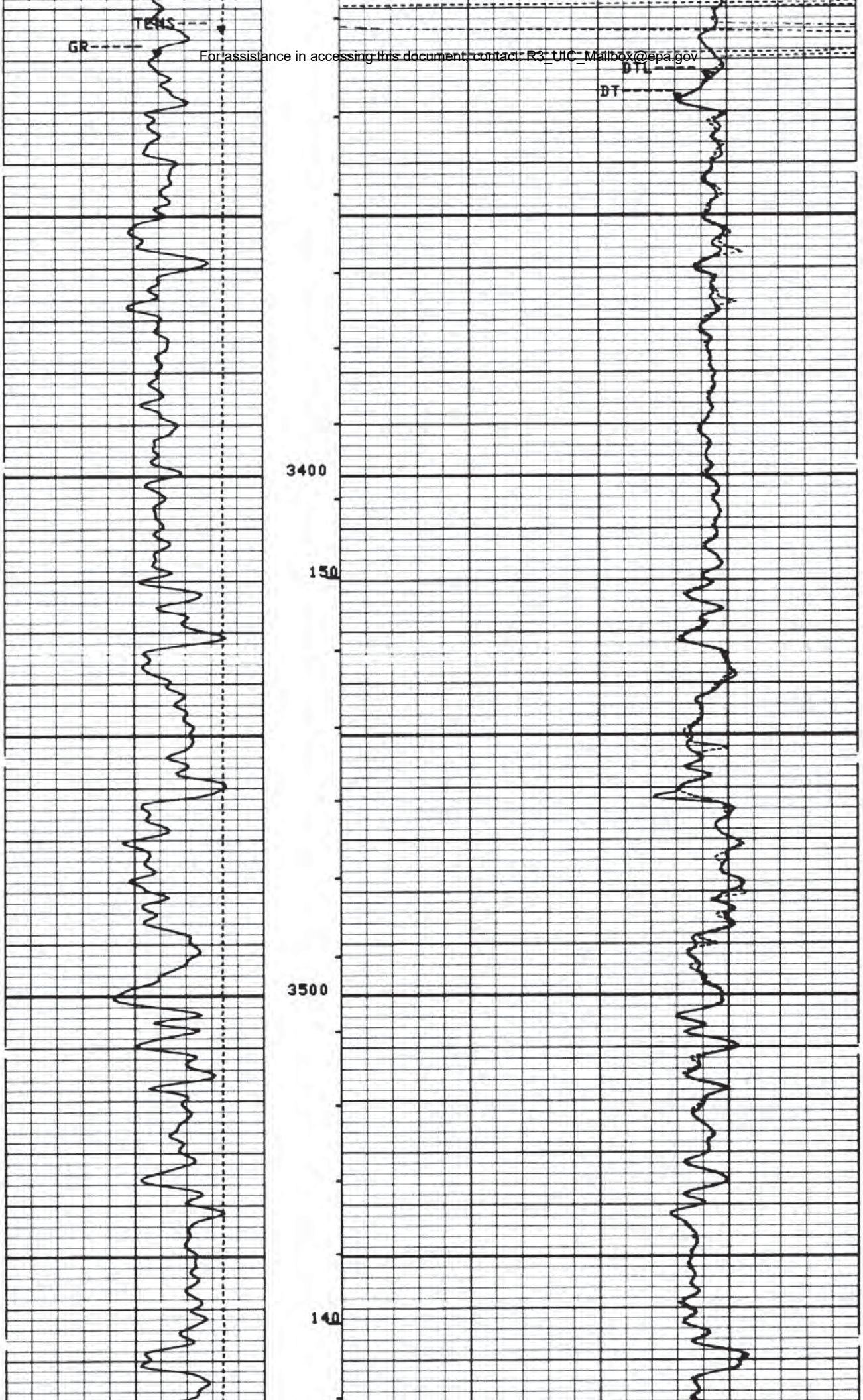
5"/100'

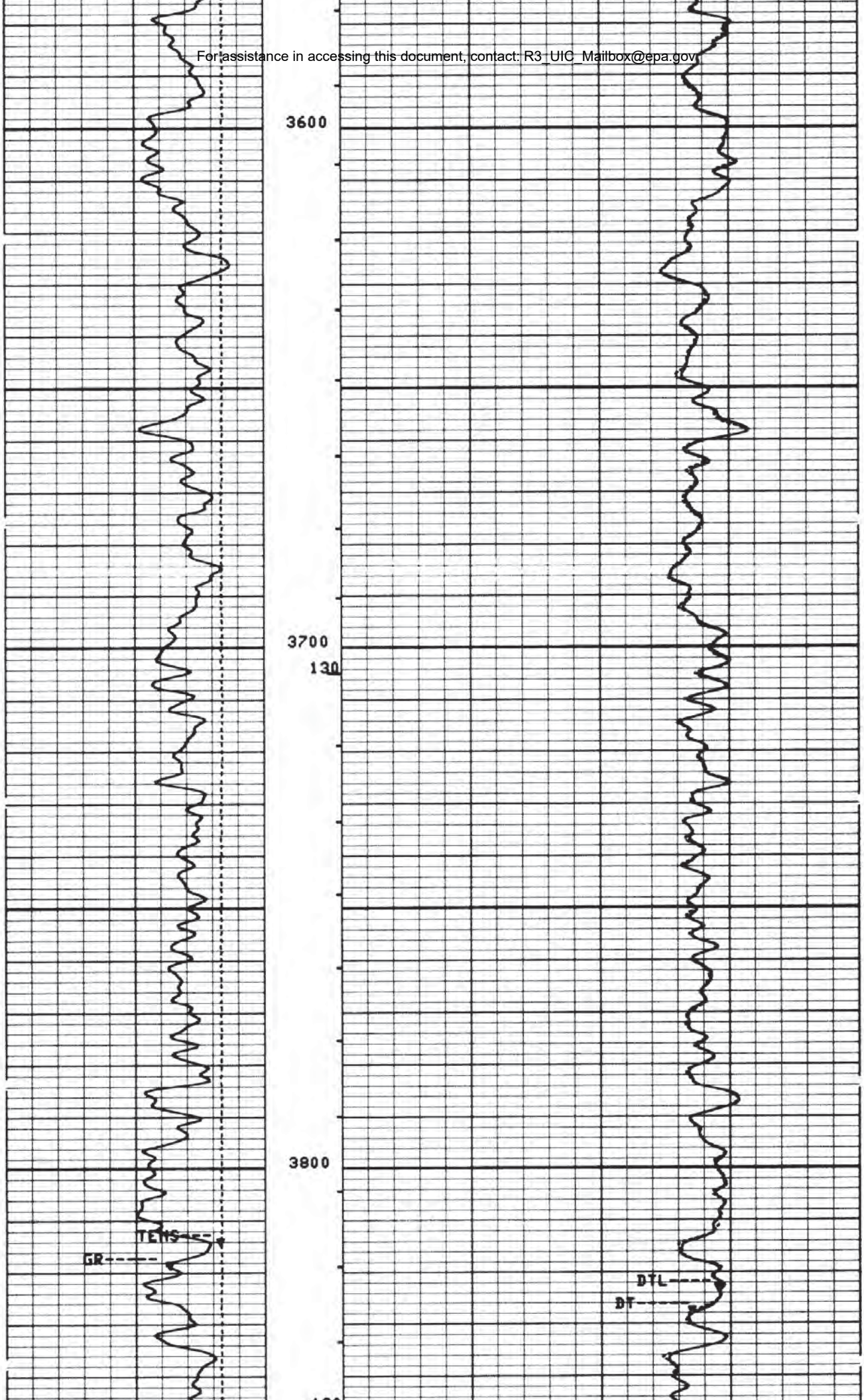


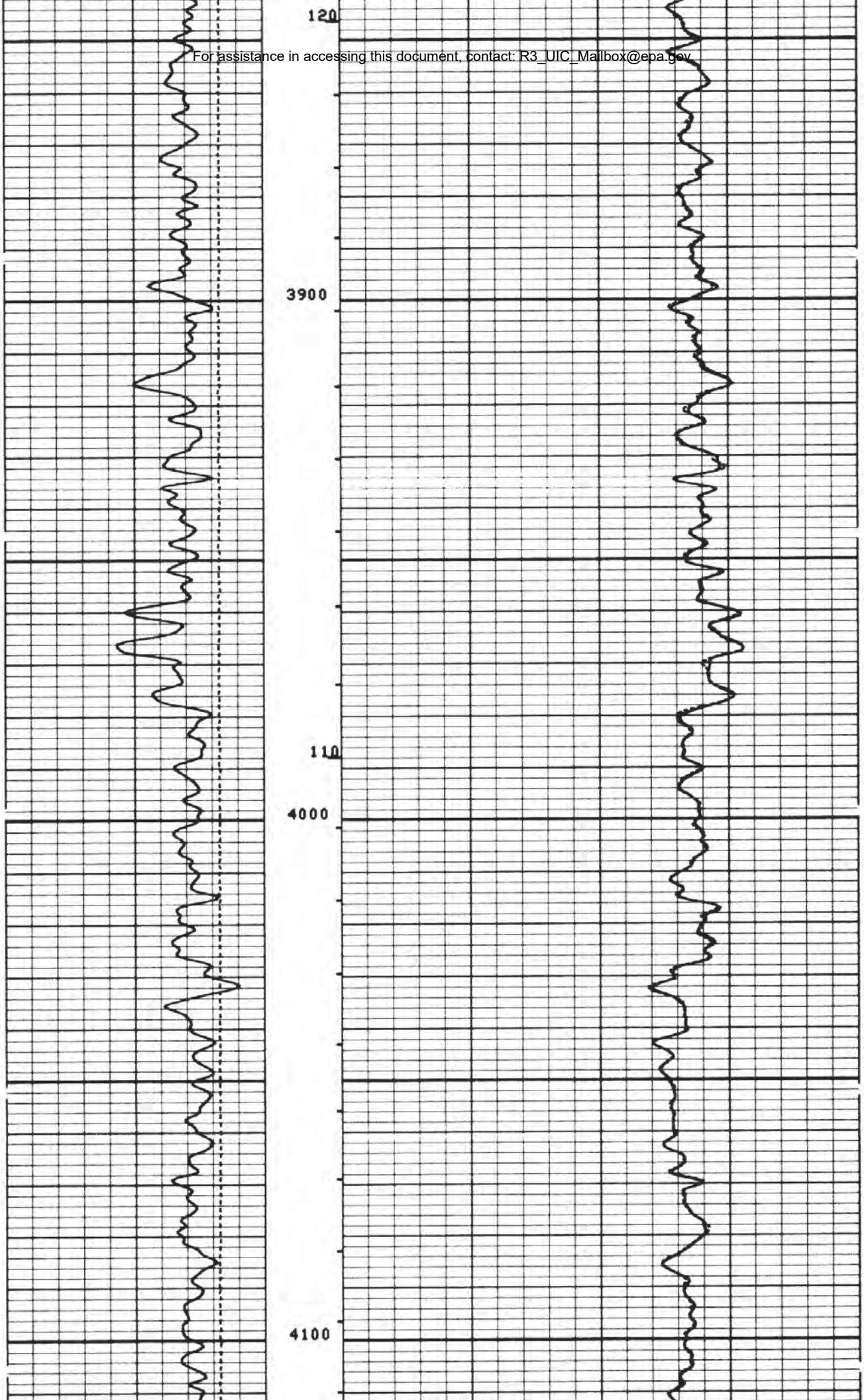


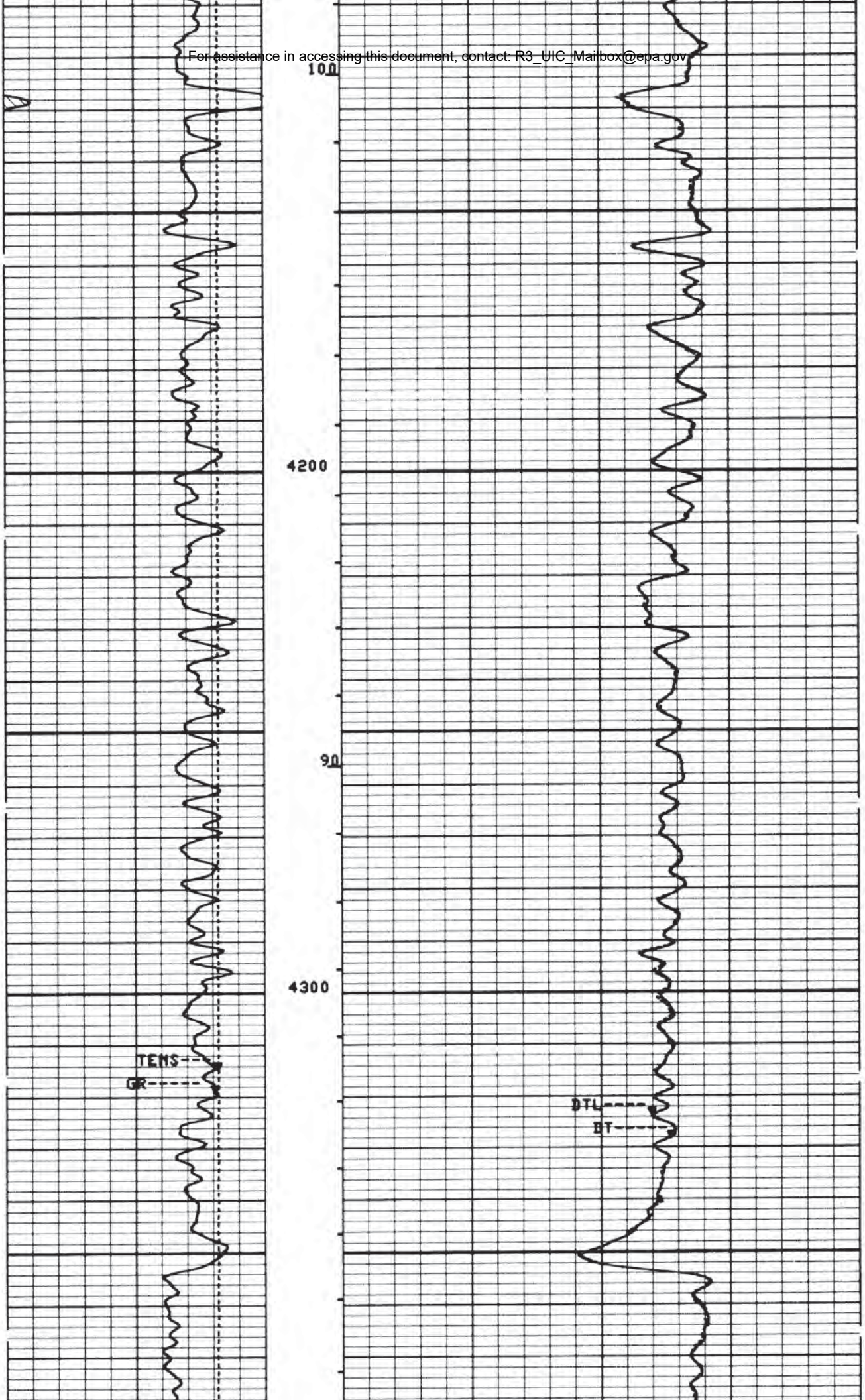


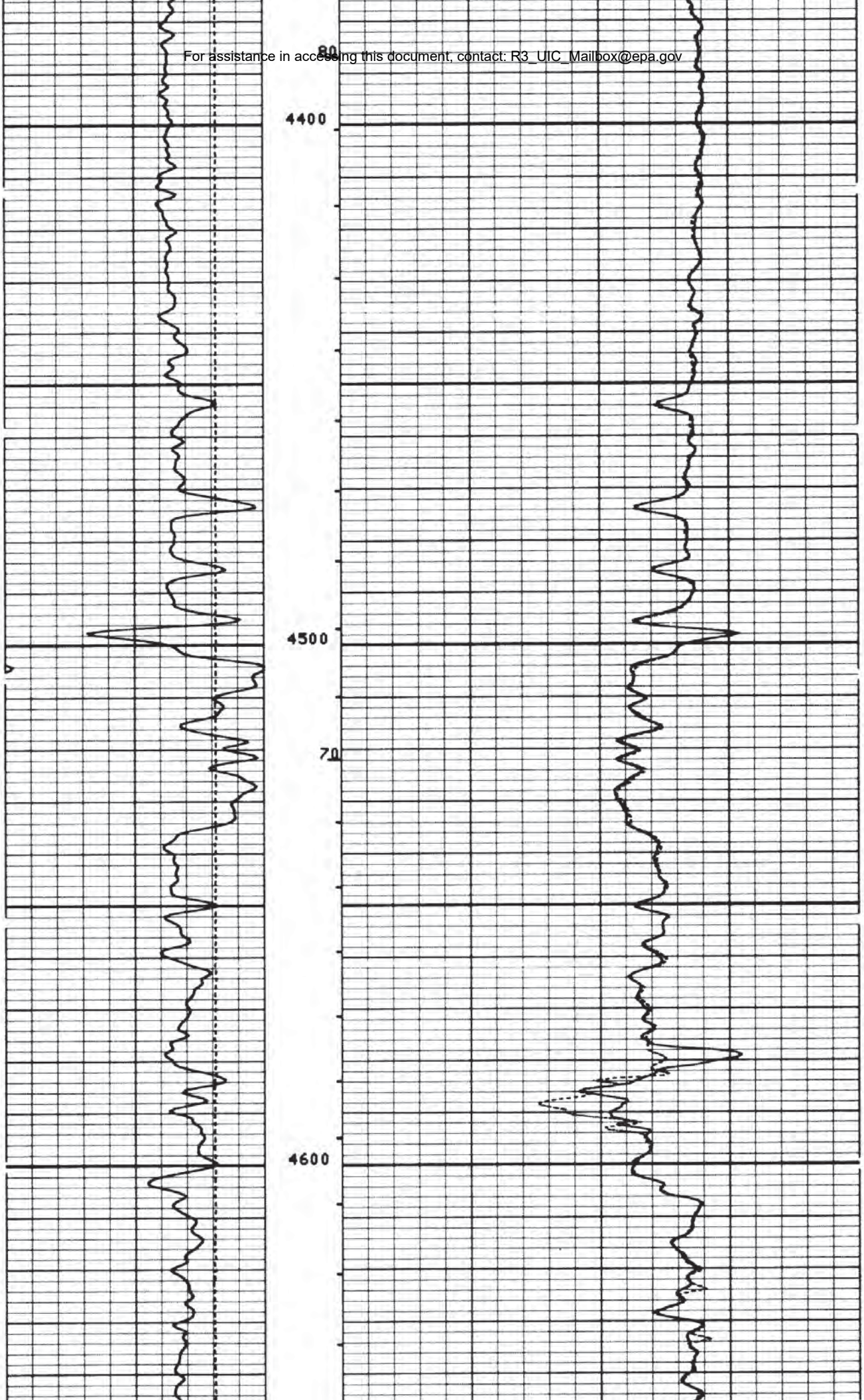


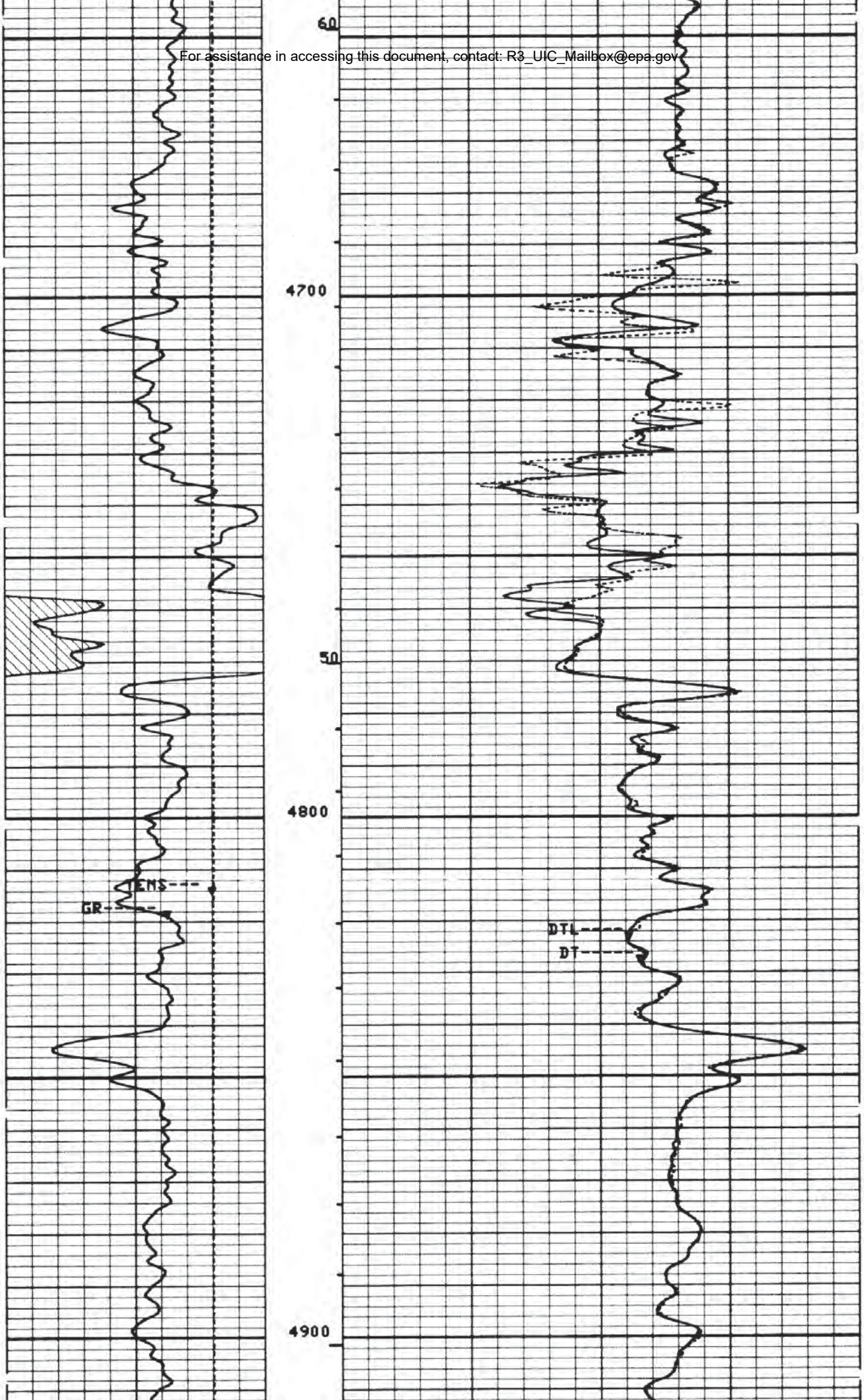


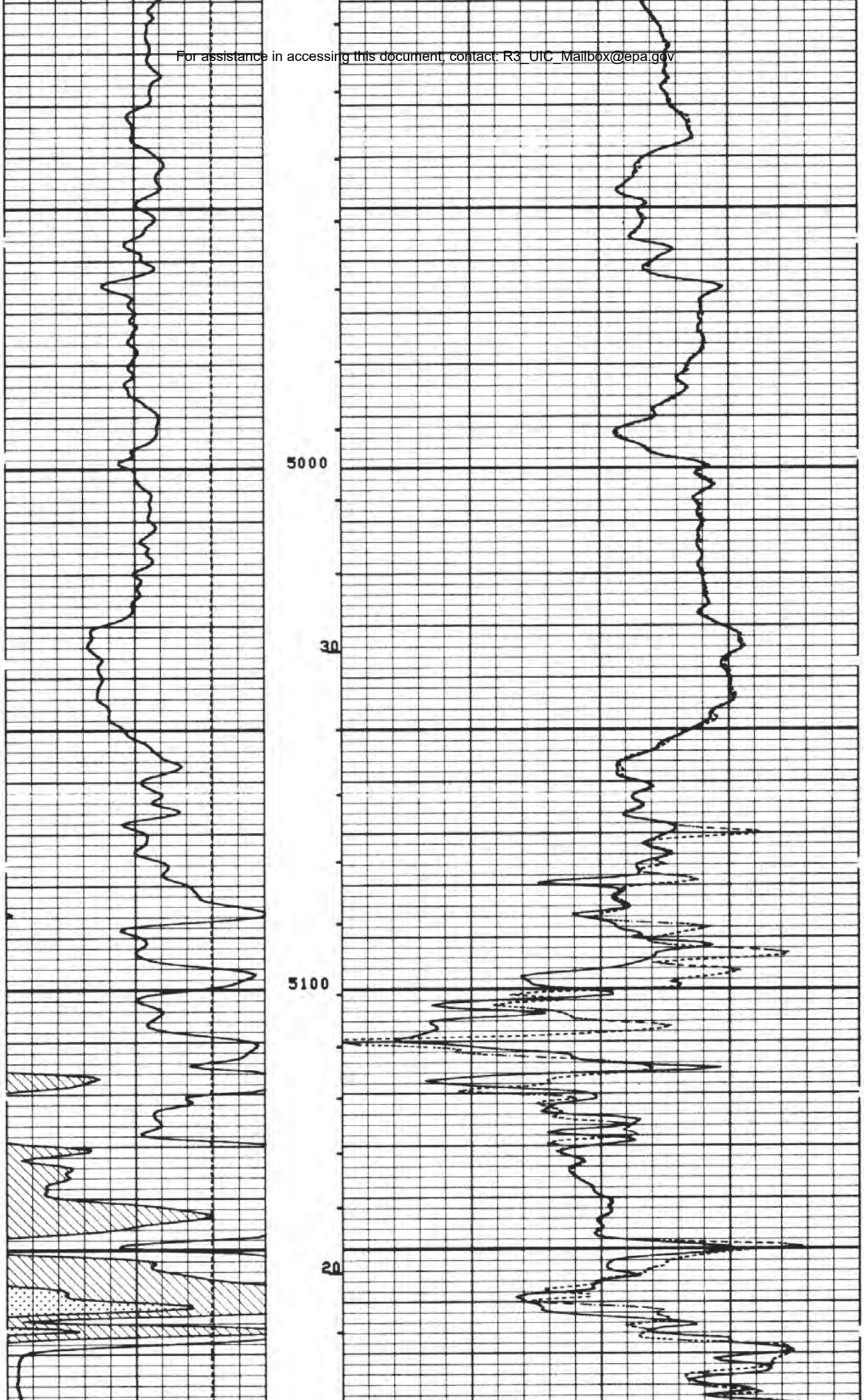


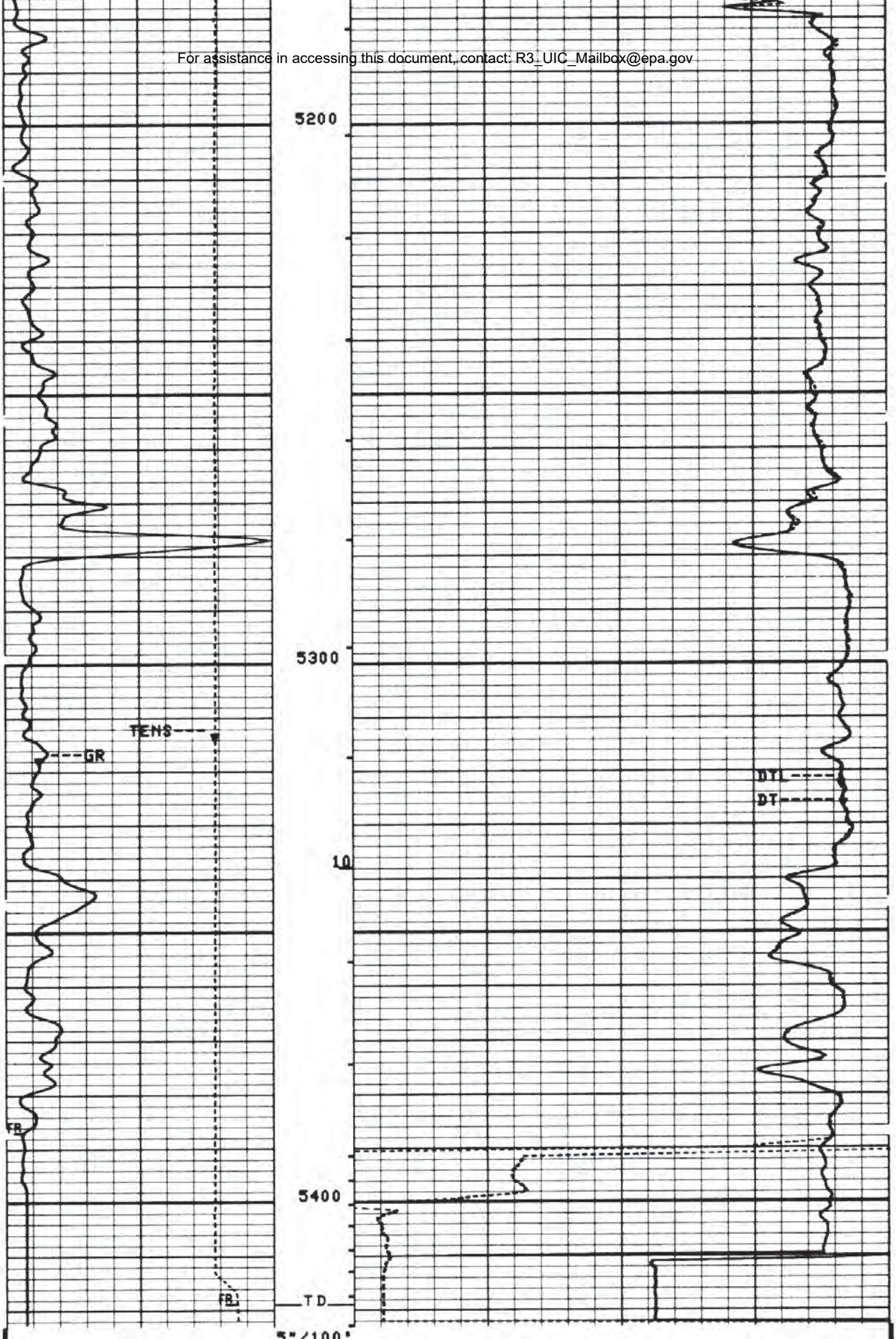












CP 32.39 FILE 2 19-MAY-1990 20:22

INPUT FILE(S)
10

DATA ACQUIRED
19-MAY-1990 18:17

TENS(LBF)		DTL (US/F)	
10000.	0.0	140.00	40.000
GR (GAPI)		DT (US/F)	
0.0	200.00	140.00	40.000
GR (GAPI)			
400.00	600.00		
GR (GAPI)			
200.00	400.00		

SENSOR MEASURE POINT TO TOOL ZERO

DTT 6.8 FEET SGTE 31.9 FEET
SLTL 16.2 FEET

PARAMETERS

PARAMETER	VALUE	UNIT
SMB - Sonic Memory Board	DISA	
TOCA - TO Correction Status	DISA	
RATE - Firing Rate	15	HZ
DG - Downhole Gain	/5	
DETE - Detection	E2	
AMPL - Sonic Amplitude	2	
CBL - Cement Bond Log Amplitude	UT	
WFM - Waveform Mode	1	
SS - Sweep Speed	FAST	
TOD - TO Delay	DISA	
RPSE - Receiver Pair Select	LONG	
DTF - Delta-T Fluid	189.000	US/F
DTM - Delta-T Matrix	56.0000	US/F
CDTS - Correction for Delta-T Shale, Empirical	100.000	
SPFS - Sonic Porosity Formula Select	R-H	
PP - Playback Processing	NORM	
DO - Depth Offset for Logical Unit LI1	0.0	F
WMUD - Weight of Mud	8.34000	LB/G
DWCO - Digitizer Word Count	512	
DSIN - Digitizer Sample Interval	5	US
DDEL - Digitizing Delay	200	US
SPSO - Sonic Porosity Source Option	DT	
ITTS - Integrated Transit Time Source	DTL	
TDL - Total Depth - Logger	5419.00	F
STEM - Surface Temperature	50.0000	DEGF
MRT - Maximum Recorded Temperature	105.000	DEGF
BSAL - Borehole Salinity	-50000.0	PPM
DFD - Drilling Fluid Density	8.34000	LB/G
RMFS - Resistivity of Mud Filtrate Sample	1.01000	OHMM
RMS - Resistivity of Mud Sample	1.35000	OHMM
MST - Mud Sample Temperature	55.0000	DEGF
MFST - Mud Filtrate Sample Temperature	55.0000	DEGF
BS - Bit Size	7.87500	IN
RW - Resistivity of Water	.0350000	OHMM
BHS - BoreHole Status (Open or Cased)	OPEN	

REPEAT SECTION

CSU Field Log

TENS(LBF)		DTL (US/F)	
10000.	0.0		
GR (GAPI)			
0.0	200.00		
GR (GAPI)			

GR (GAPI)		DTL (US/F)	
400.00	600.00	140.00	40.000
GR (GAPI)		DT (US/F)	
200.00	400.00	140.00	40.000

CP 32.39 FILE 1 19-MAY-1990 20:21

INPUT FILE(S)
9

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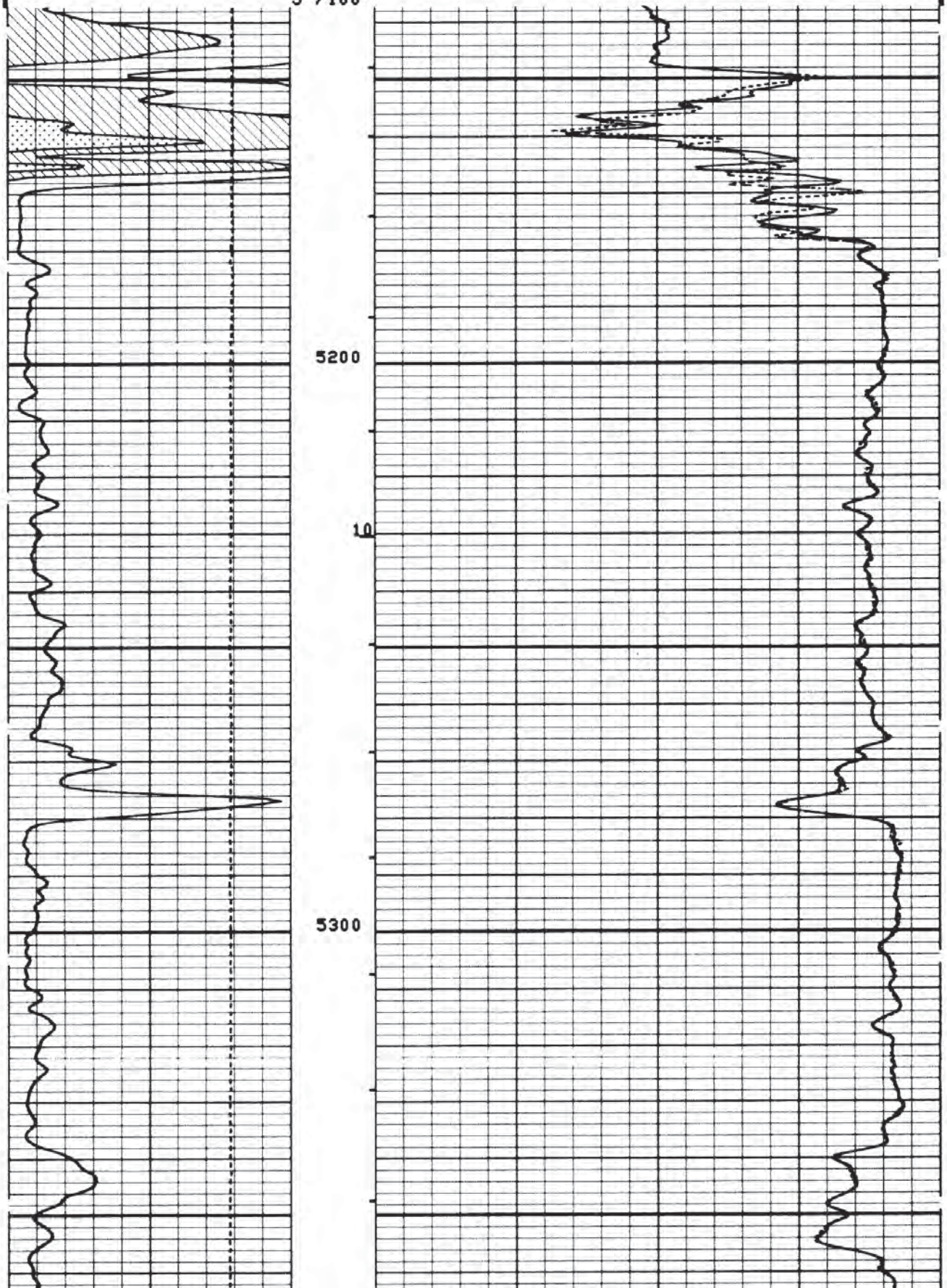
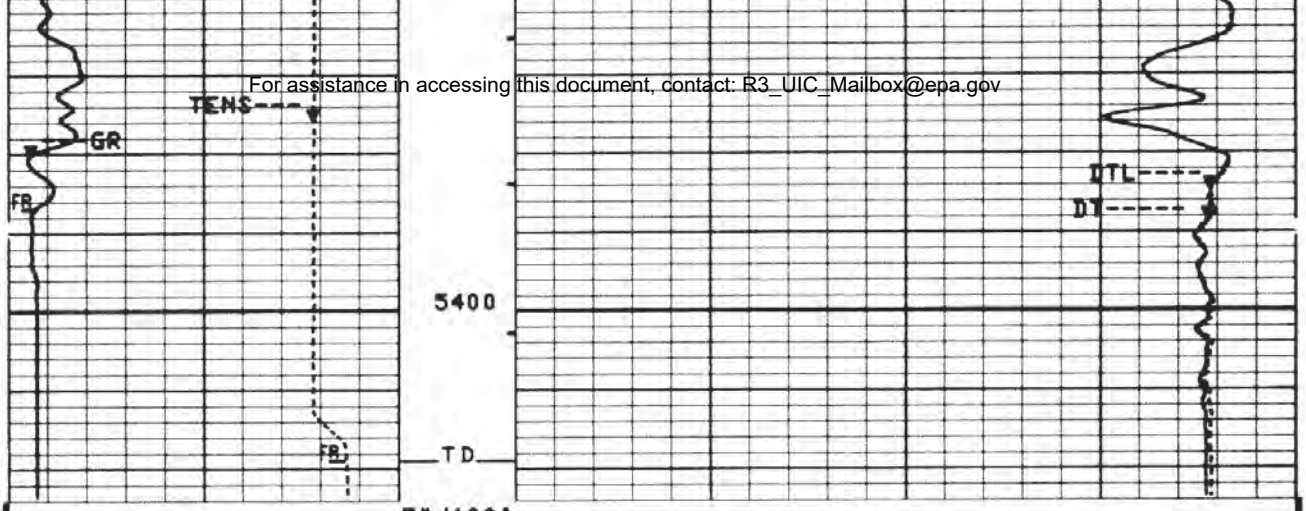
19-MAY-1990 17:58

5"/100'





5"/100'

CP 32.39 FILE 1 19-MAY-1990 20:20

INPUT FILE(S)
9

DATA ACQUIRED
19-MAY-1990 17:58

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GR (GAPI)		DT (US/F)	
0.0	200.00	140.00	40.000
GR (GAPI)			
400.00	600.00		
GR (GAPI)			
200.00	400.00		

REPEAT SECTION

CSU Field Log

COMPANY	BELDEN & BLAKE CORPORATION			SCHL. FR	5404.0 F
				SCHL. TD	5418.0 F
WELL	CYCLONE LOT 580 #1			DRLR. TD	5420.0 F
				Elev: KB	2182.0 F
FIELD	KEATING TWP - CYCLONE QUAD			DF	2181.0 F
COUNTY	MCKEAN	STATE	PENNSYLVANIA	GL	2180.0 F

Schlumberger

BOREHOLE COMPENSATED
SONIC LOG