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

Sandstone Development, LLC.
464 Bingham Road
Cyclone, PA 16726

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

III. Commercial Facility

- [ ] Yes
- [x] 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

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: McKay 7A

IX. Class and Type of Well (see reverse)

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

X. Well Status

- [ ] A. Operating — Date Injection Started
- [ ] B. Conversion — Date Well Constructed
- [x] C. Proposed

XI. Well Information

API Number: 37-083-48829

Permit (or EPA ID) Number:

Full Well Name:

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: 41-50-00

Longitude: -78-35-00

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

Name and Official Title *(Please Type or Print)*	Signature	Date Signed
R. James Barnes, Member		4/8/24

INSTRUCTIONS FOR FORM 7520-6 (CLASS II WELLS)

A permit application must be completed by all owners or operators of current or proposed Class I, II, and III wells, and some Class V injection wells subject to the requirement to obtain an Underground Injection Control (UIC) permit as described at 40 CFR 144.31 and others directed by a UIC official to apply for a UIC permit. Please note that the information needs vary by well class. These instructions are specific to Class III wells; other versions are available for other well classes. Please note that this form must be signed by a responsible entity as described at 40 CFR 144.32, even if the attachments are prepared by contractors or service companies. If the application covers multiple wells, use additional pages as necessary to provide all the requested information.

I. OWNER NAME, ADDRESS, PHONE AND/OR EMAIL: Enter the name and street address, city/town, state, and ZIP code of the owner of the well, well field, or company. Also provide an email address (if available) and/or a phone number.

II. OPERATOR NAME, ADDRESS, PHONE AND/OR EMAIL: Enter the name and street address, city/town, state, and ZIP code of the operator of well or well field; also provide an email address (if available) and/or a phone number. If the operator is the same as the owner, enter "same as owner."

III. COMMERCIAL FACILITY: Check the appropriate box to indicate the type of facility. A commercial facility is a single or multiple well facility that is specifically engaged in the business of injecting waste fluids generated by third party producers that is originated off-site and transported to the facility by truck for a fee or compensation.

IV. OWNERSHIP: Check the appropriate box to indicate whether the owner of the well/facility is a private, Federal, or State/Tribal/Municipal entity.

V. TYPE OF PERMIT ACTION REQUESTED: Check "new permit" if the well has never been subject to a UIC permit (e.g., for a newly constructed or converted well). Check "permit renewal" for an application associated with extending an expiring UIC permit. Check "modification" for an application to modify an existing permit that is not expiring. Check "add well to area permit" if additional wells are to be covered under an existing UIC area permit. Check "other," if needed and describe the situation.

VI. SIC CODES: List at least one and no more than four Standard Industrial Classification (SIC) Codes that best describe the nature of the business in order of priority. A list of SIC codes is available from the U.S. Department of Labor at https://www.osha.gov/pls/imis/sicsearch.html.

VII. INDIAN COUNTRY: Check yes if the well is located in Indian country. Indian country (as defined in 18 U.S.C. 1151) includes: all land within the limits of any Indian reservation under the jurisdiction of the U.S. government; all dependent Indian communities within the borders of the U.S.; and all Indian allotments, the Indian titles to which have not been extinguished.

VIII. TYPE OF PERMIT: Check "Individual" or "Area" to indicate the type of permit requested. Individual permits cover a single injection well, while area permits may cover more than one injection well. Note that area permits are issued at the discretion of the Director and that wells covered by an area permit must: be at one contiguous site, be under the control of one entity, and may not inject hazardous waste. If an area permit is requested, enter the ***number of wells*** to be included in the permit. In the case of a project or field that crosses State lines, it may be possible to consider an area permit if EPA has jurisdiction in all affected States (each such case will be considered individually). Also provide the ***name of the well field or project.***

IX. CLASS AND TYPE OF WELL: Enter the class (as defined in 40 CFR 144.6) and type of injection well for which a permit is requested. Use the most pertinent code selected from the table below. When selecting type "X", please explain in the space provided.

TABLE OF CLASS II WELL TYPES

A	Annular Disposal Well.
D	Produced Fluid Disposal Well.
H	Hydrocarbon Storage Well (excluding natural gas).
R	Enhanced Recovery Well.
X	Other Class II Wells (not included in Type "A," "D," "H," or "R").

X. WELL STATUS: Check ***Box A, Operating*** if the well currently operates as an injection well (e.g., if a permit renewal is requested or a permit is sought for an existing rule-authorized injection well). Check ***Box B, Conversion*** for an existing well not currently being utilized for injection that is proposed to be converted to an injection well. Check ***Box C, Proposed*** for an underground injection well not yet constructed or completed. Provide relevant dates if A or B are checked.

XI. WELL INFORMATION: Enter the ***API number*** (the number assigned by the local jurisdiction (usually a State Oil and Gas Agency) using the American Petroleum Institute standard numbering system). Enter the ***Permit or EPA ID number*** assigned to the injection well by the EPA or the permitting authority. If you do not have a number (e.g., for a new well), this will be provided by EPA or the permitting authority, and you can leave the field blank. Also enter the ***Full Name of the Well*** or project.

XII. LOCATION: For individual permit applications, in the fields provided, enter the location of the well using latitude and longitude and/or the Public Land Survey System. When using latitude and longitude, use decimal degrees to five or six places after the decimal, if possible; be sure to include a negative sign for the longitude of a well in the Western Hemisphere and a

negative sign for the latitude of a well in the Southern Hemisphere. When using the Public Land Survey System, fill in the complete township, range, and section to the nearest quarter-quarter section. A township is north or south of the baseline, and a range is east or west of the principal meridian (e.g., T12N, R34W). Also include the distance, in feet, from the nearest north or south line and nearest east or west line of the quarter-section. For area permit applications, provide the latitude and longitude of the approximate center of the area.

XIII. ATTACHMENTS: Specific instructions for completing the attachments are presented on pages 3 through 6. Place the permit or EPA ID number (or, if none has been assigned, other identifying information such as an API number or the project name) in the upper right hand corner of each page of the attachments.

XIV. CERTIFICATION: All permit applications must be signed by either: a responsible corporate officer for a corporation, by a general partner for a partnership, by the proprietor of a sole proprietorship, or by a principal executive or ranking elected official for a public agency, or a duly authorized representative of that person.

PAPERWORK REDUCTION ACT NOTICE: The public reporting and recordkeeping burden for this collection of information is estimated to average 61 hours per response for a Class II well permit application. Burden means the total time, effort, or financial resource expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal Agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to the collection of information; search data sources; complete and review the collection of information; and, transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including the use of automated collection techniques to Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822), 1200 Pennsylvania Ave., NW, Washington, DC 20460. Include the OMB control number in any correspondence. Do not send the completed forms to this address.

Instructions for Completing Attachments to Form 7520-6 (Class II Wells)

The Underground Injection Control (UIC) program, as promulgated under the Safe Drinking Water Act (SDWA), is designed to prevent injection activity from allowing the movement of fluid containing any contaminant into underground sources of drinking water (USDWs), if the presence of that contaminant may cause a violation of any primary drinking water regulation or may otherwise adversely affect the health of persons as found at Title 40 of the Code of Federal Regulations (40 CFR) section 144.12. Any applicant for a permit under this program shall have the burden of showing that their proposed construction, operation, maintenance, conversion, plugging, abandonment, and injection activity, does not endanger USDWs.

The attachments below have been constructed to provide applicants with clear expectations as to what information EPA needs to make a determination that an applicant's proposed activities will not endanger USDWs.

Pre-Application Coordination

Coordination between the UIC program and the permit applicant prior to submittal of the permit application is an important step for efficient and effective permitting. Early discussions will ensure that the applicant is aware of all the permit application requirements, including state specific requirements found at 40 CFR part 147. These discussions may also help the applicant plan how to invest time and resources needed to develop a comprehensive and complete permit application.

Applicants are encouraged to contact their EPA regional UIC program for a pre-application coordination meeting.

Note: If the owner or operator of *existing rule authorized Class II UIC well(s)* is required by the EPA to apply for a permit (40 CFR § 144.25), consult with EPA staff during the pre-application coordination for additional requirements that may apply.

When completing each attachment, please be sure to specify the units reported, e.g., of depth, pressure, temperature, etc.

Attachment A. Map(s) and Area of Review

Part I. Well Location(s)

For Individual Permits: If the surface location provided in the accompanying 7520-6 form does not adequately describe the well location (i.e., due to deviation, directional, or horizontal drilling), please describe the well's orientation and provide the top- and bottom-hole coordinates, as appropriate. If any monitoring wells are proposed as part of this permit application, provide coordinates for all monitoring wells.

For Area Permits (40 CFR § 144.33): Provide information similar to what is outlined above for individual permits for each well (existing or proposed) to be covered by this permit. In addition, provide a description of the proposed permitted area. At a minimum, this area should include all the proposed or existing wells known at the time of permit application submittal. For circular areas, this description should consist of a defined-radius from a singular point whose coordinates have been given. For polygonal areas, use a series of coordinates describing the vertices or corners of the area. Submit a Geographic Information System (GIS) file, if available.

Part II. Area of Review Size Determination (40 CFR § 146.6)

For All Permits. Give the method (fixed radius or equation) and, if appropriate, all calculations used to determine the size of the area of review (AOR). If you are uncertain as to which method to use, consult with your regional EPA office.

The AOR must be a minimum radius of one-fourth (1/4) mile from the well bore, including a well's lateral, or the proposed area permit boundary for area permits, unless the use of an equation is approved by the Director.

In addition, for Class II enhanced oil recovery well(s). The AOR will be at a minimum the larger of the following: one-fourth (1/4) mile radius or the distance to the nearest active producer in the production formation.

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

Submit a topographic map (or other map if a topographic map is unavailable) extending one mile beyond the facility property boundary showing:

- project injection well(s), well pad(s) and/or project area,
- applicable area of review,
- all outcrops of injection and confining formations,
- all surface water intake and discharge structures, and
- all hazardous waste treatment, storage, or disposal facilities.

Consult with your EPA regional office for the definition of the facility property boundary.

The information below does not apply to existing rule authorized Class II well(s).

Within the one-fourth (1/4) mile beyond the facility property boundary or the AOR, whichever is larger, the map will also show the:

- name and location of all production wells, injection wells, abandoned wells, dry holes, and all water wells, noting their types (public water system, domestic drinking water, stock, etc.),

- springs and surface bodies of water,
- mines (surface and subsurface) and quarries, and
- other pertinent surface features, including residences, schools, hospitals, and roads.

Only information of public record and pertinent information known to the applicant is required to be included on this map. Multiple maps may be needed to display this information clearly. If a certain feature is not present in the area covered, please state so definitively (e.g., *"There are no known outcrops of the confining formation in the mapped area."*).

Part IV, below does not apply to existing rule authorized Class II well(s).

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

Submit a tabulation of data and wellbore diagrams reasonably available from public records or otherwise known to the applicant on all wells within the AOR included on the map, which penetrate the proposed confining zone(s). Such information will include:

- well name, location and depth,
- well type,
- date well was drilled,
- well construction that includes casing and cement details, including demonstrated or calculated top of cement,
- cement bond logs (if available), and
- record of well completion and plugging (if applicable).

For such wells which are improperly sealed, completed, or abandoned, also submit a plan consisting of such steps or modifications as are necessary to prevent movement of fluid into USDWs.

Part V. Landowners Information (40 CFR § 144.31 and part 147)

Identify and submit a list with the names and addresses of all owners of record of land within one-fourth (1/4) mile of the facility property boundary. This requirement may be waived by the Regional Administrator if the site is in a populous area and the Regional Administrator determines that the requirement would be impracticable.

Consult with your regional EPA office, as additional state landowner notification requirements may apply (40 CFR part 147).

Attachment B. Geological and Geophysical Information

Part I. Geological Data (40 CFR § 146.24)

Provide the following information:

- geological data on all formations from the surface to the base of the injection well, identifying all USDWs and confining and injection zone(s). This data includes the lithologic description, geological name, thickness, depth, and total dissolved solids (TDS) concentrations from these formations (if known),
- source of information for the geologic data and formation TDS,
- porosity and permeability of injection formation (if available),
- geological cross-sections (if available) proximate to the injection well that includes the confining and injection zones. The cross-sections should illustrate the regional geologic setting and show the thickness and lateral continuity of the confining zone(s) through the area of review,
- within the AOR, identify known or suspected faults and fracture systems. If identified, provide proximity to the injection zone and the effect the fault/fracture system may have on the injection activities, and
- a history of seismic activity in the area and proximity to crystalline (i.e., granitic) basement.

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

Provide a formation testing program to obtain data on:

- fluid pressure,
- estimated fracture pressure, and
- physical and chemical characteristics of the injection zone.

Attachment C. Well Construction/Conversion Information

Part I. Well Schematic Diagram (40 CFR § 146.24)

Provide a detailed proposed well schematic diagram that includes:

- identification of USDWs and confining and injection zones,
- casing and cementing details, including demonstrated or calculated top of cement,
- tubing and packer (if applicable),
- open hole or perforated intervals, and

- surface trace (if horizontal or deviated well).

For wells that are drilled and to be converted to an injection well, also provide the current well schematic diagram.

Part II. Well Construction or Conversion Procedures (40 CFR §§ 144.52, 146.22, & 146.24)

Provide detailed description of well construction or conversion procedures, that includes:

- proposed logs and other tests conducted during the drilling and construction of new well(s),
- proposed stimulation plan(s), if planned, and
- description of alarms and shut-down systems at the well (if applicable).

For wells that are drilled and to be converted to an injection well, also provide:

- well completion and cementing records, and
- previously run logs/tests.

Attachment D. Injection Operation and Monitoring Program (40 CFR §§ 146.23 & 146.24)

Submit the following information:

- flow diagram of fluid flow through the facility,
- contingency plan(s) to cope with well failure, so as to prevent migration of contaminating fluids into a USDW,
- drawing of the surface construction,
- locations of all monitoring devices (show on the map(s) referenced in section A.III. above), and
- description of sampling and monitoring devices to monitor the nature of the injected fluids, injection pressure, annulus pressure (if applicable), flowrate, and cumulative volume.

Hydrocarbon storage and enhanced recovery may be monitored on a field or project basis rather than on an individual well basis by manifold monitoring. If a manifold monitoring program is utilized, describe details of the monitoring program and how the program is comparable to individual well monitoring. Also, include on the map in section A.III.B, the distribution manifold applying injection fluid to all wells in the area, including location of all system monitoring locations.

Additionally, submit the following proposed operating data for each well in the individual or area permit:

- average and maximum daily rate and volume of fluids to be injected,
- average and maximum injection pressure,
- source(s) of injection fluids (including field and formation names),
- proposed annular fluid, and
- analysis of the chemical and physical characteristics of the injection fluid. At a minimum, this should include pH, specific gravity, TDS, and conductivity. Consult with the regional EPA office for additional guidance.

Attachment E. Plugging and Abandonment Plan (40 CFR §§ 144.31, 144.51 & 146.24)

Submit a plugging and abandonment (P&A) plan of the well on EPA Form 7520-19 along with a P&A diagram. The plan should include:

- type, and number of plugs to be used,
- placement of each plug including the elevation of top and bottom,
- type, grade, and quantity of cement to be used, and
- method of placement of the plugs.

Provide one or more cost estimates from an independent firm in the business of plugging and abandoning wells to conduct the work proposed in the P&A plan for EPA to contract plugging of the well. This is to ensure that EPA has adequate funding to plug the well(s) if the operator is unable to plug the well(s).

Consult with the regional EPA office for additional guidance on developing the P&A plan and cost estimate calculations.

Attachment F. Financial Assurance (40 CFR § 144.52)

Submit evidence of financial resources, such as a surety bond or financial statement, necessary for a third party to close, plug, or abandon the well in the event an owner or operator is unable to do so. The monetary amount is based on the P&A plan cost estimate provided in Attachment E.

Attachment G. Site Security and Manifest Requirements (Commercial Wells Only)

Provide a proposed site security plan. This could include fencing around the perimeter of the facility. Consult with the regional EPA office for additional guidance on manifest requirements.

Attachment H. Aquifer Exemptions (40 CFR §§ 144.7 & 146.4)

If an aquifer exemption (AE) is requested, submit the information required at 40 CFR § 144.7 and to demonstrate that the criteria found at 40 CFR § 146.4 are met. Consult with your regional EPA office for additional guidance.

Attachment I. Existing EPA Permits (40 CFR § 144.31)

Submit a listing of all permits or construction approvals received or applied for under any of the following programs:

- Hazardous Waste Management program under RCRA,
- UIC program under SDWA,
- NPDES program under CWA,
- Prevention of Significant Deterioration (PSD) program under the Clean Air Act,
- Nonattainment program under the Clean Air Act,
- National Emission Standards for Hazardous Pollutants (NESHAPS) preconstruction approval under the Clean Air Act.
- Ocean dumping permits under the Marine Protection Research and Sanctuaries Act,
- Dredge and fill permits under section 404 of CWA, and
- Other relevant environmental permits, including State permits.

Attachment J. Description of Business (40 CFR § 144.31)

Provide a brief description of the nature of the business.

Attachment K. Optional Additional Project Information (40 CFR § 144.4)

The following is a list of Federal laws that may apply prior to the issuance of permits. When any of these laws are applicable, EPA must ensure that they are followed. The optional additional information requested below will assist EPA in its analyses to satisfy these laws.

- The Wild and Scenic Rivers Act, 16 U.S.C. 1273 et seq.

  Identify any national wild and scenic river that may be impacted by the activities associated with the proposed project.

- The National Historic Preservation Act of 1966, 16 U.S.C. 470 et seq.

  Identify properties listed or eligible for listing in the National Register of Historic Places that may be affected by the activities associated with the proposed project. If previous historic and cultural resource survey(s) have been conducted, provide the results of the survey(s).

- The Endangered Species Act, 16 U.S.C. 1531 et seq.

  Identify any endangered or threatened species that may be affected by the activities associated with the proposed project. If a previous endangered or threatened species survey has been conducted, provide the results of the survey.

- The Coastal Zone Management Act, 16 U.S.C. 1451 et seq.

  Identify any coastal zones that may be affected by the activities associated with the proposed project.

ATTACHEMENT A

Map(s) and Area of Review

Map(s) and Area Review

Attached are three individual maps for the following Area Permit. The fixed radius method was applied to all three maps (quarter mile, quarter mile and 1 mile) for the purposed injection well. All springs, surface bodied or water and pertinent surface structures (none) have been identified on all maps.

Figure 1: Topographic map showing AOR: ¼ mile red circle

This map shows quarter mile circle in red. Well 7A is labeled inside the quarter mile red circle. All wells effected by the quarter mile AOR are listed on a separate paper listed as FIGURE 1 TABLE and are all active production and plugged wells. No other wells (abandoned, water, injection, dry holes, etc.) are present in the quarter mile AOR.

There is an unnamed tributary located in the south section of the quarter mile AOR. This is marked on Figure 1 map as unnamed tributary.

No pertinent surface features, Mines (surface or subsurface), quarries are present in the quarter mile AOR.

Figure 2: Topographic map showing AOR with ¼ mile extension

This map shows all wells within the quarter mile red circle. All wells within the quarter mile extension of the area of review. The wells located inside the blue circle to the red circle are all producing wells operated by Sandstone Development LLC except for 1 producing well. These are owned by Open Flow Gas.

All surface land is owned by:

Landowners Information:
Collins Pine Company
95 Hardwood Drive
Kane, PA 16735

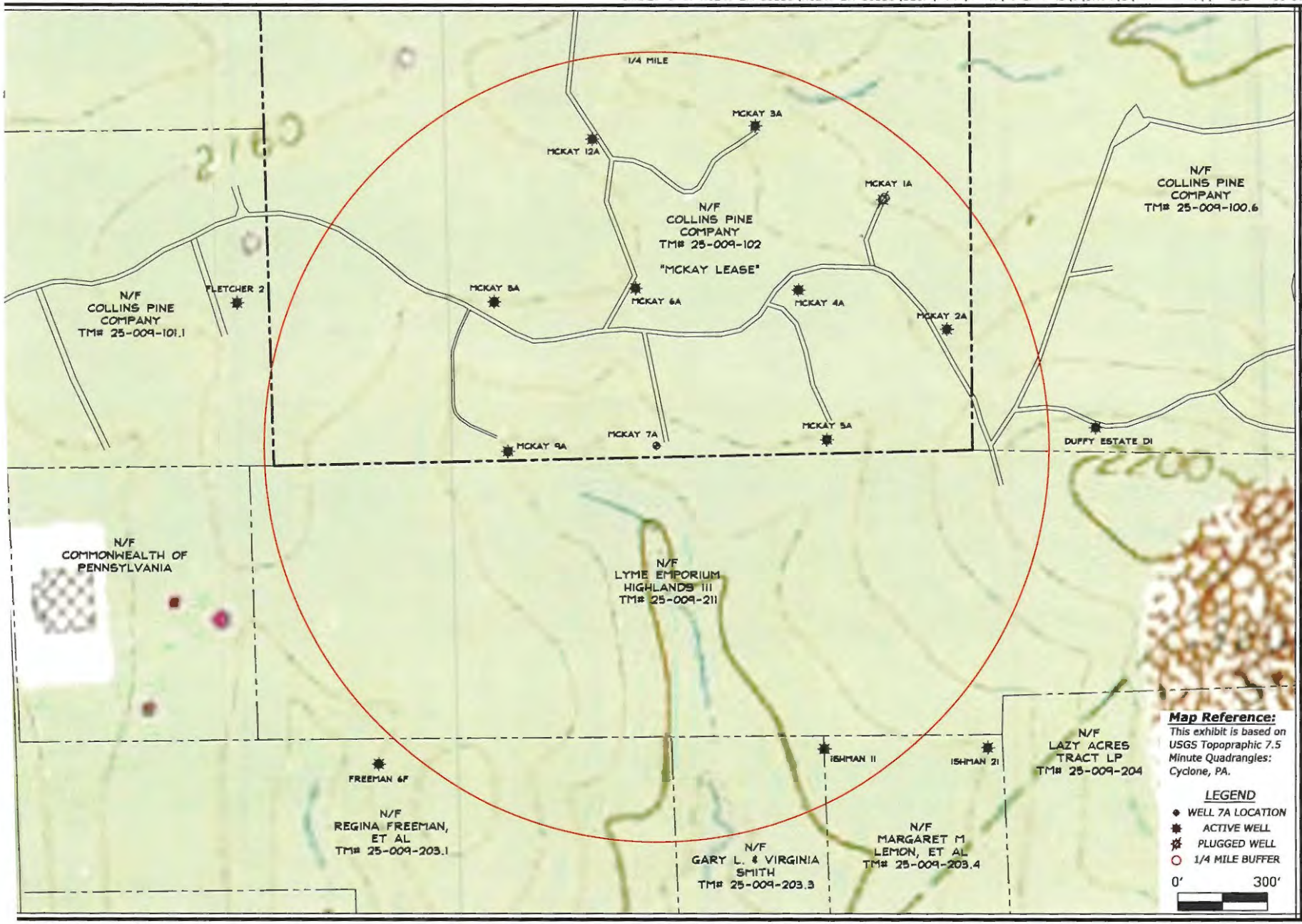
Lyme Hardwood
15970 Rte 120
Emporium, PA 15834

No pertinent surface features, Mines (surface or subsurface), quarries or water wells are present in the quarter mile extension of the AOR.

Figure 3: Topographic Map showing ¼ mile AOR with 1 mile extension

No outcrops of injection and confining formations present

No surface water intake, discharge structures, hazardous waste treatment storage or disposal facilities present.



REV	DATE	DESCRIPTION	APPD

ANDREW S. ROSENBERGER
REGISTERED LAND SURVEYOR
PENNSYLVANIA AND NEW YORK
LANG SURVEYING LLC
1059 LAFFERTY LANE
BRADFORD, PA. 16701
PHONE: (814) 368-4139
EMAIL: langsurveyhq@gmail.com
BOUNDARY, SUBDIVISION
TOPOGRAPHIC, OIL & GAS
WELL SURVEYS

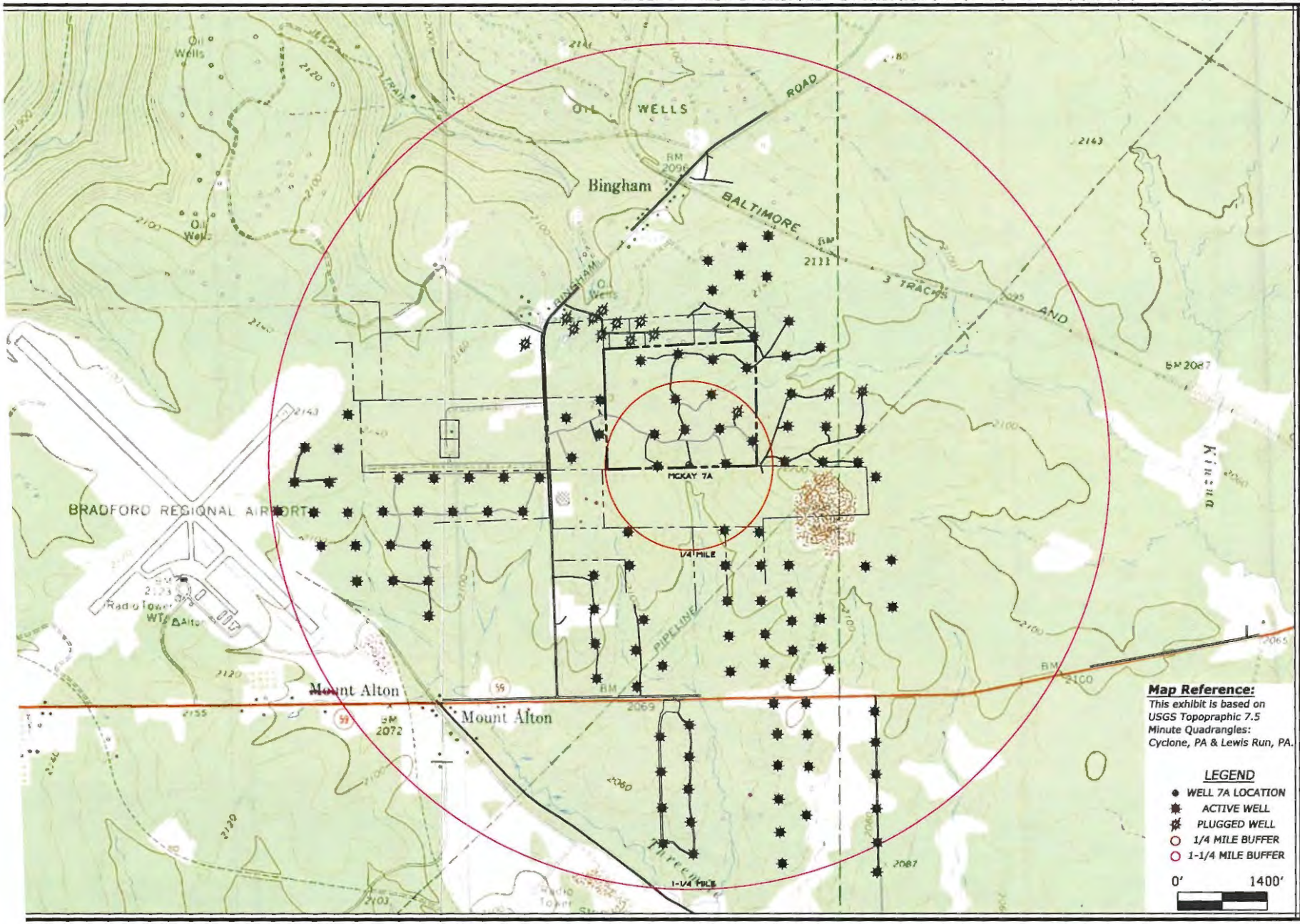
DRAWING TITLE:
FIGURE 1
1/4 MILE BUFFER LOCATION MAP
MCKAY WELL 7A

CLIENT:
SANDSTONE DEVELOPMENT, LLC
LAFAYETTE TOWNSHIP McKEAN COUNTY
PENNSYLVANIA

DRAWN BY: DLC	DATE: 8/7/23
CHKD. BY: ASR	DATE:
APPD. BY:	DATE:
SCALE:	1" = 300'
ISSUE DATE:	
PROJECT #:	05982
DRAWING NUMBER:	05982.1

FIGURE 1 TABLE

WELL NAME	API #	WELL #	DATE DRILLED	STATUS	CONDUCTOR	SURFACE CSG	CEMENT RETURN	TD
McKay 1A	37-083-48823	1A	2/10/03	Active	22.2'	550'	NO	1954'
McKay 2A	37-083-48824	2A	2/08/03	Active	22.3'	550'	YES	2504'
McKay 3A	37-083-48825	3A	2/19/03	Active	22.3'	573'	YES	1959'
McKay 4A	37-083-48826	4A	2/17/03	Active	22.0'	554'	YES	1961'
McKay 5A	37-083-48827	5A	2/13/03	Active	22.2'	563'	NO	1955'
McKay 6A	37-083-48828	6A	2/21/03	Active	22.2'	563'	NO	1961'
McKay 7A	37-083-48829	7A	2/14/03	Active	22.2'	550'	NO	2504'
McKay 8A	37-083-48830	8A	2/25/03	Active	22.2'	563'	NO	1961'
McKay 9A	37-083-48831	9A	2/22/03	Active	22.3'	563'	YES	1960'
McKay 12A	37-083-48884	12A	2/15/03	Active	22.1'	560'	NO	2504'
McKay Witco 1	37-083-44648	Witco 1	8/27/85	Plugged				2370'
Ishman 1I	37-083-50070	1I	5/23/05	Active	19'	518.4'	NO	1971'



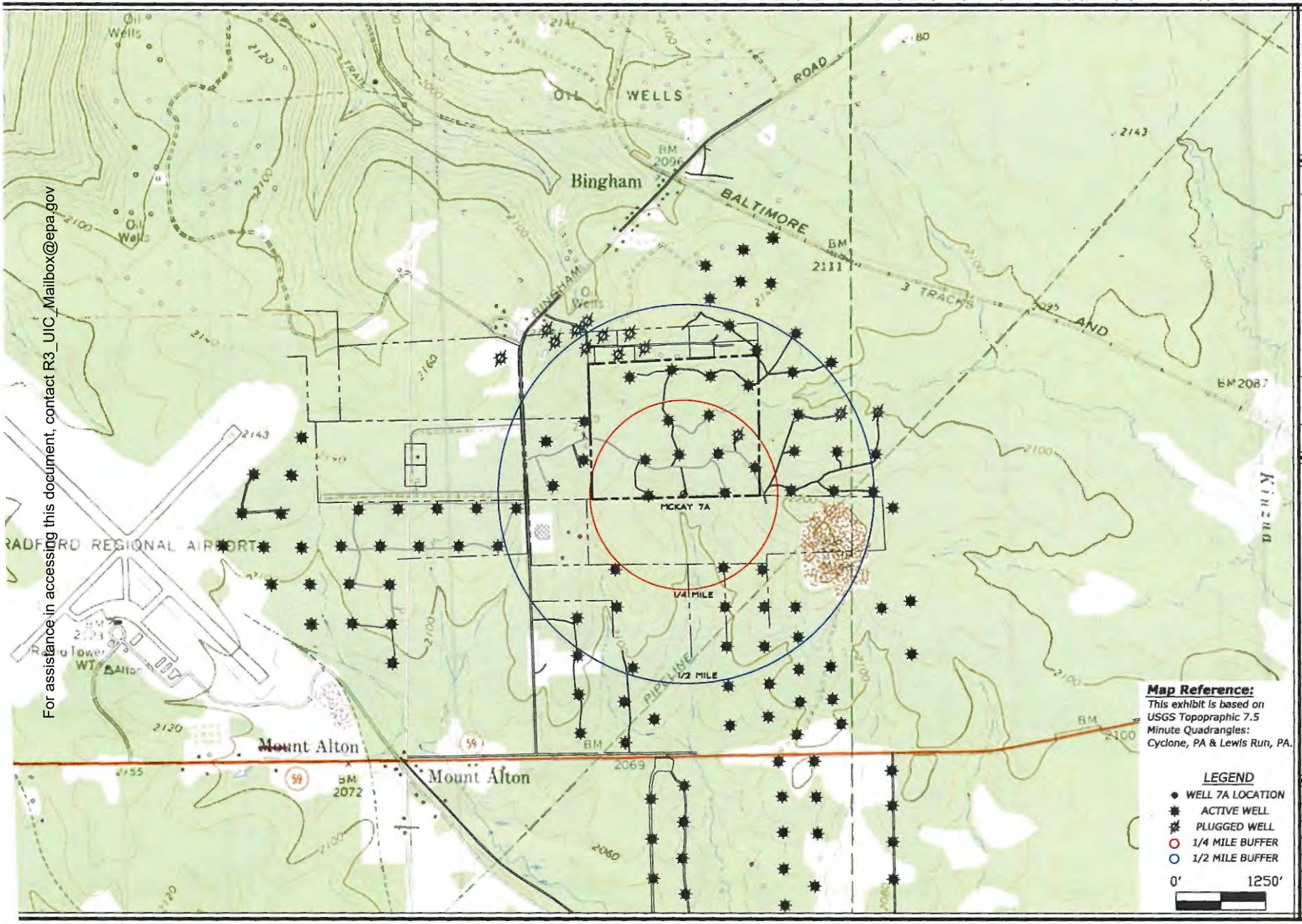
ANDREW S. ROSENBERGER
REGISTERED LAND SURVEYOR
PENNSYLVANIA AND NEW YORK
LANG SURVEYING LLC
1059 LAFFERTY LANE
BRADFORD, PA. 16701
PHONE: (814) 368-4139
EMAIL: longsurveyinglic@gmail.com
BOUNDARY, SUBDIVISION
TOPOGRAPHIC, OIL & GAS
WELL SURVEYS

REV | DATE | DESCRIPTION | APPD

DRAWING TITLE:
FIGURE 3
TOPOGRAPHIC LOCATION MAP
MCKAY WELL 7A

CLIENT:
SANDSTONE DEVELOPMENT, LLC
LAFAYETTE TOWNSHIP, McKEAN COUNTY
PENNSYLVANIA

DRAWN BY: DLC	DATE: 8/7/23
CHKD. BY: ASR	DATE:
APPD. BY:	DATE:
SCALE:	1" = 1400'
ISSUE DATE:	
PROJECT #:	05982
DRAWING NUMBER:	05982.3



REV	DATE	DESCRIPTION	APPD

ANDREW S. ROSENBERGER
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PENNSYLVANIA AND NEW YORK
LANG SURVEYING LLC
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BRADFORD, PA. 16701
PHONE: (814) 368-4139
EMAIL: longsurveyinglic@gmail.com
BOUNDARY, SUBDIVISION
TOPOGRAPHIC, OIL & GAS
WELL SURVEYS

DATE

DRAWING TITLE:
FIGURE 2
TOPOGRAPHIC LOCATION MAP
MCKAY WELL 7A

CLIENT:
SANDSTONE DEVELOPMENT, LLC
LAFFAYETTE TOWNSHIP - McKEAN COUNTY
PENNSYLVANIA

DRAWN BY: DLC	DATE: 8/7/23
CHKD. BY: ASR	DATE:
APPD. BY:	DATE:
SCALE:	1" = 1250'
ISSUE DATE:	
PROJECT #:	05982
DRAWING NUMBER:	05982.2

ATTACHEMENT B

Geological and Geophysical Information

Geological and Geophysical Information

Geological and geophysical information was obtained from each of the well drillers log, as well as cross reference by the well logs provided by PENNGOLD. Fresh water was encountered approximately 130-160ft from surface while drilling on air as noted in the drillers log. (Drillers and geophysical log copy attached)

The Bradford Third sand runs from approximately 2050-2100ft based on elevation differences. Net pay for the Bradford Third sand based on porosity and permeability is only approximately 30 feet. Kane sand runs from 2295-2315ft. The Bradford Third and Kane sand history has proved to be a prolific oil producing sand in some areas. In other areas, the Bradford Third and Kane sand has provided to be a source of high volume brine producing sand. The area of review for McKay 7A has a mixture of both, oil and brine.

Injectivity Test Data

The 30 day Injectivity test data results are attached.

Fracturing Report

McKay 7A completion schedule and results are attached.

Earthquake Hazard in Pennsylvania

A report conducted by the ***Commonwealth of Pennsylvania Department of Conservation and Natural Resources Bureau of Topographic and Geologic Survey***, "Earthquake Hazard in Pennsylvania documents known epicenters found in Pennsylvania (page 8 of the report). A red "x" denotes the location of the area of review. Per the report, there are no documents cases where the epicenter of an earthquake was traced back to McKean County, Pennsylvania. On page 7 within the report, the author states, "The great majority of earthquakes occur along boundaries between tectonic plates. The reason for this is not completely clear, but it appears that stress levels are higher along plate boundaries, and that strain energy builds up more rapidly in those areas. Eastern North America, including Pennsylvania, today is far from the nearest plate boundary—the Mid-Atlantic Ridge, some 2,000 miles to the East." See attached.

INJECTIVITY TEST MCKAY 7A

DATE	TIME	CSG	TBG	BBL/DAY FLOW RATE	TOTAL BBLS	COMMNENTS
9/27/2023	9:30	16	16	0	0	HOOK UP PUMP, PUMP 6 BBLS, TBG ON VAC, SET TURBINE METER
	15:30	16	7"	170	33	SI TBG
9/28/2023	7:30	16	75	0	33	BLEW TBG DOWN, NEED MORE CONNECTIONS
	9:45		20"	270		RECONNECT SUCTION, PUMP 6 BBLS, TBG ON VACUUM
	16:30	16	8"		93	SI TBG
9/29/2023	7:00	16	45			BLEW TBG DOWN, PUMP 6 BBLS, TBG ON VACUUM
	16:00	16	25"		193	SI TBG
10/1/2023	9:00	16	25"	286	193	TURN ON TBG
	12:00	16	25"	260	221	SI TBG
10/2/2023	8:30	16	23"	260	221	TURN ON TBG
	15:30	16	23"	260	296	SI TBG
10/3/2023	7:30	16	23"	264	296	TURN ON TBG
	16:00	16	23"	245	381	SI TBG
10/5/2023	10:30	16	23"	250	381	TURN ON TBG
	16:30	16	23"	245	445	SI TBG
10/6/2023	6:00	16	23"	285	445	TURN ON TBG
	13:30	16	23"	270	533	SI TBG
10/7/2023	10:30	16	23"	286	533	TURN ON TBG
	16:30	16	23"	270	602	SI TBG
10/8/2023	8:30	16	23"	270	602	TURN ON TBG
	14:30	16	23"	260	670	SI TBG
10/9/2023	7:30	16	23"	270	670	TURN ON TBG
	14:30	16	23"	280	755	SI TBG
10/10/2023	8:30	16	23"	260	755	TURN ON TBG
	15:30	16	23"	260	833	SI TBG
10/11/2023	6:00	16	23"	260	833	TURN ON TBG
	14:00	16	23"	250	918	SI TBG
10/12/2023	7:00	16	23"	250	918	TURN ON TBG
	14:00	16	23"	250	993	SI TBG
10/13/2023	10:00	16	23"	250	993	TURN ON TBG
	17:00	16	23"	250	1067	SI TBG
10/14/2023	6:00	16	23"	260	1067	TURN ON TBG
	13:00	16	23"	250	1145	SI TBG
10/15/2023	7:30	16	23"	250	1145	TURN ON TBG
	14:30	16	23"	250	1219	SI TBG
10/16/2023	6:00	16	23"	260	1219	TURN ON TBG
	14:00	16	23"	250	1304	SI TBG
10/17/2023	6:30	16	23"	250	1304	TURN ON TBG
	14:30	16	20"	240	1392	SI TBG
10/18/2023	6:30	16	25"	260	1392	TURN ON TBG
	14:30	16	15"	225	1479	SI TBG
10/19/2023	6:00	16	23"	260	1479	TURN ON TBG
	14:00	20	18"	210	1559	PACKER LEAKING BY, CALL DAVE R., SI TBG
10/20/2023	6:00	20"	23"	255	1559	TURN ON TBG
	14:00	44	10"	200	1638	OPEN TBG TO SALES LINE, SI TBG
10/21/2023	6:00	25"	25"	260	1638	TURN ON TBG
	13:00	20	25"	260	1712	SI TBG
10/22/2023	6:00	20"	25"	260	1712	TURN ON TBG
	12:45	22	25"	260	1782	SI TBG
10/23/2023	6:00	22"	25"	260	1782	TURN ON TBG
	14:00	24	22"	260	1867	SI TBG
10/24/2023	6:30	22"	25"	260	1867	TURN ON TBG
	14:00	25	15"	170	1944	SI TBG
10/25/2023	6:00	20"	25"	260	1944	TURN ON TBG
	12:30	22	5"	180	2012	SI TBG
10/26/2023	6:00	20"	25"	260	2012	TURN ON TBG
	13:00	28	7"	160	2085	SI TBG
10/27/2023	6:00	20"	25"	260	2085	TURN ON TBG
	18:00	32	10"	210	2182	SI TBG

Double J Resources, Inc — Well Completion Schedule & Results

Well Name:	McKay #1A		**API ID**	37-083-48823	
Casing Size:	7" O.D.		**Csg. Depth**	550 (ft.)	
Total Depth	1954 (ft.)		**Log Meas. From**	Top of 7" Collar	
Amt. Sand	940 (Sks.)	72.307692	**Max. Rate**	18 (BPM)	
Est Tbg. T.D.	1869.5 (ft.)		**Service Rig**	Keane	
Completion Date	06/11/2003				

SCHEDULE					RESULTS				
Stage Number	**Zone**	**Notch Depth (ft)**	**Adjusted Notch Depth (ft)**	**Sand (sks)**	**Break Down (PSI)**	**Avg. Rate (BPM)**	**Avg Pres. (PSI)**	**Total Water (gl)**	**ISIP (PSI)**
1	Bradford 1st	1478.5	**1478.7**	70	2400	19	1600	6200	1100
2	Watsonville	1545.0	**1545.2**	50	2100	18	1650	5200	1150
3	Kinzua-Clarendon	1570.5	**1570.7**	50	2300	18	1800	5200	1200
4	**Cherry Grove**	1644.0	**1644.5**	100	3450	16	1750	7800	1350
5	**Cherry Grove**	1650.0	**1650.5**	90	3600	16	1850	7300	1400
6	**Cherry Grove**	1654.0	**1654.5**	80	3600	16	1950	6800	1450
7	**Chipmunk/Tiona**	1697.0	**1697.5**	50	2400	16	2300	5400	1500
8	**Chipmunk/Tiona**	1704.5	**1705.0**	50	3600	16	2350	5400	1550
9	**Chipmunk/Tiona**	1711.0	**1711.5**	60	3750	16	2450	5900	1400
10	**Chipmunk/Tiona**	1716.5	**1717.0**	100	3800	16	2800	10,000	1400
11	**Chipmunk/Tiona**	1722.5	**1723.0**	80	3400	16	2800	7000	1550
12	**Chipmunk/Tiona**	1728.5	**1729.0**	100	3000	19	2600	7900	1550
13	**Bradford 2nd**	1809.5	**1810.2**	60	2400	16	2100	6000	1500

NOTE: Cherry Grove,Chip-Ti & B2 16 BPM MAX RATE

Well Name: McKay #1A **API ID** 37-083-48823

CURTIS WELL SERVICE
PO BOX 367
SUGAR GROVE, PA 16350

DATE 02-10-03
COMPANY DOUBLE J RESOURCES, INC.
WELL NO 1A
FARM MCKAY

ORDER NO. 4177
CUST. REP. KEANE DRILLING
TYPE OF SERVICE CEMENT CASING

CASING LENGTH 557' BBLS/FT .0415 = 23.1
BIG HOLE 555' BBLS/FT .0268 = 14.8
(.0195-8 INCH, .0247 - 8 5/8, .0268 8 3/4)
NO. OF SACKS 105 MIX WATER 13.0 SLURRY 22.0 SLURRY WT. 15.6
MIX WATER 5.2 X 105 SACKS ÷ 42 = WATER
SLURRY 105 SACKS X 1.18 ÷ 5.61 = SLURRY
CAL. 94 X 105 SACKS X % OF CAL = LBS (25%)
0.025

50% OVER 22.0 BBLS

REMARKS NO RETURN - WATER ONLY
0' = 23.1

BARRELS PER FT.	WEIGHT PER FT.	SIZE O.D IN.
0.0381	13	6 5/8
0.0366	17	*6.5/8
0.0355	20	6 5/8
0.0348	22	*6 5/8
0.0341	24	6 5/8
0.0333	26	*6 5/8
0.0326	28	6 5/8
0.0322	29	*6 5/8
0.0313	32	6 5/8
0.0415	17	7
0.0405	20	7
0.0398	22	7
0.0394	23	7
0.039	24	7
0.0383	26	7
0.0375	28	7
0.0371	29	7
0.0368	30	7
0.0361	32	7

SACKS	MIX	SLURRY 15.6	CALCIUM 2%	3%
30	3.7	6.3	56	85
35	4.3	7.3	65	99
40	4.9	8.4	75	113
45	5.6	9.5	85	127
50	6.2	10.5	94	141
55	6.8	11.6	103	155
60	7.4	12.6	113	169
65	8	13.7	122	183
70	8.7	14.7	132	197
75	9.3	15.8	141	212
80	9.9	16.8	150	226
85	10.5	17.9	160	240
90	11.1	18.9	169	254
95	11.8	20	179	268
100	12.4	21	188	282
105	**13**	**22**	**206**	**296**
110	13.6	23.1	207	310
115	14.2	24.2	216	324
120	14.9	25.2	226	338

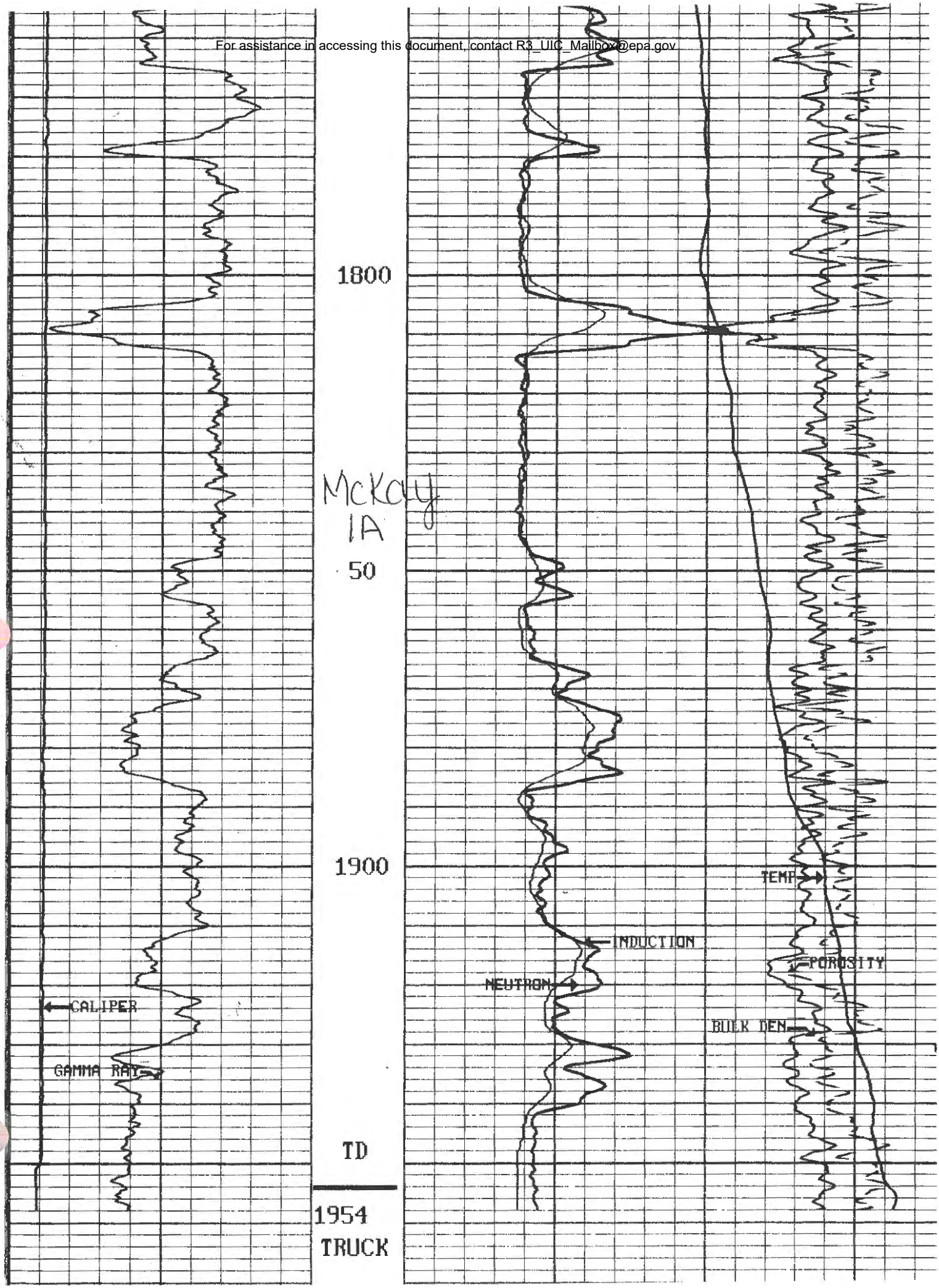
INJECTION TIME	RATE	BBLS IN	PRESSURE CSG.	TBG	REMARKS
2:10	3.0	12.0	50#		LOADED HOLE
2:13	3.0	3.0	50#		PUMPED GEL & MULTI-SEAL
2:31	3.0	22.0	50#		PUMPED CEMENT
2:39	3.0	23.1	225#		PUMPED PLUG & DISPLACEMENT

AVER. RATE 3.0 BPM
MAX. PRESSURE 225#
AVER. PRESSURE 100#
ENGINEER JACK HOLLABAUGH

PRODUCTS USED			
CEMENT	105 SACKS	MULTI-SEAL	40#
CALCIUM	300#	7" PLUG	1
GEL (BET)	100#	6 5/8" PLUG	

KEANE & SONS DRILLING CORP.
DRILLING REPORTS
FOR.DOUBLE J RESOURCES.....McKAY LEASE.....WELL #1A.....INVOICE #003079

FROM	TO	FORMATION	COMMENTS
0	105	BROWN SHALE	WATER @ 65'
105	495	SHALE	WATER @ 135'
495	645	RED ROCK	
645	675	RED ROCK/SHALE	
675	765	SHALE	
765	795	SHALE/RED ROCK	
795	1455	SHALE	
1455	1665	SAND/SHALE	
1665	1695	SHALE	
1695	1875	SAND/SHALE	
1875	1950	SHALE	



Double J Resources, Inc — Well Completion Schedule & Results

Well Name:	McKay #2A	**API ID**	37-083-48823
Casing Size:	7" O.D.	**Csg. Depth**	550 (ft.)
Total Depth	2504 (ft.)	**Log Meas. From**	Top of 7" Collar
Amt. Sand	800 (Sks.) 72.727273	**Max. Rate**	18 (BPM)
Est Tbg. T.D.	1907.0 (ft.)	**Service Rig**	Keane
Completion Date	03/18/2003		

SCHEDULE					RESULTS				
Stage Number	**Zone**	**Notch Depth (ft)**	**Adjusted Notch Depth (ft)**	**Sand (sks)**	**Break Down (PSI)**	**Avg. Rate (BPM)**	**Avg Pres. (PSI)**	**Total Water (gl)**	**ISIP (PSI)**
1	Bradford 1st	1513.5	**1514.9**	50	2400	19.5	2100	5355	1100
2	**Cherry Grove**	1683.5	**1684.6**	80	2800	16	2225	7679	1300
3	**Cherry Grove**	1687.5	**1688.6**	80	———	16	1875	6982	1350
4	**Cherry Grove**	1691.5	**1692.6**	50	———	———	———	———	———
5	Chipmunk/Tiona	1733.5	**1734.6**	80	2400	18.5	2000	7016	1400
6	Chipmunk/Tiona	1740.0	**1741.1**	50	2600	16	1900	5905	1400
7	Chipmunk/Tiona	1744.5	**1745.6**	50	3400	16	2075	5524	1500
8	Chipmunk/Tiona	1748.5	**1749.6**	80	1700	16	2400	7027	1500
9	Chipmunk/Tiona	1757.0	**1758.1**	80	2500	16	2400	7033	1500
10	Chipmunk/Tiona	1762.0	**1763.1**	100	2200	16	2300	8036	1500
11	Bradford 2nd	1847.0	**1848.1**	100	3000	18.7	2325	8099	1500

NOTE: Cherry Grove 16 BPM MAX RATE

Well Name: McKay #2A **API ID** 37-083-48823

CURTIS WELL SERVICE
PO BOX 367
SUGAR GROVE, PA 16350

DATE 02-08-03
COMPANY DOUBLE J RESOURCES, INC.
WELL NO 2A
FARM MCKAY

ORDER NO. 4176
CUST. REP. JIM MACFARLANE & KEVIN KEANE
TYPE OF SERVICE CEMENT CASING

CASING LENGTH 560' BBLS/FT .0415 = 23.2
BIG HOLE 560' BBLS/FT .0268 = 15.0
(.0195-8 INCH, .0247 - 8 5/8, .0268 8 3/4)
NO. OF SACKS 105 MIX WATER 13.0 SLURRY 22.0 SLURRY WT. 15.6
MIX WATER 5.2 X 105 SACKS ÷ 42 = WATER
SLURRY 105 SACKS X 1.18 ÷ 5.61 = SLURRY
CAL. 94 X 105 SACKS X % OF CAL = LBS (25%)
0.025

20% OVER 22.0 BBLS

REMARKS CEMENT TO SURFACE

BARRELS PER FT.	WEIGHT PER FT.	SIZE O.D IN.
0.0381	13	6 5/8
0.0366	17	*6.5/8
0.0355	20	6 5/8
0.0348	22	*6 5/8
0.0341	24	6 5/8
0.0333	26	*6 5/8
0.0326	28	6 5/8
0.0322	29	*6 5/8
0.0313	32	6 5/8
0.0415	17	7
0.0405	20	7
0.0398	22	7
0.0394	23	7
0.039	24	7
0.0383	26	7
0.0375	28	7
0.0371	29	7
0.0368	30	7
0.0361	32	7

SACKS	MIX	SLURRY 15.6	CALCIUM 2%	3%
30	3.7	6.3	56	85
35	4.3	7.3	65	99
40	4.9	8.4	75	113
45	5.6	9.5	85	127
50	6.2	10.5	94	141
55	6.8	11.6	103	155
60	7.4	12.6	113	169
65	8	13.7	122	183
70	8.7	14.7	132	197
75	9.3	15.8	141	212
80	9.9	16.8	150	226
85	10.5	17.9	160	240
90	11.1	18.9	169	254
95	11.8	20	179	268
100	12.4	21	188	282
105	**13**	**22**	**206**	**296**
110	13.6	23.1	207	310
115	14.2	24.2	216	324
120	14.9	25.2	226	338

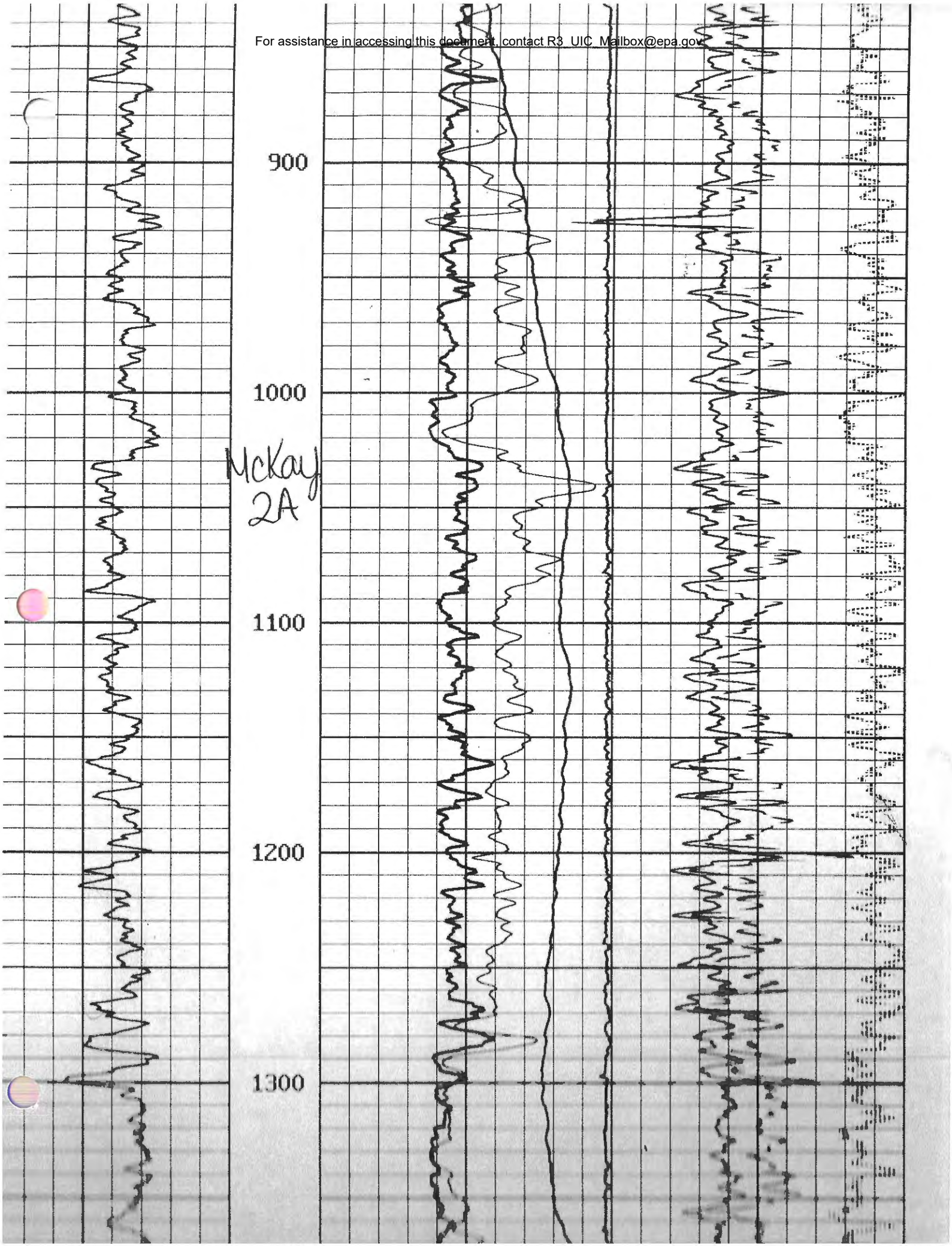
INJECTION TIME	RATE	BBLS IN	PRESSURE CSG.	TBG	REMARKS
11:00	3.0	10.0	50#		LOAD HOLE
11:03					MIX GEL & FLAKES
11:08	3.0	10.0	50#		PUMP GEL & FLAKES
11:11		22.0			MIX CEMENT & CALCIUM
11:26	3.0	22.0	100#		PUMP CEMENT & CALCIUM
11:33	3.0	23.1	200#		DISPLACE CEMENT & CALCIUM
11:40					LAND PLUG 300 LBS

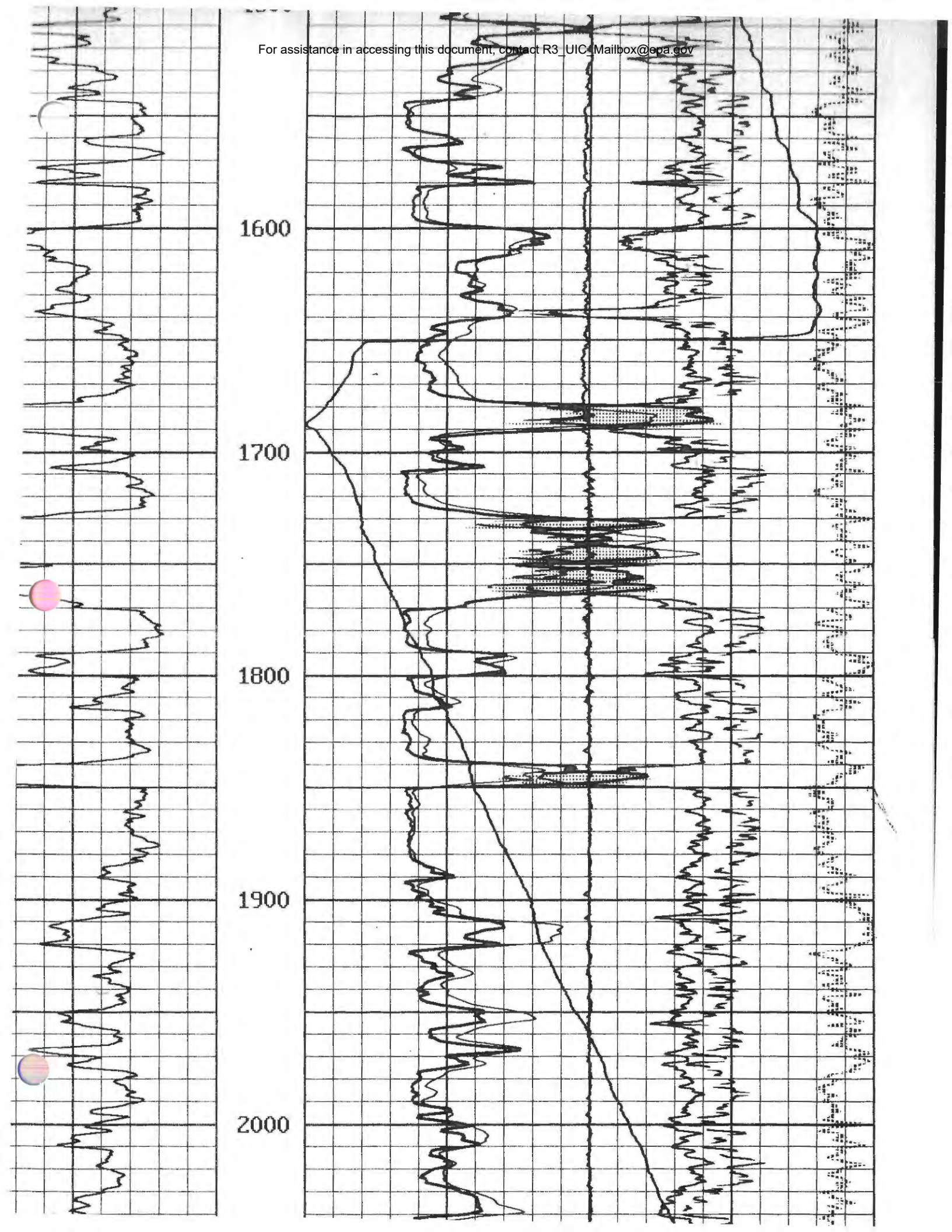
AVER. RATE 3.0 BPM
MAX. PRESSURE 200#
AVER. PRESSURE 175#
ENGINEER JAY CURTIS

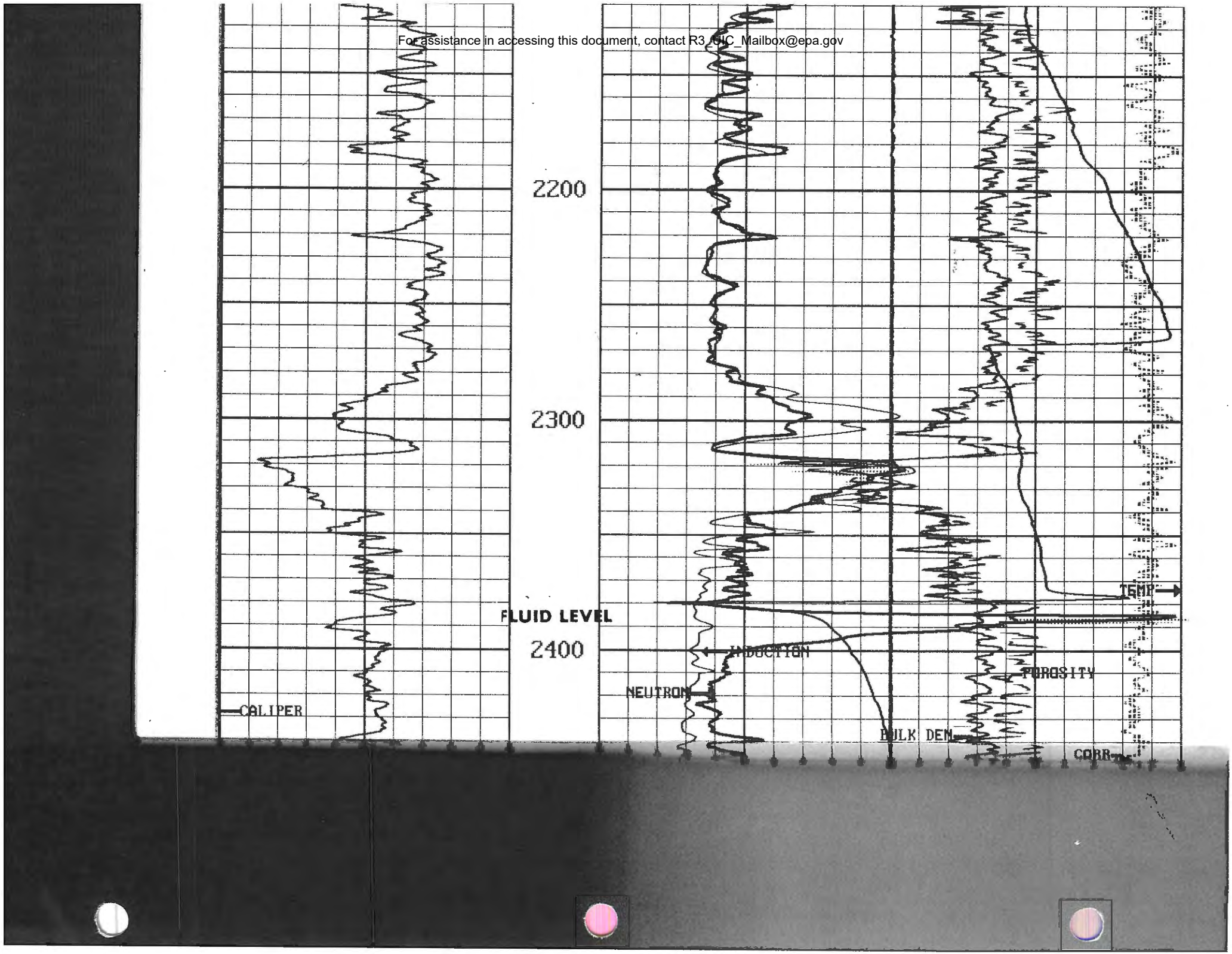
PRODUCTS USED			
CEMENT	105 SACKS	MULTI-SEAL	40#
CALCIUM	200#	7" PLUG	1
GEL (BET)	100#	6 5/8" PLUG	

KEANE & SONS DRILLING CORP.
DRILLING REPORTS
FOR.DOUBLE J RESOURCES.....McKAY LEASE.....WELL #2A.....INVOICE #003078

FROM	TO	FORMATION	COMMENTS
0	45	BROWN SHALE	
45	525	SHALE	WATER @ 90' 30GPM
525	675	RED ROCK	
675	705	RED ROCK/SHALE	
705	1485	SHALE	
1485	1905	SHALE/SAND	
1905	2085	SHALE	
2085	2115	SHALE/SAND	
2115	2295	SHALE	
2295	2355	SHALE/SAND	
2355	2500	SHALE	







JL **Double J Resources, Inc** — Well Completion Schedule & Results

Well Name:	McKay #3A		**API ID**	37-083-48825	
Casing Size:	7" O.D.		**Csg. Depth**	565 (ft.)	
Total Depth	1959 (ft.)		**Log Meas. From**	Top of 7" Collar	
Amt. Sand	930 (Sks.)	66.428571	**Max. Rate**	18 (BPM)	
Est Tbg. T.D.	1883.0 (ft.)		**Service Rig**	Keane	
Completion Date	05/20/2003				

SCHEDULE					RESULTS				
Stage Number	**Zone**	**Notch Depth (ft)**	**Adjusted Notch Depth (ft)**	**Sand (sks)**	**Break Down (PSI)**	**Avg. Rate (BPM)**	**Avg Pres. (PSI)**	**Total Water (gl)**	**ISIP (PSI)**
1	Bradford 1st	1489.0	**1486.2**	60	2500	19	1700	4600	1150
2	Watsonville	1551.0	**1547.9**	50	2350	19	1750	4000	1300
3	Kinzua	1580.0	**1576.9**	50	2700	19	1750	4200	1250
4	Kinzua	1588.0	**1584.9**	50	1800	19	1900	4000	1350
5	Cherry Grove	1657.5	**1654.1**	80	3000	16	2000	7000	1280
6	Cherry Grove	1661.5	**1658.1**	80	3450	16	2000	6500	1400
7	Cherry Grove	1665.5	**1662.1**	80	TREATED WITH #6			6500	1400
8	Chipmunk/Tiona	1707.5	**1703.9**	50	1800	16	2000	4000	1550
9	Chipmunk/Tiona	1713.5	**1709.9**	60	3300	16	2100	4500	1550
10	Chipmunk/Tiona	1723.0	**1719.4**	80	3300	16	2200	5600	1500
11	Chipmunk/Tiona	1731.5	**1727.9**	90	3200	16	2200	7000	1700
12	Chipmunk/Tiona	1735.5	**1731.9**	50	2200	16	2300	4000	1800
13	Bradford 2nd	1819.0	**1815.4**	100	2300	16	2100	7500	1600
14	Bradford 2nd	1823.0	**1819.4**	50	2000	16	2300	4000	1600

NOTE: Cherry Grove, Chip/Tiona & Brad 2d @ 16 BPM MAX RATE

Well Name: McKay #3A **API ID** 37-083-48825

KEANE & SONS DRILLING CC
DRILLING REPORTS
FOR.DOUBLE J RESOURCES.....McKAY LEASE.....WELL #3A.....INVOICE #003084

FROM	TO	FORMATION	COMMENTS
0	45	SANDSTONE/SHALE	
45	465	SHALE	
465	795	RED ROCK	
795	1155	SHALE	
1155	1215	PINK ROCK	
1215	1455	SHALE	
1455	1485	SHALE/SAND	
1485	1605	SAND	
1605	1635	SAND/SHALE	
1635	1665	SHALE	
1665	1785	SAND	
1785	1815	SAND/SHALE	
1815	1845	SAND	
1845	1875	SAND/SHALE	
1875	1950	SHALE	

KEANE & SONS DRILLING CORP.
DRILLING REPORT

DOUBLE J RESOURCES, INC.
JAMES J. MACFARLANE, PRESIDENT
1185 E. MAIN ST.
BRADFORD, PA 16701

INVOICE #003084

LEASE: McKAY LEASE WELL# 3A

DATE STARTED 2/17/03 FINISHED 2/19/03

22.3' CONDUCTOR 9 5/8"

573' SURFACE CASING

1950' TOTAL DEPTH OF DRILLING

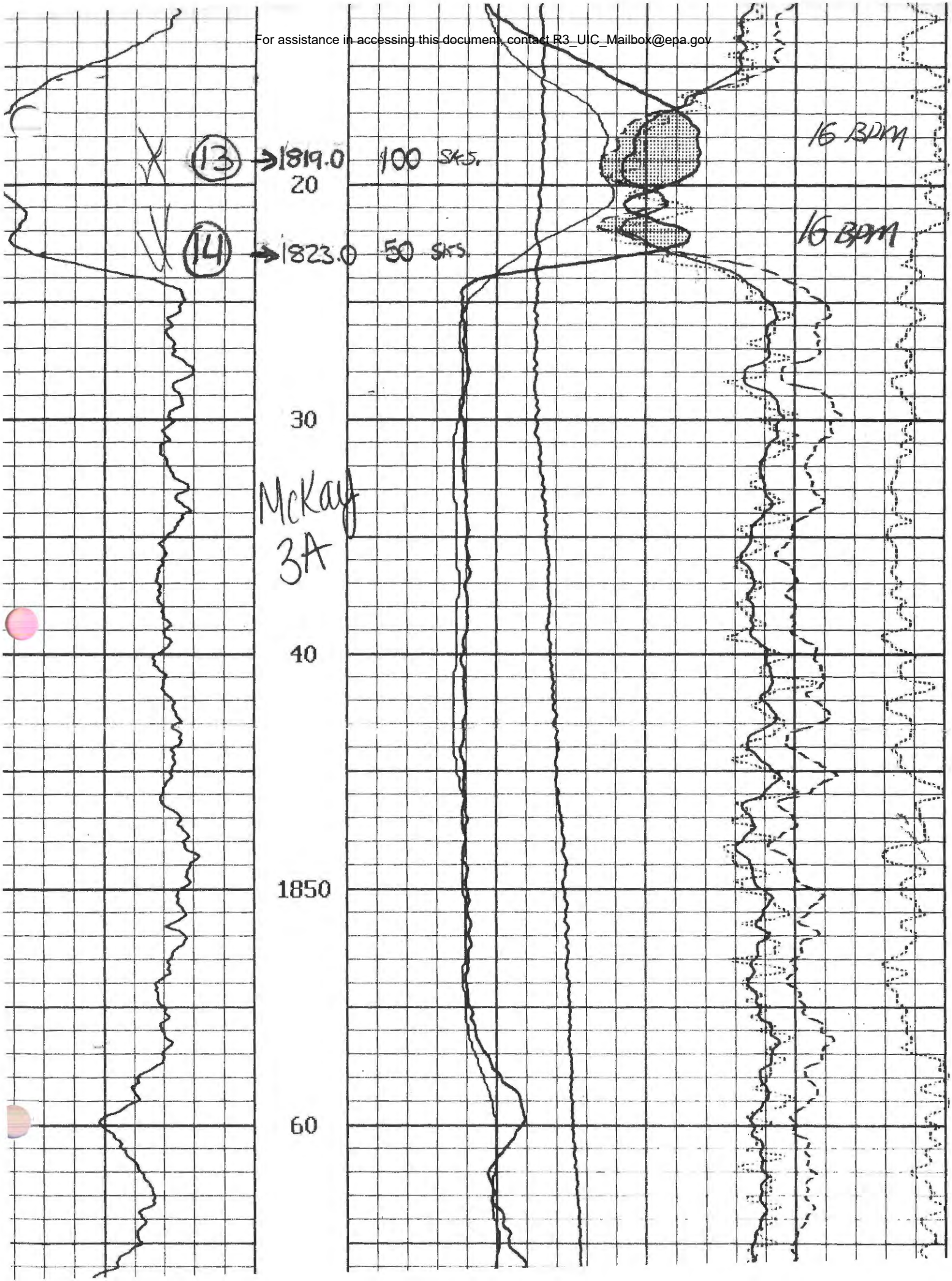
CEMENT REPORT

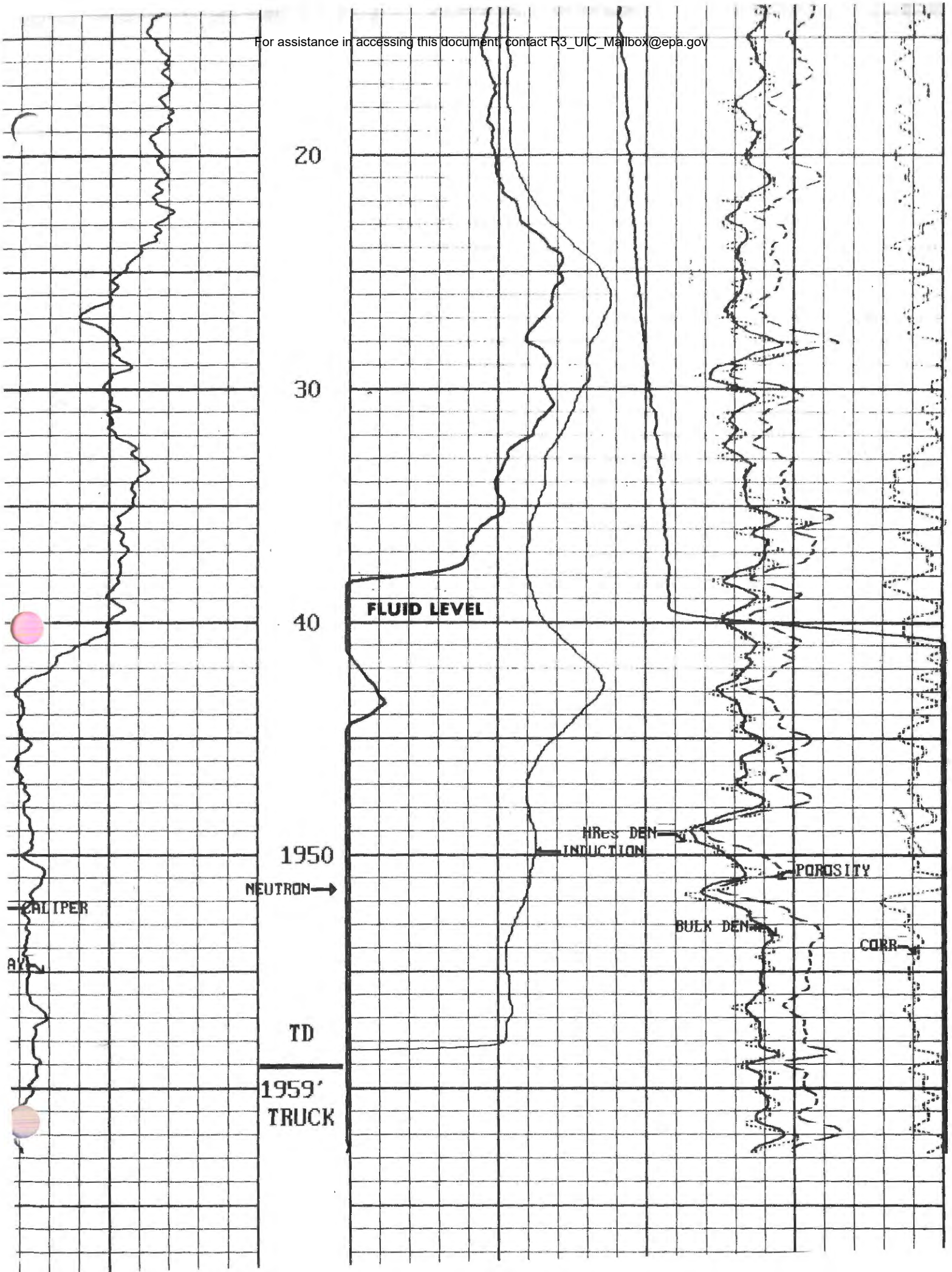
DATE: 2/17/03
OWNER: Double J
WELL NUMBER: 3A

LEASE:
COUNTY:

STAGE I	Preflush	MATERIAL:	Water
		VOLUME:	20 BBL
		RATE:	2.8 BPM
		PRESSURE:	0 PSI
		CIRCULATION:	yes
STAGE II	Condition Hole	MATERIAL:	Gelwater w/ 80 lbs. LCM
		VOLUME:	10 BBL
		RATE:	2.8 BPM
		PRESSURE:	0 PSI
		CIRCULATION:	yes
STAGE III	Cement	MATERIAL:	Portland Type 1 110 sacks 3% CaCl
		VOLUME:	130 CU. FT.
		RATE:	2.8 BPM
		PRESSURE:	0 PSI
		CIRCULATION:	yes
STAGE IV	Displace	MATERIAL:	Water
		VOLUME:	23.7 BBL
		RATE:	2.8 BPM
		PRESSURE:	225 PSI
		CIRCULATION:	yes
STAGE V		MATERIAL:	
		VOLUME:	
		RATE:	
		PRESSURE:	
		CIRCULATION:	

REMARKS: Good cement circulation.





Double J Resources, Inc — Well Completion Schedule & Results

Well Name:	McKay #4A	**API ID**	37-083-48826
Casing Size:	7" O.D.	**Csg. Depth**	556 (ft.)
Total Depth	1961 (ft.)	**Log Meas. From**	Top of 7" Collar
Amt. Sand	1080 (Sks.) 90	**Max. Rate**	18 (BPM)
Est Tbg. T.D.	1907.0 (ft.)	**Service Rig**	Keane
Completion Date	06/05/2003		

SCHEDULE					RESULTS				
Stage Number	**Zone**	**Notch Depth (ft)**	**Adjusted Notch Depth (ft)**	**Sand (sks)**	**Break Down (PSI)**	**Avg. Rate (BPM)**	**Avg Pres. (PSI)**	**Total Water (gl)**	**ISIP (PSI)**
1	Bradford 1st	1512.0	**1509.2**	60	2400	18.9	1700	4600	1100
2	Watsonvile	1575.0	**1572.2**	70	2000	19	1800	5200	1250
3	Watsonvile	1580.5	**1577.7**	50	1700	16	1800	4200	1300
4	Dew Drop	1604.5	**1601.7**	60	2100	15.7	1800	4500	1300
5	**Cherry Grove**	1682.5	**1679.3**	200	3400	16.5	1700	12,500	1300
6	**Cherry Grove**	1687.5	**1684.3**	100	2900	16	2100	7500	1400
7	**Chipmunk/Tiona**	1733.0	**1729.8**	80	2600	16	2000	5500	1350
8	**Chipmunk/Tiona**	1740.5	**1737.3**	100	3400	16.2	2100	6600	1400
9	**Chipmunk/Tiona**	1751.0	**1747.8**	100	3400	16.2	2350	8000	1400
10	**Chipmunk/Tiona**	1759.0	**1755.8**	100	2100	15.7	2000	6500	1550
11	**Chipmunk/Tiona**	1763.0	**1759.8**	80	2000	15.9	2000	6000	1660
12	**Bradford 2nd**	1847.0	**1843.6**	80	3600	16.6	2200	6300	1650

NOTE: Cherry Grove, Chip/Ti & Brad 2nd 16 BPM MAX RATE

Well Name: McKay #4A **API ID** 37-083-48826

KEANE & SONS DRILLING COR.
DRILLING REPORTS
FOR.DOUBLE J RESOURCES.....McKAY LEASE.....WELL #4A.....INVOICE #003082

FROM	TO	FORMATION	COMMENTS
0	45	BROWN SHALE	
45	525	SHALE	
525	765	RED ROCK	
765	1485	SHALE	
1485	1515	SAND/SHALE	
1515	1575	SAND	
1575	1725	SAND/SHALE	
1725	1755	SAND	
1755	1785	SAND/SHALE	
1785	1875	SAND	
1875	1905	SAND/SHALE	
1905	1950	SHALE	

DUTCH HILL SERVICE
PO BOX 367
SUGAR GROVE, PA 16350

DATE 02-14-03
COMPANY DOUBLE J RESOURCES
WELL NO 4A
FARM MCKAY

ORDER NO. 4180
CUST. REP. KEANE DRILLING (RON)
TYPE OF SERVICE CEMENT CASING

CASING LENGTH 554' BBLS/FT .0415 = 22.9
BIG HOLE 559' BBLS/FT .0268 = 14.9
(.0196-8 INCH, .0247 - 8 5/8, .0268 8 3/4)
NO. OF SACKS 105 MIX WATER 13.0 SLURRY 22.0 SLURRY WT. 15.6
MIX WATER 5.2 X 105 SACKS + 42 = WATER
SLURRY 105 SACKS X 1.18 + 5.61 = SLURRY
CAL. 94 X 105 SACKS X % OF CAL = LBS (25%)
0.025

50% OVER 22.2 BBLS

REMARKS CEMENT RETURNED TO SURFACE
-0' = 22.9

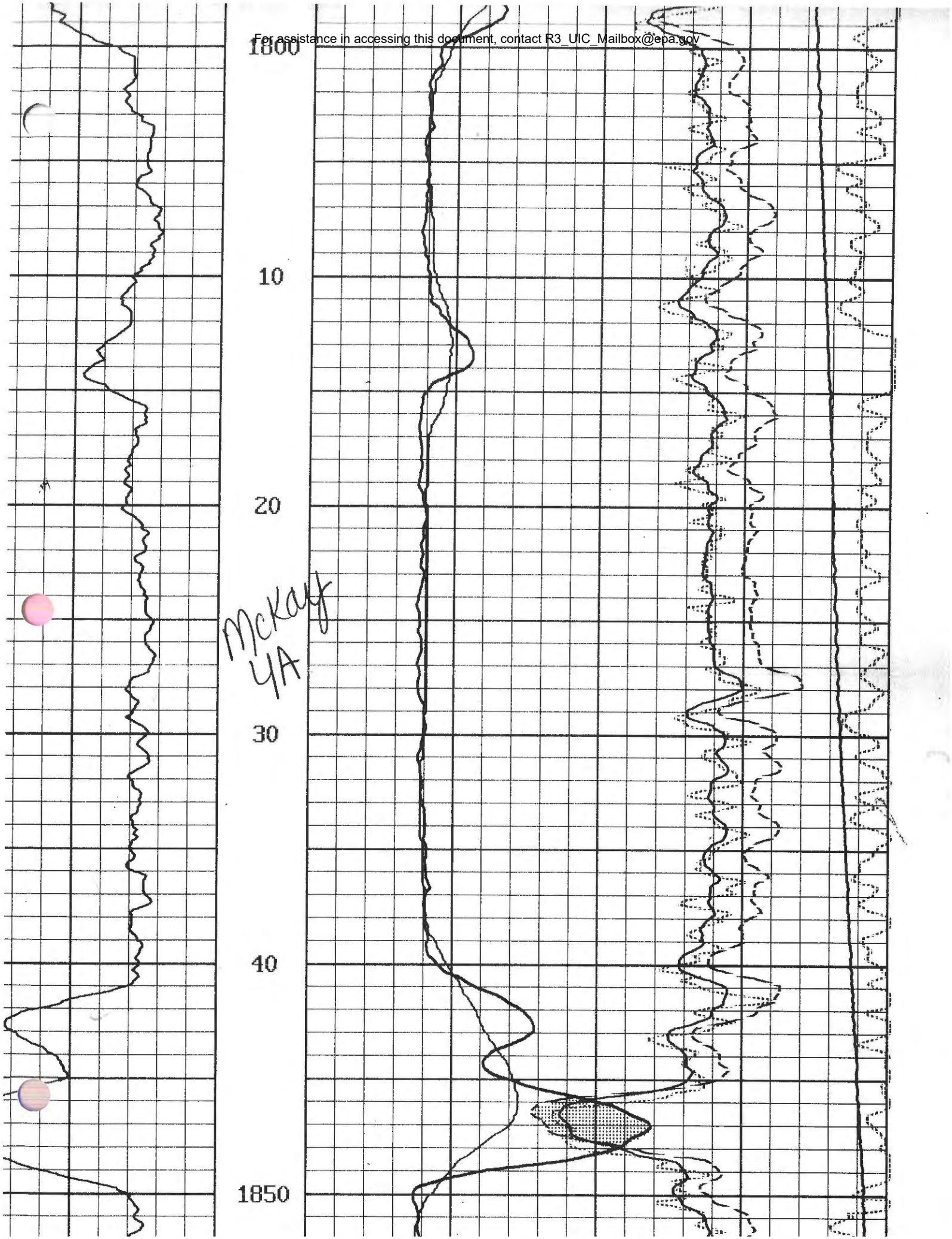
BARRELS PER FT.	WEIGHT PER FT.	SIZE O.D IN.
0.0381	13	6 5/8
0.0366	17	*6.5/8
0.0355	20	6 5/8
0.0348	22	*6 5/8
0.0341	24	6 5/8
0.0333	26	*6 5/8
0.0326	28	6 5/8
0.0322	29	*6 5/8
0.0313	32	6 5/8
0.0415	17	7
0.0405	20	7
0.0398	22	7
0.0394	23	7
0.039	24	7
0.0383	26	7
0.0375	28	7
0.0371	29	7
0.0368	30	7
0.0361	32	7

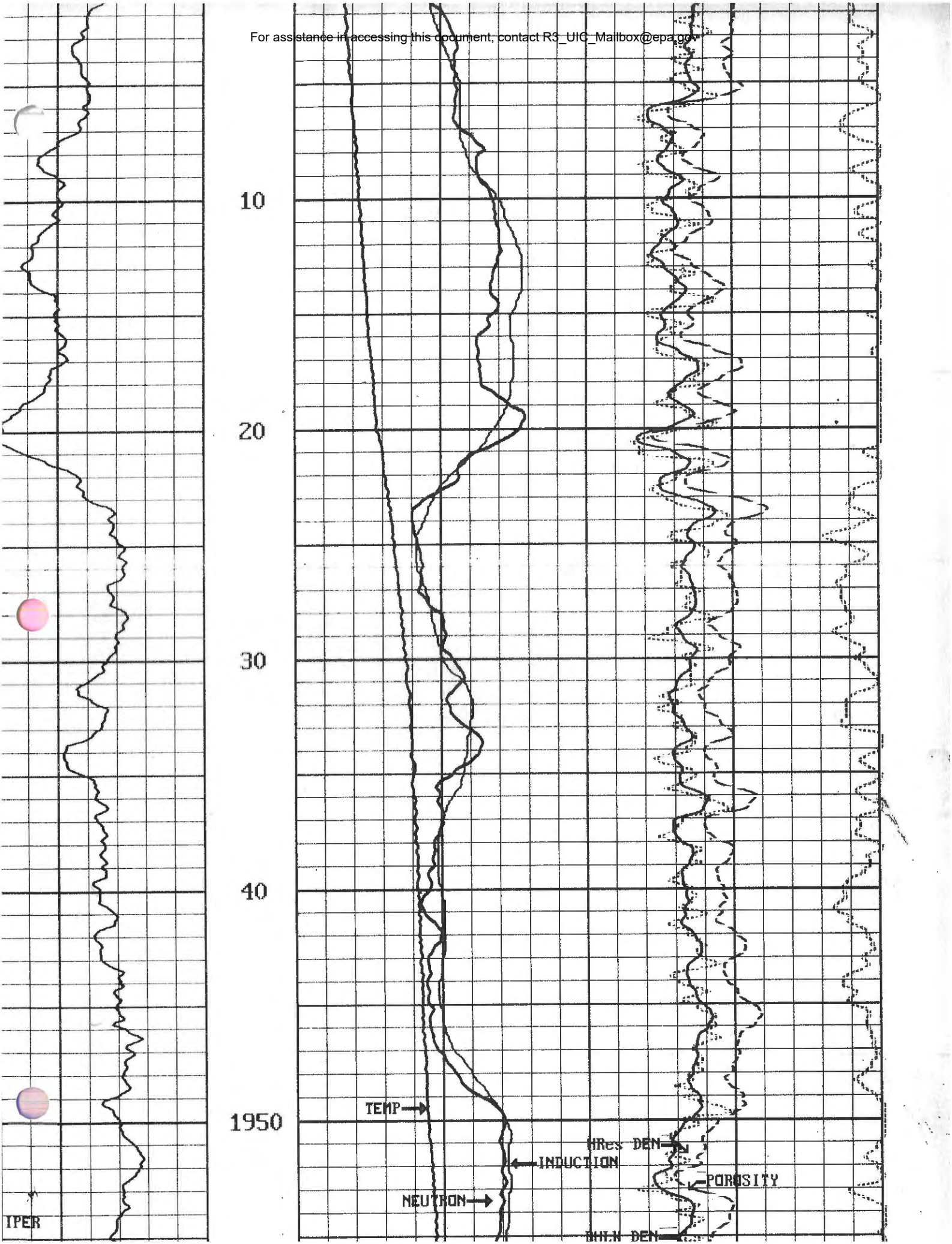
SACKS	MIX	SLURRY 15.6	CALCIUM 2%	3%
30	3.7	6.3	56	85
35	4.3	7.3	65	99
40	4.9	8.4	75	113
45	5.6	9.5	85	127
50	6.2	10.5	94	141
55	6.8	11.6	103	155
60	7.4	12.6	113	169
65	8	13.7	122	183
70	8.7	14.7	132	197
75	9.3	15.8	141	212
80	9.9	16.8	150	226
85	10.5	17.9	160	240
90	11.1	18.9	169	254
95	11.8	20	179	268
100	12.4	21	188	282
105	**13**	**22**	**206**	**296**
110	13.6	23.1	207	310
115	14.2	24.2	216	324
120	14.9	25.2	226	338

INJECTION TIME	RATE	BBLS IN	PRESSURE CSG.	TBG	REMARKS
4:57	4.0	16.0	50#		LOADED HOLE
5:05	4.0	3.0	50#		PUMPED GEL & MULTI-SEAL
5:27	4.0	22.0	50#		PUMPED CEMENT
5:34	3.0	23.2	250#		PUMPED PLUG & DISPLACEMENT

AVER. RATE 3.5 BPM
MAX. PRESSURE 250#
AVER. PRESSURE 100#
ENGINEER JACK HOLLABAUGH

PRODUCTS USED			
CEMENT	105 SACKS	MULTI-SEAL	40#
CALCIUM	300#	7" PLUG	1
GEL (BET)	100#	6 5/8" PLUG	





Double J Resources, Inc — Well Completion Schedule & Results

Well Name:	McKay #5A	**API ID**	37-083-48827
Casing Size:	7" O.D.	**Csg. Depth**	563 (ft.)
Total Depth	1955 (ft.)	**Log Meas. From**	Top of 7" Collar
Amt. Sand	630 (Sks.)	70 **Max. Rate**	18 (BPM)
Est Tbg. T.D.	1904.5 (ft.)	**Service Rig**	Keane
Completion Date	06/03/2003		

SCHEDULE					RESULTS				
Stage Number	**Zone**	**Notch Depth (ft)**	**Adjusted Notch Depth (ft)**	**Sand (sks)**	**Break Down (PSI)**	**Avg. Rate (BPM)**	**Avg Pres. (PSI)**	**Total Water (gl)**	**ISIP (PSI)**
1	Bradford 1st	1515.5	**1515.7**	70	2400	18.8	1650	5200	1150
2	Kinzua	1607.5	**1607.7**	50	2400	18.8	1800	4100	1250
3	Kinzua	1611.5	**1611.7**	50	2400	18.6	1800	4100	1300
4	**Chipmunk/Tiona**	1734.5	**1734.9**	100	2900	16	1800	6600	1400
5	**Chipmunk/Tiona**	1741.5	**1741.9**	50	1700	16	1900	4100	1400
6	**Chipmunk/Tiona**	1749.0	**1749.4**	100	2800	16	1900	6600	1400
7	**Chipmunk/Tiona**	1753.0	**1753.4**	80	3000	16	1900	5800	1450
8	**Chipmunk/Tiona**	1758.0	**1758.4**	50	WOULD NOT BREAK				
9	**Bradford 2nd**	1844.5	**1845.3**	80	2700	16	2300	5800	1600

NOTE: @ 16 BPM MAX RATE

Well Name: McKay #5A **API ID** 37-083-48827

KEANE & SONS DRILLING CO.
DRILLING REPORTS
FOR.DOUBLE J RESOURCES.....McKAY LEASE.....WELL #5A.....INVOICE #003083

FROM	TO	FORMATION	COMMENTS
0	45	BROWN SHALE	
45	525	SHALE	WATER @ 100'
525	825	RED ROCK	
825	1485	SHALE	
1485	1515	SAND/SHALE	
1515	1845	SAND	
1845	1875	SAND/SHALE	
1875	1950	SHALE	

CURTIS WELL SERVICE
P.O. BOX 307
SUGAR GROVE, PA 16350

DATE 02-12-03
COMPANY DOUBLE J RESOURCES, INC.
WELL NO 5A
FARM MCKAY

ORDER NO. 4178
CUST. REP. KEANE DRILLING (RON)
TYPE OF SERVICE CEMENT CASING

CASING LENGTH 561' BBLS/FT .0415 = 23.2
BIG HOLE 570' BBLS/FT .0268 = 15.2
(.0195-8 INCH, .0247 - 8 5/8, .0268 8 3/4)
NO. OF SACKS 105 MIX WATER 13.0 SLURRY 22.0 SLURRY WT. 15.6
MIX WATER 5.2 X 105 SACKS + 42 = WATER
SLURRY 105 SACKS X 1.18 + 5.61 = SLURRY
CAL. 94 X 105 SACKS X % OF CAL = LBS (25%)
0.025

20% OVER 22.5 BBLS

REMARKS NO RETURN
-0' = 23.2

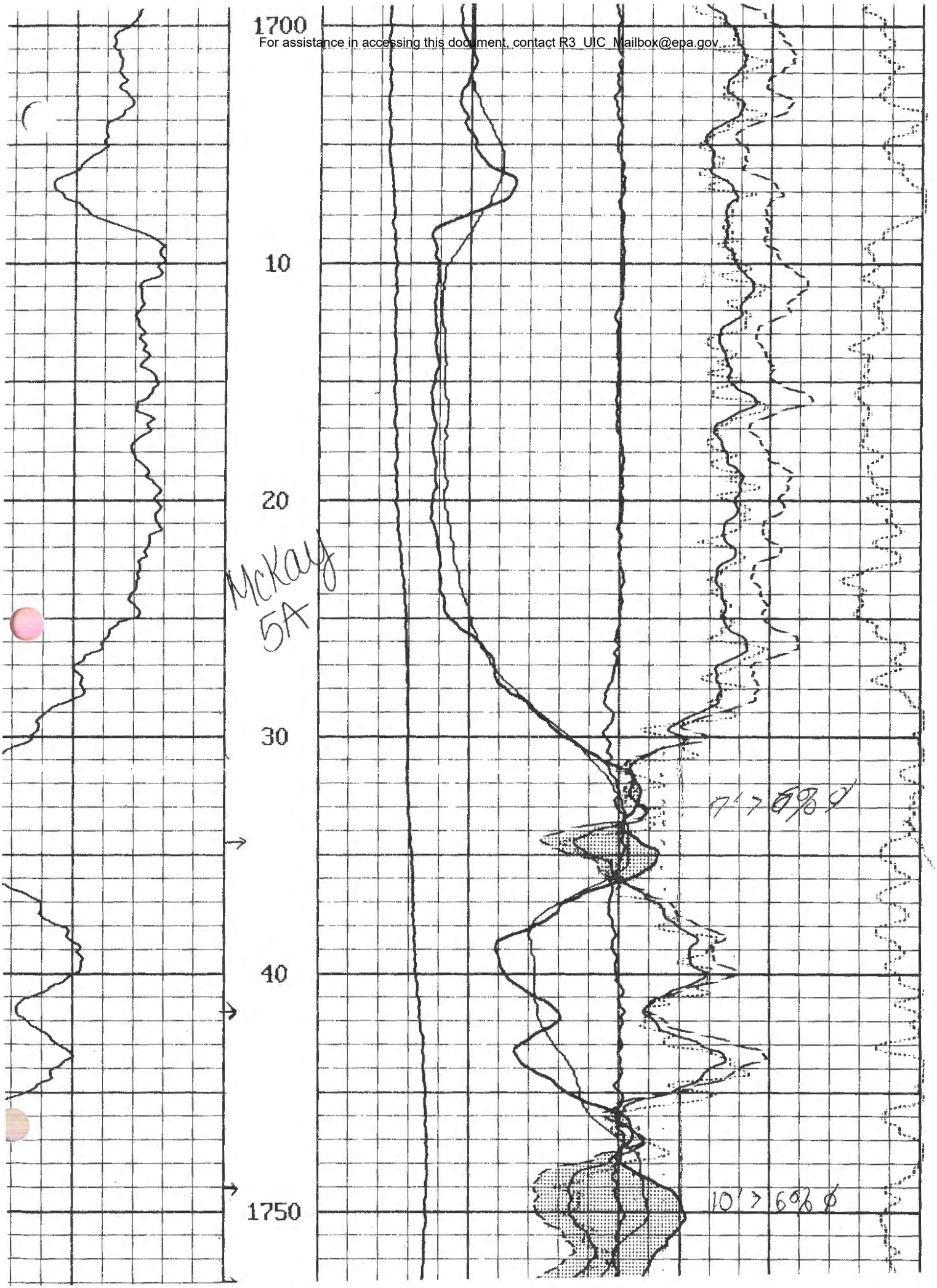
BARRELS PER FT.	WEIGHT PER FT.	SIZE O.D IN.
0.0381	13	6 5/8
0.0366	17	*6.5/8
0.0355	20	6 5/8
0.0348	22	*6 5/8
0.0341	24	6 5/8
0.0333	26	*6 5/8
0.0326	28	6 5/8
0.0322	29	*6 5/8
0.0313	32	6 5/8
0.0415	17	7
0.0405	20	7
0.0398	22	7
0.0394	23	7
0.039	24	7
0.0383	26	7
0.0375	28	7
0.0371	29	7
0.0368	30	7
0.0361	32	7

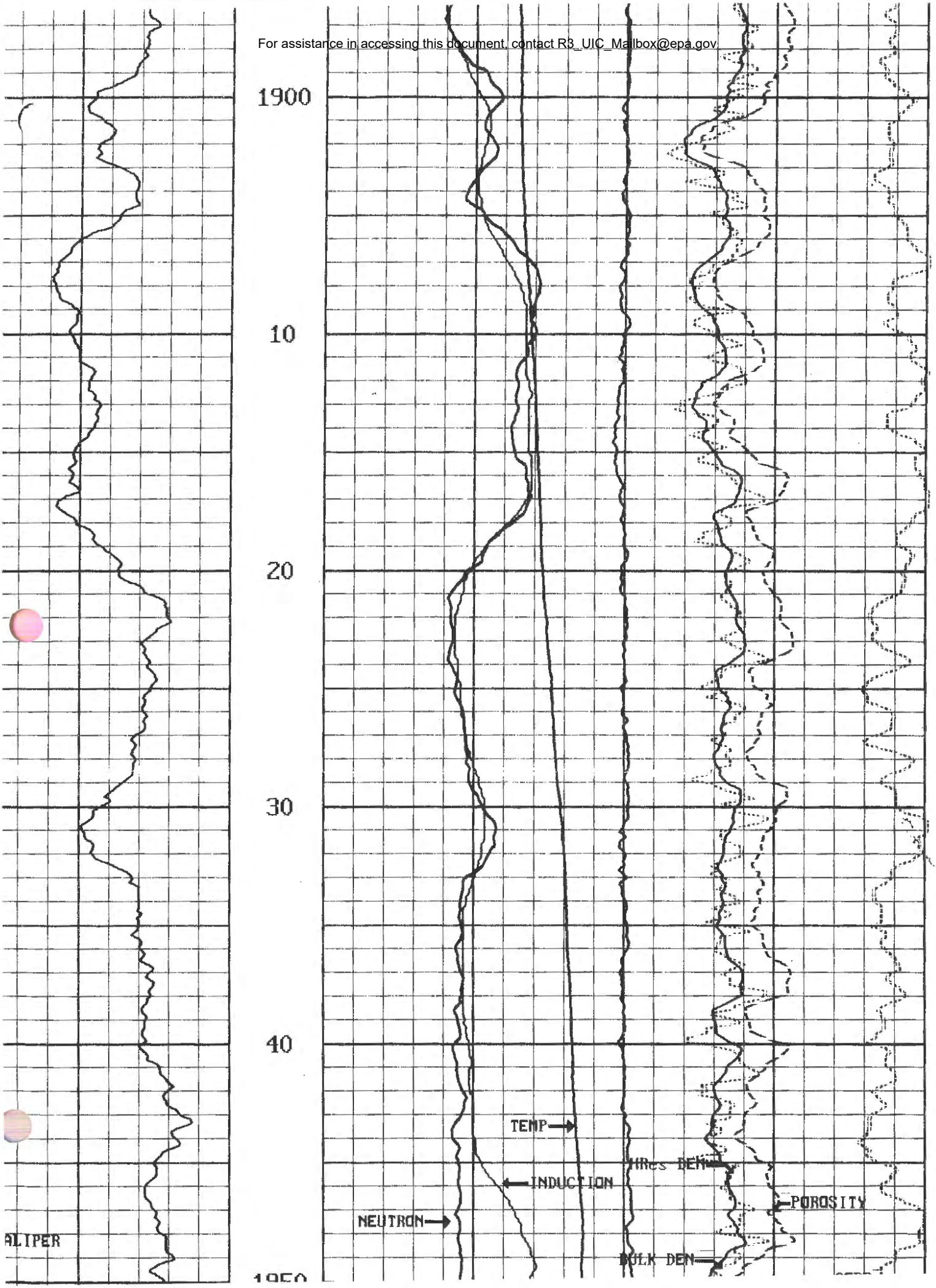
SACKS	MIX	SLURRY 15.6	CALCIUM 2%	3%
30	3.7	6.3	56	85
35	4.3	7.3	65	99
40	4.9	8.4	75	113
45	5.6	9.5	85	127
50	6.2	10.5	94	141
55	6.8	11.6	103	155
60	7.4	12.6	113	169
65	8	13.7	122	183
70	8.7	14.7	132	197
75	9.3	15.8	141	212
80	9.9	16.8	150	226
85	10.5	17.9	160	240
90	11.1	18.9	169	254
95	11.8	20	179	268
100	12.4	21	188	282
105	**13**	**22**	**206**	**296**
110	13.6	23.1	207	310
115	14.2	24.2	216	324
120	14.9	25.2	226	338

INJECTION TIME	RATE	BBLS IN	PRESSURE CSG.	TBG	REMARKS
3:00	4.0	12.0	50#		LOADED HOLE
3:04	4.0	3.0	50#		PUMPED GEL & MULTI-SEAL
3:21	4.0	22.0	50#		PUMPED CEMENT
3:30	3.0	23.2	200#		PUMPED PLUG & DISPLACEMENT

AVER. RATE 3.5 BPM
MAX. PRESSURE 200#
AVER. PRESSURE 100#
ENGINEER JACK HOLLABAUGH

PRODUCTS USED			
CEMENT	105 SACKS	MULTI-SEAL	40#
CALCIUM	300#	7" PLUG	1
GEL (BET)	100#	6 5/8" PLUG	





Double J Resources, Inc — Well Completion Schedule & Results

Well Name:	McKay #6A		**API ID**	37-083-48828	
Casing Size:	7" O.D.		**Csg. Depth**	566 (ft.)	
Total Depth	1961 (ft.)		**Log Meas. From**	Top of 7" Collar	
Amt. Sand	620 (Sks.)	68.888889	**Max. Rate**	18 (BPM)	
Est Tbg. T.D.	1909.0 (ft.)		**Service Rig**	Keane	
Completion Date	05/27/2003				

SCHEDULE					RESULTS				
Stage Number	**Zone**	**Notch Depth (ft)**	**Adjusted Notch Depth (ft)**	**Sand (sks)**	**Break Down (PSI)**	**Avg. Rate (BPM)**	**Avg Pres. (PSI)**	**Total Water (gl)**	**ISIP (PSI)**
1	Bradford 1st	1519.0	**1515.3**	50	2500	18	1700	4100	1100
2	Watsonville	1584.0	**1580.3**	80	2200	19	1800	5200	1300
3	Kinzua	1615.0	**1611.3**	50	2700	19	2000	4100	1300
4	**Cherry Grove**	1693.0	**1689.3**	100	3300	16	1700	5800	1300
5	**Chipmunk/Tiona**	1736.5	**1732.8**	50	2700	16	2000	4100	1350
6	**Chipmunk/Tiona**	1740.5	**1736.8**	50	2000	16	1900	4100	1400
7	**Chipmunk/Tiona**	1752.5	**1748.8**	100	3100	16	1700	6500	1400
8	**Chipmunk/Tiona**	1759.5	**1755.8**	50	2700	16	2000	4200	1350
9	**Bradford 2nd**	1849.0	**1845.3**	90	3800	16	1900	7000	1550

NOTE: Cherry Grove, Chip/Tiona & Brad 2d @ 16 BPM MAX RATE

Well Name: McKay #6A **API ID** 37-083-48828

KEANE & SONS DRILLING CO.
DRILLING REPORTS
FOR.DOUBLE J RESOURCES.....McKAY LEASE.....WELL #6A.....INVOICE #003105

FROM	TO	FORMATION	COMMENTS
0	45	BROWN SHALE	
45	525	SHALE	WATER @70' 40GPM
525	825	RED ROCK	
825	1185	SHALE	
1185	1215	SHALE/PINK ROCK	
1215	1545	SHALE	
1545	1575	SHALE/SAND	
1575	1845	SAND	
1845	1875	SAND/SHALE	
1875	1950	SHALE	

KEANE & SONS DRILLING CORP.
DRILLING REPORT

DOUBLE J RESOURCES, INC.
JAMES J. MACFARLANE, PRESIDENT
1185 E. MAIN ST.
BRADFORD, PA 16701

INVOICE #003105

LEASE: MC KAY LEASE WELL# 6A

DATE STARTED 2/19/03 FINISHED 2/21/03

22.2' CONDUCTOR 9 5/8"

563' SURFACE CASING

1950' TOTAL DEPTH OF DRILLING

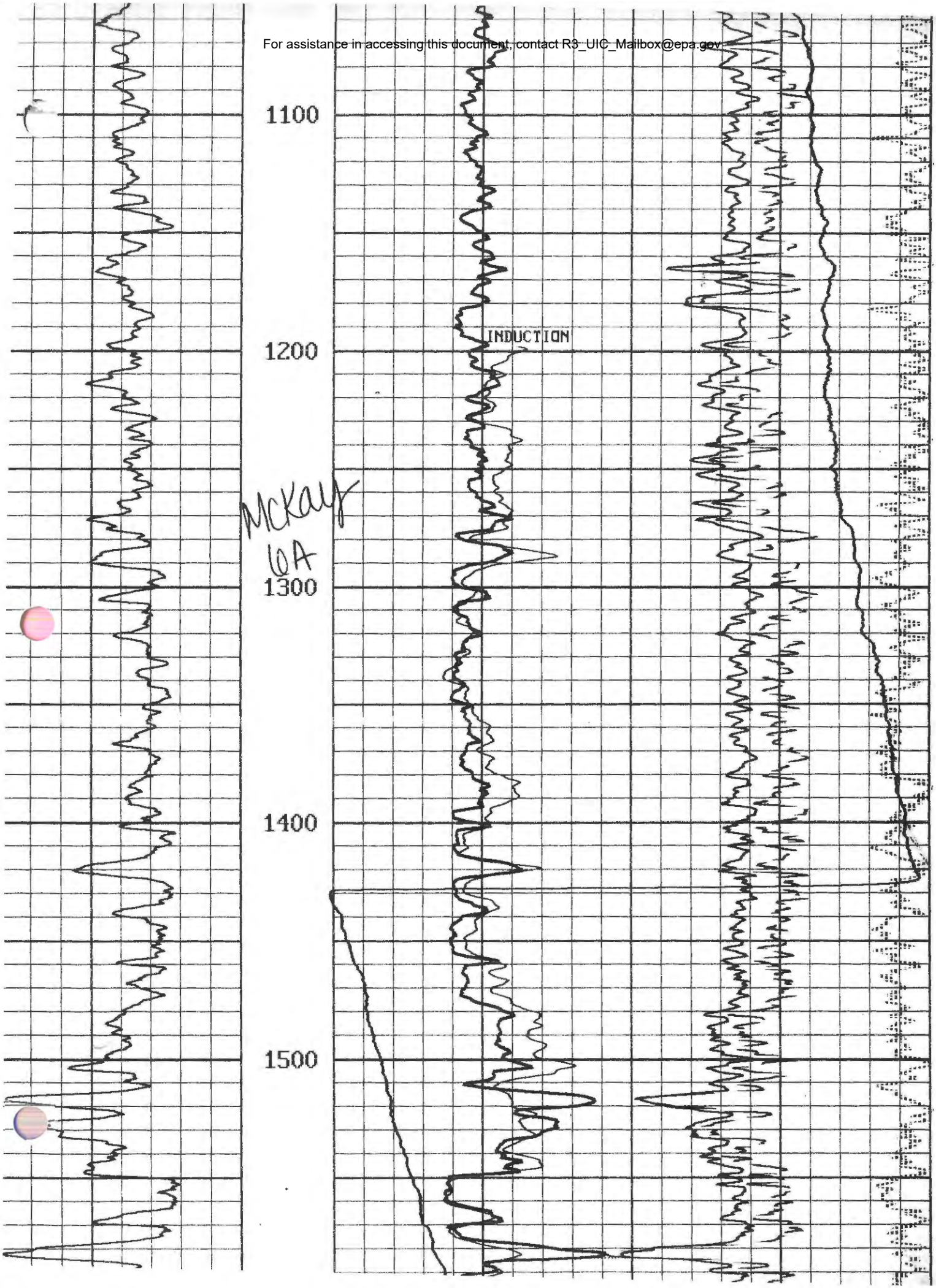
CEMENT REPORT

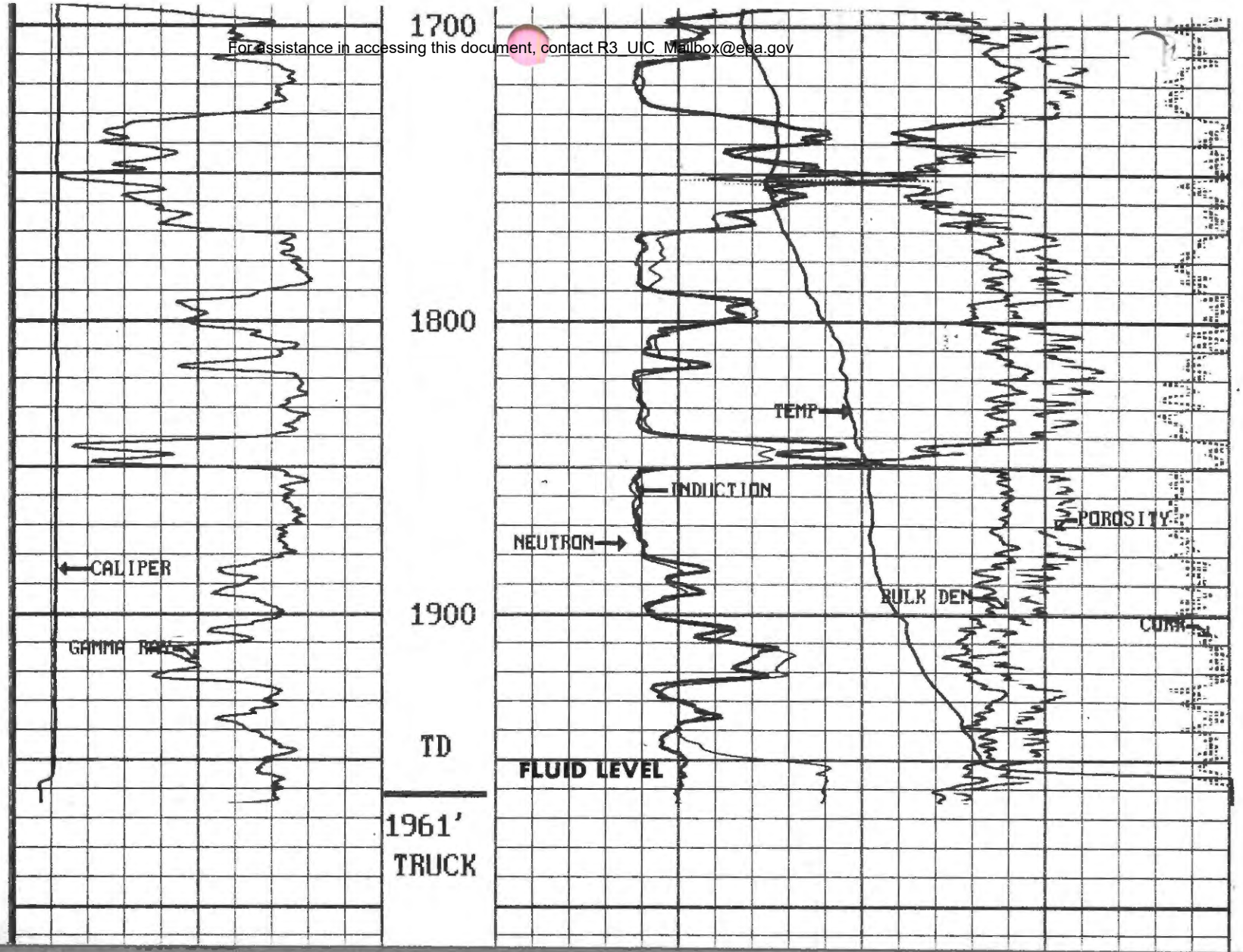
DATE: 2/19/03
OWNER: Double J
WELL NUMBER: 6A

LEASE:
COUNTY:

STAGE I	Preflush	MATERIAL:	Water
		VOLUME:	20 BBL
		RATE:	2.8 BPM
		PRESSURE:	0 PSI
		CIRCULATION:	no
STAGE II	Condition Hole	MATERIAL:	Gelwater w/ 80 lbs. LCM
		VOLUME:	10 BBL
		RATE:	2.8 BPM
		PRESSURE:	0 PSI
		CIRCULATION:	no
STAGE III	Cement	MATERIAL:	Portland Type 1 108 sacks 3% CaCl
		VOLUME:	127 CU. FT.
		RATE:	2.8 BPM
		PRESSURE:	0 PSI
		CIRCULATION:	no
STAGE IV	Displace	MATERIAL:	Water
		VOLUME:	23.3 BBL
		RATE:	2.8 BPM
		PRESSURE:	225 PSI
		CIRCULATION:	yes
STAGE V		MATERIAL:	
		VOLUME:	
		RATE:	
		PRESSURE:	
		CIRCULATION:	

REMARKS: Good cement circulation.





Double J Resources, Inc — Well Completion Schedule & Results

Well Name:	McKay #7A	**API ID**	37-083-48829
Casing Size:	7" O.D.	**Csg. Depth**	548 (ft.)
Total Depth	2504 (ft.)	**Log Meas. From**	Top of 7" Collar
Amt. Sand	700 (Sks.) 53.846154	**Max. Rate**	18 (BPM)
Est Tbg. T.D.	2372.5 (ft.)	**Service Rig**	Keane
Completion Date	05/30/2003		

SCHEDULE					RESULTS				
Stage Number	**Zone**	**Notch Depth (ft)**	**Adjusted Notch Depth (ft)**	**Sand (sks)**	**Break Down (PSI)**	**Avg. Rate (BPM)**	**Avg Pres. (PSI)**	**Total Water (gl)**	**ISIP (PSI)**
1	Bradford 1st	1497.0	**1497.9**	60	2300	18.6	1800	4600	1150
2	Bradford 1st	1508.5	**1509.4**	50	2700	18.5	1900	4100	1200
3	Watsonville	1560.5	**1561.4**	60	1700	18.5	1900	4600	1200
4	Kinzua	1590.0	**1590.9**	50	2600	19	1900	4100	1300
5	Kinzua	1598.5	**1599.4**	50	2700	19	2100	4200	1400
6	Chipmunk/Tiona	1722.5	**1723.2**	100	3400	16	1800	6600	1400
7	Chipmunk/Tiona	1732.5	**1733.2**	60	3300	16	2000	4600	1500
8	Chipmunk/Tiona	1744.5	**1745.2**	50	3300	16	1900	4100	1400
9	Bradford 2nd	1824.5	**1825.2**	80	2000	16	2000	5500	1500
10	A-Kane	2297.5	**2298.6**	80	3300	16	2300	5600	1800
10	B-Kane	2300.0	**2301.1**	0	-------	------	------	------	-------
10	C-Kane	2302.0	**2303.1**	0	-------	------	------	------	-------
11	Kane	2312.5	**2313.6**	60	CAME AROUND				

NOTE:

Well Name:	McKay #7A	**API ID**	37-083-48829

KEANE & SONS DRILLING CORP.
DRILLING REPORTS
FOR.DOUBLE J RESOURCES.....McKAY LEASE.....WELL #7A.....INVOICE #003080

FROM	TO	FORMATION	COMMENTS
0	45	BROWN SHALE	
45	105	SANDSTONE	
105	495	SHALE	WATER @ 130 & 160'
495	525	SHALE/RED ROCK	
525	675	RED ROCK	
675	1455	SHALE	
1455	1635	SHALE/SAND	
1635	1665	SHALE	
1665	1755	SHALE/SAND	
1755	1785	SHALE	
1785	1845	SHALE/SAND	
1845	2025	SHALE	
2025	2055	SHALE/SAND	
2055	2085	SAND	
2085	2115	SAND/SHALE	
2115	2265	SHALE	
2265	2355	SAND/SHALE	
2355	2500	SHALE	

KEANE & SONS DRILLING CORP.
DRILLING REPORT

DOUBLE J RESOURCES, INC.
JAMES J. MACFARLANE, PRESIDENT
1185 E. MAIN ST.
BRADFORD, PA 16701

INVOICE #003080

LEASE: McKAY LEASE WELL# 7A

DATE STARTED 2/12/03 FINISHED 2/14/03

22.2' CONDUCTOR 9 5/8"

550' SURFACE CASING

2500' TOTAL DEPTH OF DRILLING

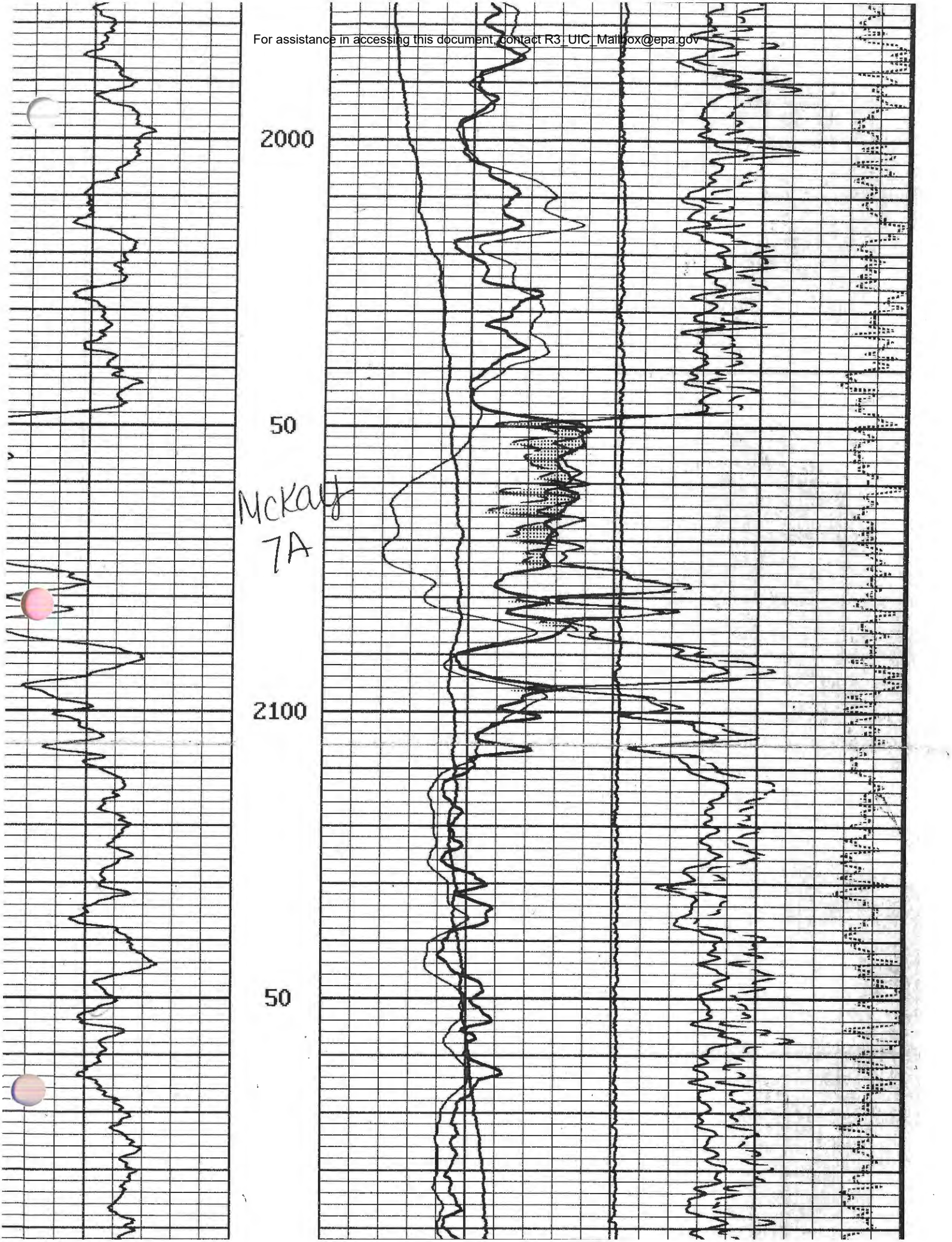
CEMENT REPORT

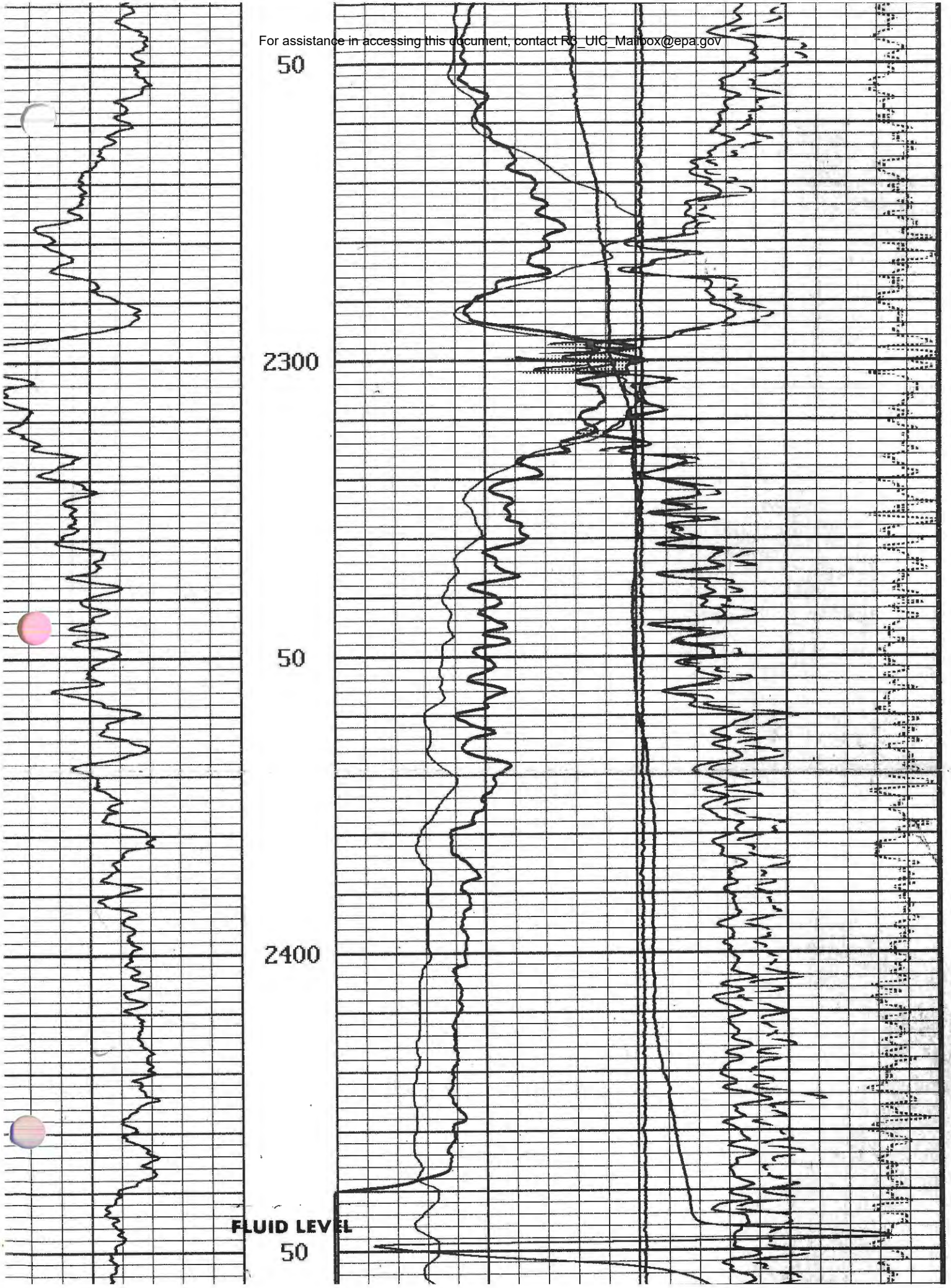
DATE: 2/13/03
OWNER: Double J
WELL NUMBER: 7A

LEASE:
COUNTY:

STAGE I	Preflush	MATERIAL:	Water
		VOLUME:	20 BBL
		RATE:	2.8 BPM
		PRESSURE:	0 PSI
		CIRCULATION:	no
STAGE II	Condition Hole	MATERIAL:	Gelwater w/ 80 lbs. LCM
		VOLUME:	0 BBL
		RATE:	0 BPM
		PRESSURE:	0 PSI
		CIRCULATION:	no
STAGE III	Cement	MATERIAL:	Portland Type 1 105 sacks 3% CaCl
		VOLUME:	124 CU. FT.
		RATE:	2.8 BPM
		PRESSURE:	0 PSI
		CIRCULATION:	no
STAGE IV	Displace	MATERIAL:	Water
		VOLUME:	22.8 BBL
		RATE:	2.8 BPM
		PRESSURE:	200 PSI
		CIRCULATION:	no
STAGE V		MATERIAL:	
		VOLUME:	
		RATE:	
		PRESSURE:	
		CIRCULATION:	

REMARKS: Curtis had already conditioned hole w/ gel





Double J Resources, Inc — Well Completion Schedule & Results

Well Name:	McKay #8A	**API ID**	37-083-48830
Casing Size:	7" O.D.	**Csg. Depth**	564 (ft.)
Total Depth	1961 (ft.)	**Log Meas. From**	Top of 7" Collar
Amt. Sand	620 (Sks.)	**Max. Rate**	18 (BPM)
Est Tbg. T.D.	1909.5 (ft.)	**Service Rig**	Keane
Completion Date	05/16/2003		

SCHEDULE					RESULTS				
Stage Number	**Zone**	**Notch Depth (ft)**	**Adjusted Notch Depth (ft)**	**Sand (sks)**	**Break Down (PSI)**	**Avg. Rate (BPM)**	**Avg Pres. (PSI)**	**Total Water (gl)**	**ISIP (PSI)**
1	Bradford 1st	1522.0	**1519.0**	80	2350	18	1800	7000	1100
2	Bradford 1st	1533.0	**1530.0**	50	2400	19	1750	4000	1170
3	Watsonville	1588.5	**1585.5**	60	2700	16	2100	4600	1250
4	Kinzua	1617.5	**1614.5**	50	2500	16	2000	4000	1250
5	Kinzua	1624.5	**1621.5**	50	1800	16	1900	4000	1250
6	Chipmunk/Tiona	1738.0	**1734.0**	50	2500	15	2400	4000	1350
7	Chipmunk/Tiona	1742.5	------	50	------	------	------	------	------
8	Chipmunk/Tiona	1749.5	**1745.5**	80	3300	16	2200	6500	1350
9	Chipmunk/Tiona	1759.0	**1755.0**	50	DID NOT TREAT				
10	Bradford 2nd	1849.5	**1845.5**	100	3000	16	2200	6600	1450

NOTE:

Well Name: McKay #8A **API ID** 37-083-48830

KEANE & SONS DRILLING CORP.
DRILLING REPORTS
FOR.DOUBLE J RESOURCES.....McKAY LEASE.....WELL #8A.....INVOICE #003107

FROM	TO	FORMATION	COMMENTS
0	45	BROWN SHALE	
45	525	SHALE	
525	765	RED ROCK	
765	1485	SHALE	
1485	1575	SAND	
1575	1605	SHALE/SAND	
1605	1665	SHALE	
1665	1755	SHALE/SAND	
1755	1875	SAND	
1875	1950	SHALE	

KEANE & SONS DRILLING CORP.
DRILLING REPORT

DOUBLE J RESOURCES, INC.
JAMES J. MACFARLANE, PRESIDENT
1185 E. MAIN ST.
BRADFORD, PA 16701

INVOICE #003107

LEASE: MCKAY LEASE WELL# 8A

DATE STARTED 2/24/03 FINISHED 2/25/03

22.2' CONDUCTOR 9 5/8"

563' SURFACE CASING

1950' TOTAL DEPTH OF DRILLING

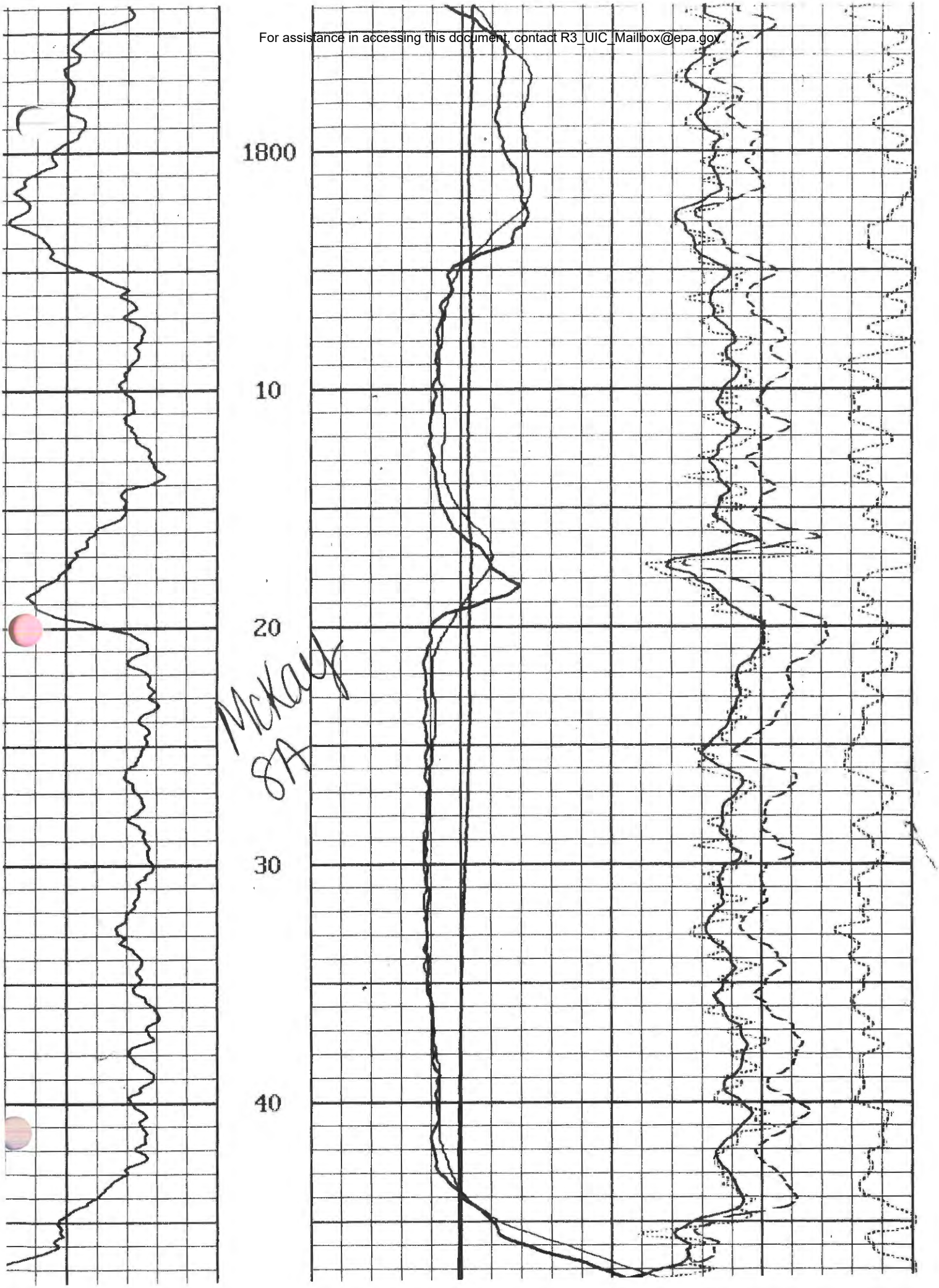
CEMENT REPORT

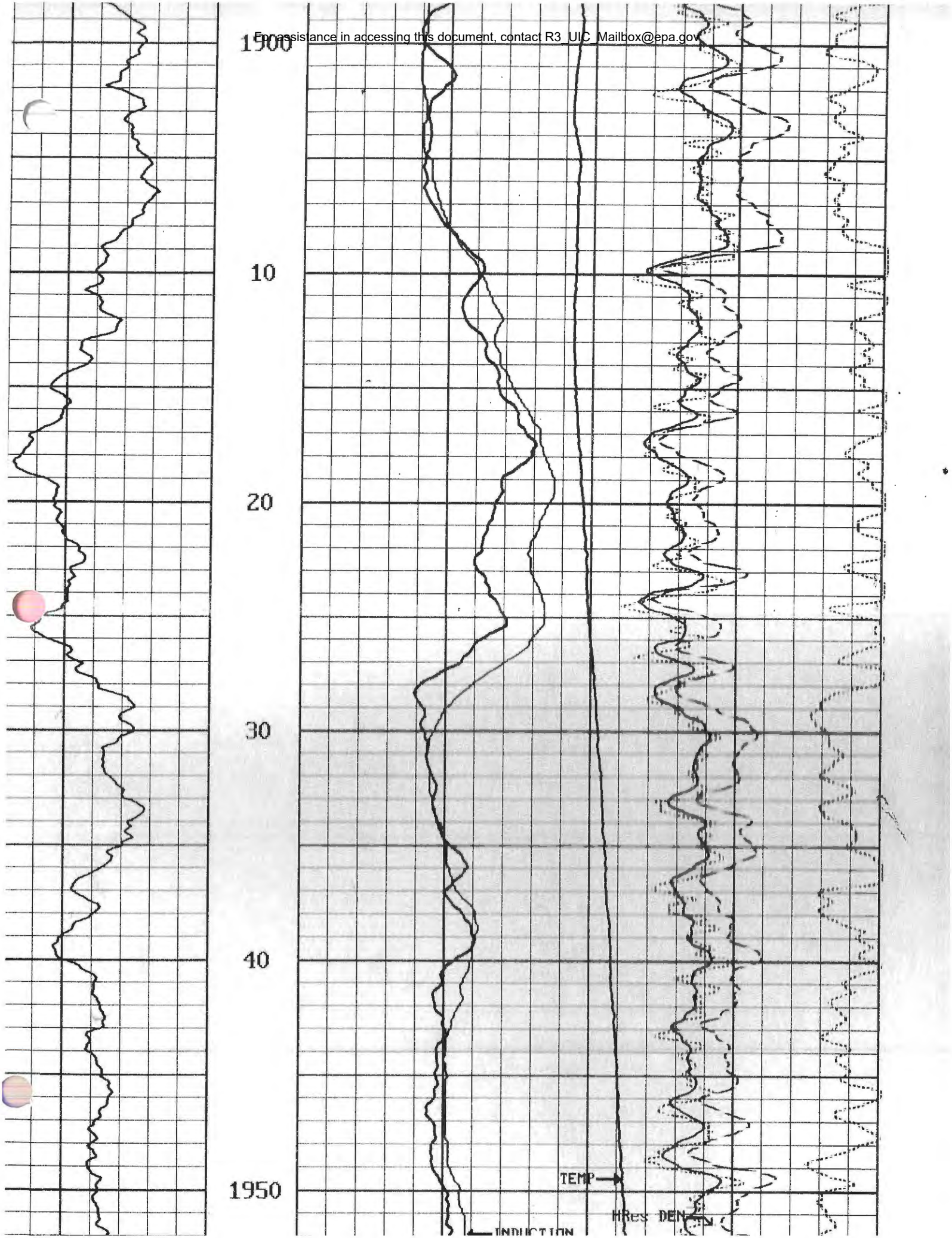
DATE: 2/24/03
OWNER: Double J
WELL NUMBER: 8A

LEASE:
COUNTY:

STAGE I	Preflush	MATERIAL:	Water
		VOLUME:	20 BBL
		RATE:	2.8 BPM
		PRESSURE:	0 PSI
		CIRCULATION:	no
STAGE II	Condition Hole	MATERIAL:	Gelwater w/ 80 lbs. LCM
		VOLUME:	10 BBL
		RATE:	2.8 BPM
		PRESSURE:	0 PSI
		CIRCULATION:	no
STAGE III	Cement	MATERIAL:	Portland Type 1 108 sacks 3% CaCl
		VOLUME:	127 CU. FT.
		RATE:	2.8 BPM
		PRESSURE:	0 PSI
		CIRCULATION:	no
STAGE IV	Displace	MATERIAL:	Water
		VOLUME:	23.3 BBL
		RATE:	2.8 BPM
		PRESSURE:	225 PSI
		CIRCULATION:	yes
STAGE V		MATERIAL:	
		VOLUME:	
		RATE:	
		PRESSURE:	
		CIRCULATION:	

REMARKS: Good cement circulation.





Double J Resources, Inc — Well Completion Schedule & Results

Well Name:	McKay #9A	**API ID**	37-083-48831
Casing Size:	7" O.D.	**Csg. Depth**	559 (ft.)
Total Depth	1960 (ft.)	**Log Meas. From**	Top of 7" Collar
Amt. Sand	600 (Sks.)	**Max. Rate**	18 (BPM)
Est Tbg. T.D.	1894.5 (ft.)	**Service Rig**	Keane
Completion Date	05/14/2003		

SCHEDULE					RESULTS				
Stage Number	**Zone**	**Notch Depth (ft)**	**Adjusted Notch Depth (ft)**	**Sand (sks)**	**Break Down (PSI)**	**Avg. Rate (BPM)**	**Avg Pres. (PSI)**	**Total Water (gl)**	**ISIP (PSI)**
1	Bradford 1st	1515.5	**1511.7**	50	2600	18	1950	4000	1200
2	Watsonville	1567.5	**1563.7**	70	2300	18	2160	5000	1300
3	Watsonville	1575.5	**1571.7**	50	2700	18	2200	4000	1350
4	Kinzua	1598.5	**1594.7**	60	PACKER SLID UP HOLE				
5	Kinzua	1606.0	**1602.2**	50	PACKER SLID UP HOLE				
6	Chipmunk/Tiona	1726.0	**1721.5**	80	3400	16	1850	5600	1350
7	Chipmunk/Tiona	1735.0	**1730.5**	50	2510	16	1850	4000	1400
8	Chipmunk/Tiona	1751.0	**1746.5**	100	3200	16	1850	6600	1400
9	Bradford 2nd	1834.5	**1830.0**	90	2000	16	2000	6300	1500

NOTE:

Well Name: McKay #9A **API ID** 37-083-48831

KEANE & SONS DRILLING CC
DRILLING REPORTS
FOR.DOUBLE J RESOURCES.....McKAY LEASE.....WELL #9A.....INVOICE #003106

FROM	TO	FORMATION	COMMENTS
0	45	BROWN SHALE	
45	495	SHALE	WATER @ 150' 30GPM
495	555	RED ROCK	
555	585	SANDSTONE	
585	615	SHALE	
615	645	SHALE/RED ROCK	
645	675	RED ROCK	
675	705	RED ROCK/SHALE	
705	765	SHALE	
765	795	SHALE/RED ROCK	
795	825	RED ROCK	
825	855	RED ROCK/SHALE	
855	1155	SHALE	
1155	1185	SHALE/PINK ROCK	
1185	1215	SHALE	
1215	1245	SHALE/PINK ROCK	
1245	1275	PINK ROCK	
1275	1425	SHALE	
1425	1515	SHALE/SAND	
1515	1545	SHALE	
1545	1665	SHALE/SAND	
1665	1695	SHALE	
1695	1755	SHALE/SAND	
1755	1785	SHALE	
1785	1875	SAND/SHALE	
1875	1950	SHALE	

CURTIS WELL SERVICE
PO BOX 367
SUGAR GROVE, PA 16350

DATE 02-21-03
COMPANY DOUBLE J RESOURCES, INC.
WELL NO 9A
FARM MCKAY

ORDER NO. 4184
CUST. REP. KEANE DRILLING
TYPE OF SERVICE CEMENT CASING

CASING LENGTH 563' BBLS/FT .0415 = 23.3
BIG HOLE 567' BBLS/FT .0268 = 15.1
(.0195-8 INCH, .0247 - 8 5/8, .0268 8 3/4)
NO. OF SACKS 105 MIX WATER 13.0 SLURRY 22.0 SLURRY WT. 15.6
MIX WATER 5.2 X 105 SACKS + 42 = WATER
SLURRY 105 SACKS X 1.18 + 5.61 = SLURRY
CAL. 94 X 105 SACKS X % OF CAL = LBS (25%)
0.025

20% OVER 22.0 BBLS

REMARKS CIRCULATION
CEMENT RETURNED

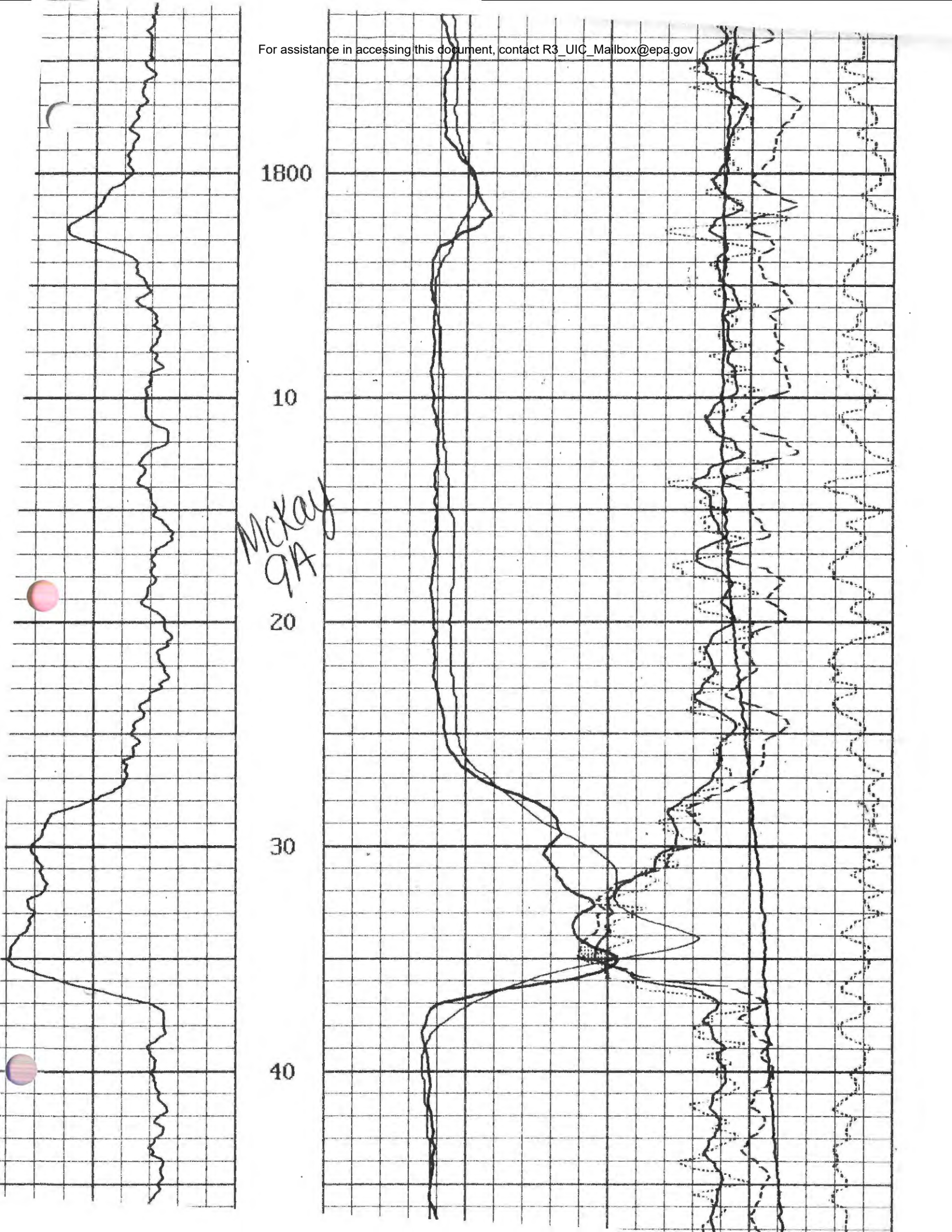
BARRELS PER FT.	WEIGHT PER FT.	SIZE O.D IN.
0.0381	13	6 5/8
0.0366	17	*6.5/8
0.0355	20	6 5/8
0.0348	22	*6 5/8
0.0341	24	6 5/8
0.0333	26	*6 5/8
0.0326	28	6 5/8
0.0322	29	*6 5/8
0.0313	32	6 5/8
0.0415	17	7
0.0405	20	7
0.0398	22	7
0.0394	23	7
0.039	24	7
0.0383	26	7
0.0375	28	7
0.0371	29	7
0.0368	30	7
0.0361	32	7

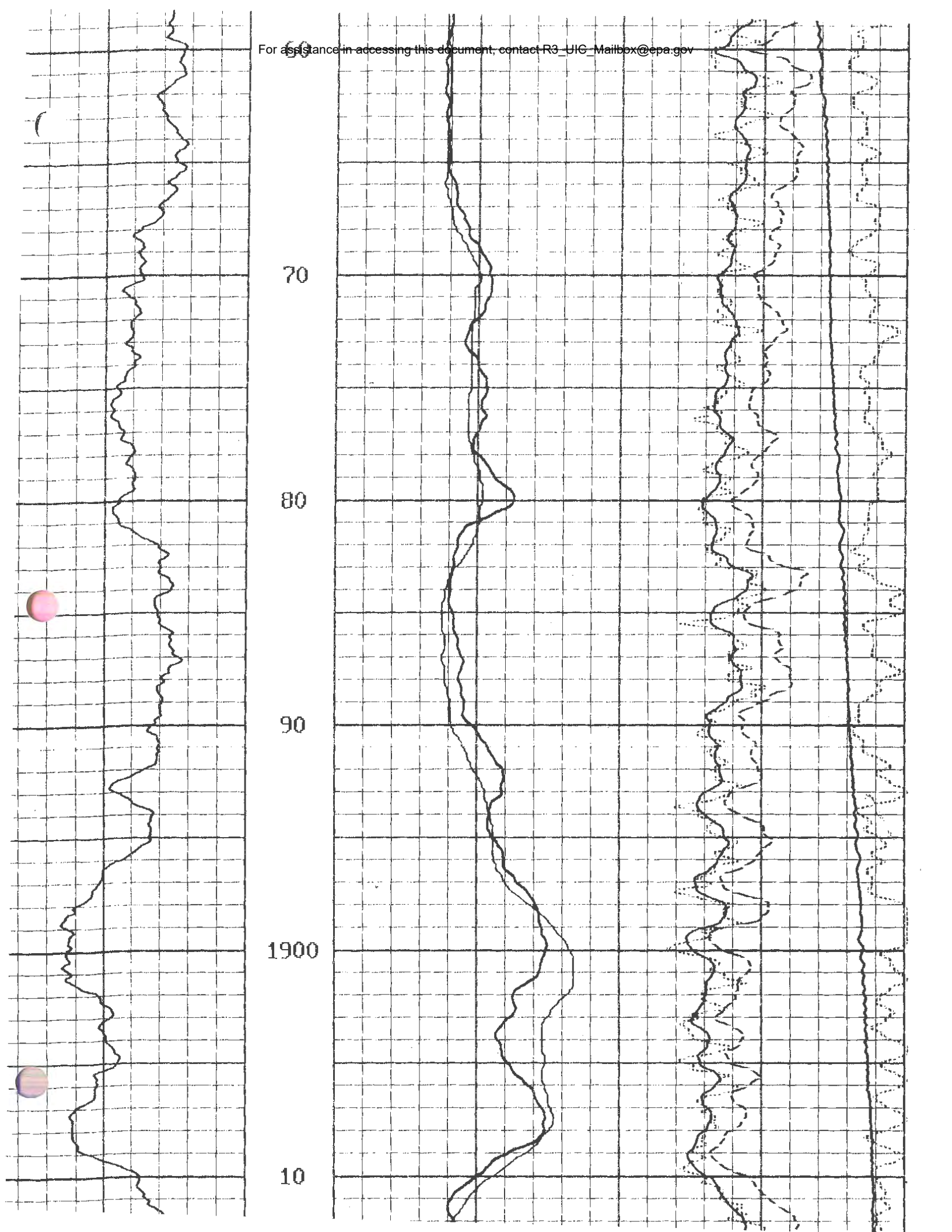
SACKS	MIX	SLURRY 15.6	CALCIUM 2%	3%
30	3.7	6.3	56	85
35	4.3	7.3	65	99
40	4.9	8.4	75	113
45	5.6	9.5	85	127
50	6.2	10.5	94	141
55	6.8	11.6	103	155
60	7.4	12.6	113	169
65	8	13.7	122	183
70	8.7	14.7	132	197
75	9.3	15.8	141	212
80	9.9	16.8	150	226
85	10.5	17.9	160	240
90	11.1	18.9	169	254
95	11.8	20	179	268
100	12.4	21	188	282
105	**13**	**22**	**206**	**296**
110	13.6	23.1	207	310
115	14.2	24.2	216	324
120	14.9	25.2	226	338

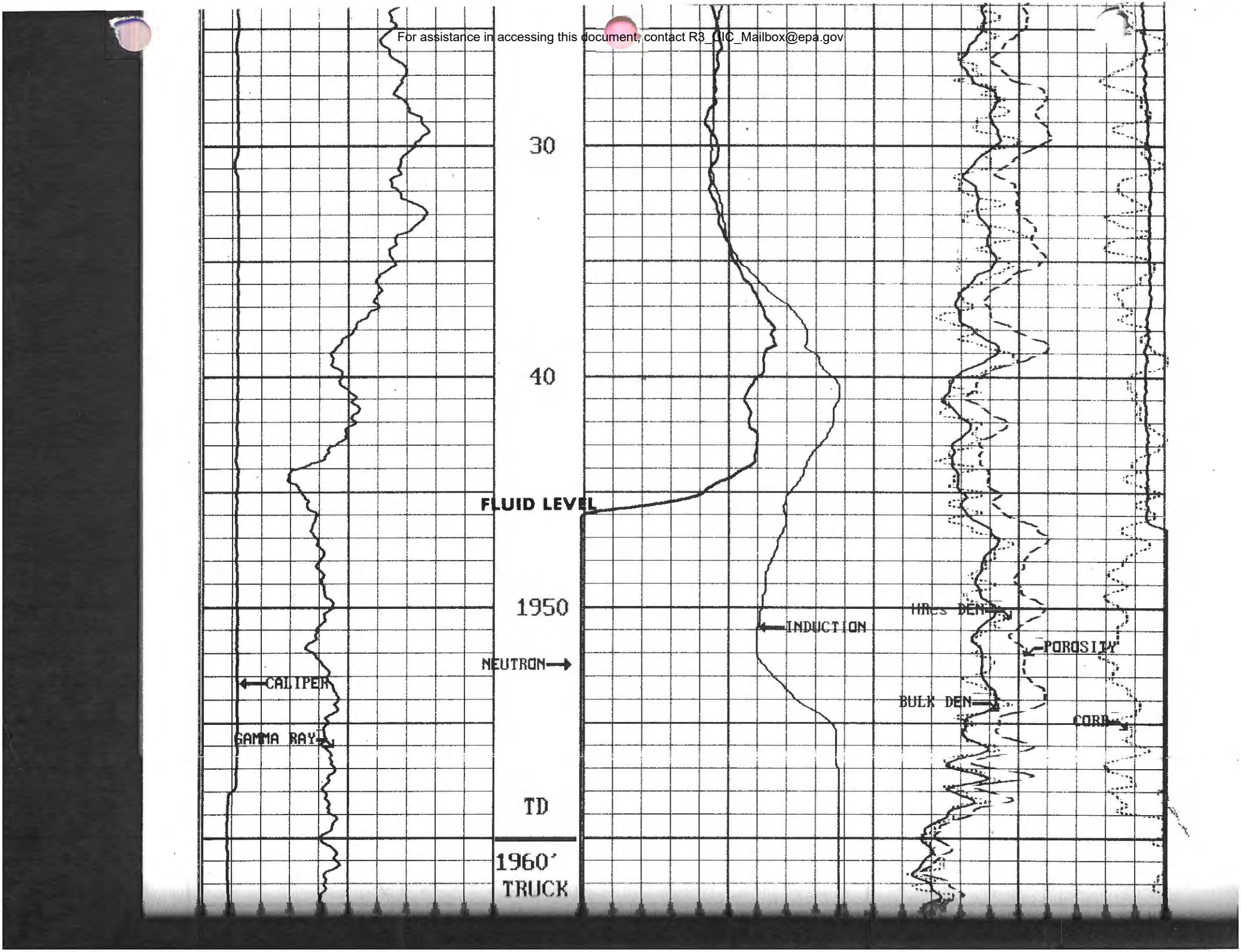
INJECTION TIME	RATE	BBLS IN	PRESSURE CSG.	TBG	REMARKS
4:01	4.0	15.0	50#		LOADED HOLE
4:12	4.0	3.5	50#		PUMPED GEL & FLAKES
4:29	3.0	22.0	50#		PUMPED CEMENT
4:40	2.5	23.3	200#		DISPLACED CEMENT & PLUG

AVER. RATE 3.0 BPM
MAX. PRESSURE 200#
AVER. PRESSURE 100#
ENGINEER JIM BRYERTON

PRODUCTS USED			
CEMENT	105 SACKS	MULTI-SEAL	40#
CALCIUM	300#	7" PLUG	1
GEL (BET)	100#	6 5/8" PLUG	







Double J Resources, Inc — Well Completion Schedule & Results

Well Name:	McKay #12A	**API ID**	37-083-48884
Casing Size:	7" O.D.	**Csg. Depth**	558 (ft.)
Total Depth	2504 (ft.)	**Log Meas. From**	Top of 7" Collar
Amt. Sand	680 (Sks.)	68 **Max. Rate**	18 (BPM)
Est Tbg. T.D.	1905.0 (ft.)	**Service Rig**	Keane
Completion Date	05/22/2003		

SCHEDULE					RESULTS				
Stage Number	**Zone**	**Notch Depth (ft)**	**Adjusted Notch Depth (ft)**	**Sand (sks)**	**Break Down (PSI)**	**Avg. Rate (BPM)**	**Avg Pres. (PSI)**	**Total Water (gl)**	**ISIP (PSI)**
1	Bradford 1st	1515.5	**1515.6**	60	2200	18.7	1700	4500	1150
2	Watsonville	1576.0	**1576.1**	50	1600	16	1700	4100	1200
3	Watsonville	1580.0	**1580.1**	50	2300	16	1700	4000	1300
4	Kinzua	1611.0	**1611.1**	50	2500	19	1850	4100	1300
5	**Cherry Grove**	1686.0	**1686.5**	100	2800	15.5	2000	6500	1300
6	**Cherry Grove**	1690.0	**1690.5**	50	3100	16.3	2150	4000	1350
7	**Chipmunk/Tiona**	1734.5	**1735.0**	70	3100	16.6	1800	5200	1400
8	**Chipmunk/Tiona**	1743.5	**1744.0**	50	2000	16.3	1850	4300	1450
9	**Chipmunk/Tiona**	1752.5	**1753.0**	100	2950	16	1900	6900	1400
10	**Bradford 2nd**	1845.0	**1845.5**	100	3000	16	1950	6900	1500

NOTE: Cherry Grove, Chip/Tiona & Brad 2d @ 16 BPM MAX RATE

Well Name: McKay #12A **API ID** 37-083-48884

KEANE & SONS DRILLING CO.
DRILLING REPORTS
FOR.DOUBLE J RESOURCES.....McKAY LEASE.....WELL #12A.....INVOICE #003081

FROM	TO	FORMATION	COMMENTS
0	525	SHALE	
525	555	SHALE/RED ROCK	
555	645	RED ROCK	
645	675	RED ROCK/SHALE	
675	795	SHALE	
795	825	RED ROCK	
825	855	SHALE/RED ROCK	
855	945	SHALE	
945	975	PINK ROCK/SHALE	
975	1155	SHALE	
1155	1245	PINK ROCK	
1245	1275	PINK ROCK/SHALE	
1275	1305	SHALE/RED ROCK	
1305	1455	SHALE	
1455	1635	SAND/SHALE	
1635	1665	SHALE	
1665	1845	SAND/SHALE	
1845	2055	SHALE	
2055	2085	SHALE/SAND	
2085	2115	SAND	
2115	2145	SHALE/SAND	
2145	2175	SHALE	
2175	2205	SHALE/SAND	
2205	2265	SHALE	
2265	2295	SHALE/SAND	
2295	2325	SAND	
2325	2385	SAND/SHALE	
2385	2500	SHALE	

KEANE & SONS DRILLING CORP.
DRILLING REPORT

DOUBLE J RESOURCES, INC.
JAMES J. MACFARLANE, PRESIDENT
1185 E. MAIN ST.
BRADFORD, PA 16701

INVOICE #003081

LEASE: McKAY LEASE WELL# 12A

DATE STARTED 2/14/03 FINISHED 2/15/03

22.1' CONDUCTOR 9 5/8"

560' SURFACE CASING

2500' TOTAL DEPTH OF DRILLING

CEMENT REPORT

DATE: 2/14/03
OWNER: Double J
WELL NUMBER: 12A

LEASE:
COUNTY:

STAGE I — Preflush

MATERIAL: Water
VOLUME: 20 BBL
RATE: 2.8 BPM
PRESSURE: 0 PSI
CIRCULATION: no

STAGE II — Condition Hole

MATERIAL: Gelwater w/ 80 lbs. LCM
VOLUME: 10 BBL
RATE: 2.8 BPM
PRESSURE: 0 PSI
CIRCULATION: no

STAGE III — Cement

MATERIAL: Portland Type 1 107 sacks 3% CaCl
VOLUME: 126 CU. FT.
RATE: 2.8 BPM
PRESSURE: 0 PSI
CIRCULATION: no

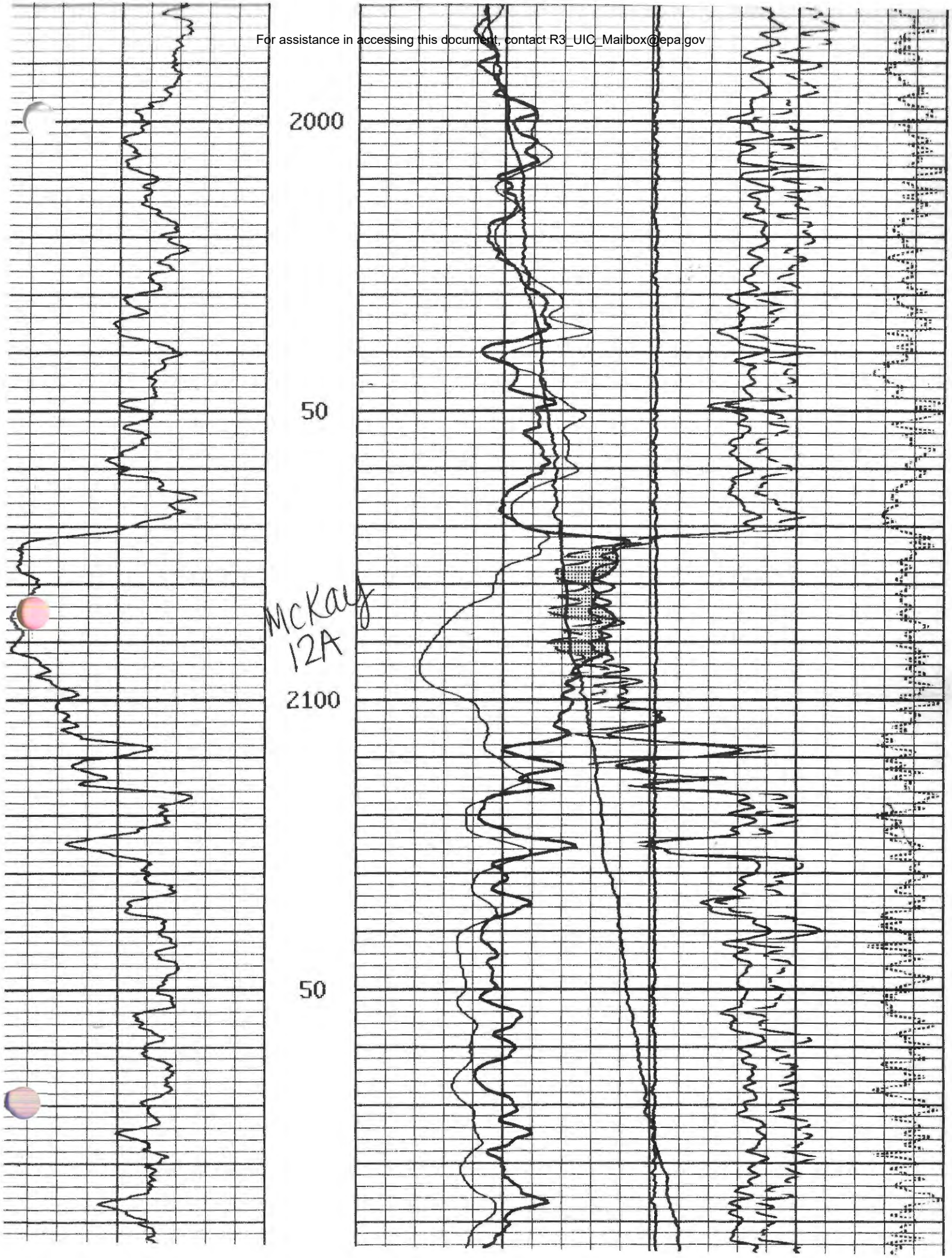
STAGE IV — Displace

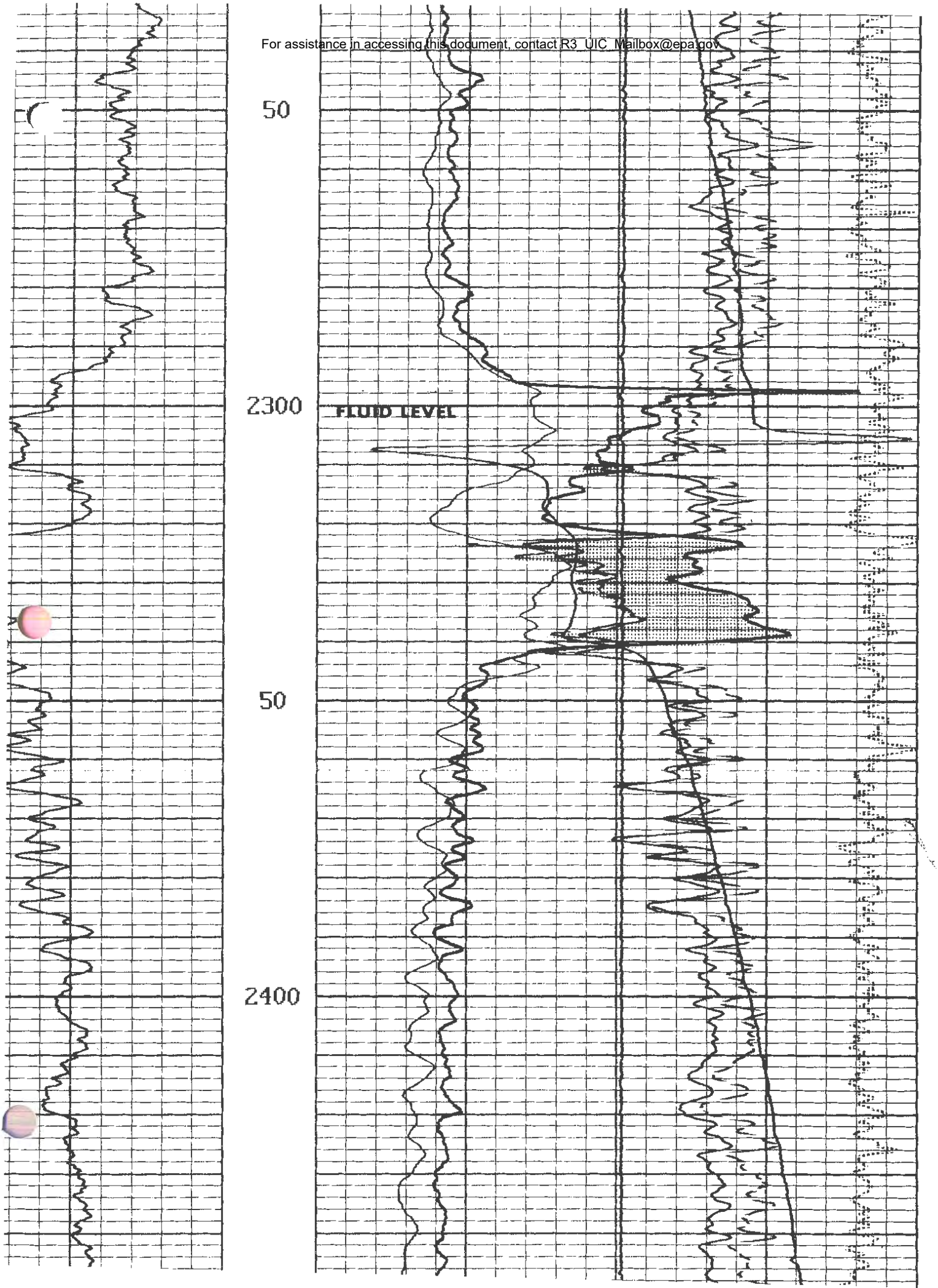
MATERIAL: Water
VOLUME: 23.2 BBL
RATE: 2.8 BPM
PRESSURE: 225 PSI
CIRCULATION: yes

STAGE V

MATERIAL:
VOLUME:
RATE:
PRESSURE:
CIRCULATION:

REMARKS: Good cement circulation.





5500-FM-OG0006 Rev. 2/2000

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

DEP USE ONLY	
Site ID#	Primary Facility ID#
eFACTS Client #	Sub-facility ID#
Bonded Well? ☐ Yes ☐ No	Bond Agreement #

Certificate of Well Plugging

Well Operator	DEP ID#	Well API # (Permit / Reg)	Project Number	Type of Well
Double J Resources, Inc.	161402	37-083-44648		Oil

Address	Well Farm Name	Well #	Serial #
1185 East Main	McKay	1 (Witco)	

City	State	Zip Code	County	Municipality
Bradford	PA	16701	McKean	Lafayette

Phone	Fax
814 362 4263	814 362 3249

Complete the next section (coal) if applicable.

Coal ☐ Operator ☐ Owner ☐ Lessee	Coal ☐ Operator ☐ Owner ☐ Lessee	Coal ☐ Operator ☐ Owner ☐ Lessee
Address	Address	Address
City, State, Zip	City, State, Zip	City, State, Zip

The undersigned representatives of the Well Operator certify that we participated in plugging this well, and that the work was started on *(date)* 5/7/03 , and that the well was plugged as follows.

Filling Material and Plugs	Depth From	Depth To	Casing and Tubing Size	Pulled	Left
Cement	Surface	50'	8"	0	15'
Mud & Stone	50'	550'	6 5/8"	0	494'
Cement	550'	650'			
Gel	650'	1358'			
Cement	1358'	1830'			
Gel	1830'	1975'	**Depth to coal seams, if any**		

Describe Monument
2" Steel Pipe w/ API ID

Signature of Participants

Signature – Well Operator	Signature – Qualified Participant	Signature – Qualified Participant
Print or Type Signer's Name and Title: James J. Macfarlane, President	Print or Type Signer's Name, Title, & Co.: Paul Phillips, Phillips & Dart Oilfield Service, Inc.	Print or Type Signer's Name, Title, & Co.

Signers certify that the work of plugging this well was completed on *(date)* 5/13/03 and that the information above is true and accurate.

DEP USE ONLY

☐ Approved ☐ Denied DEP Rep: Date	Plug Inspector Date:	Site Restoration (WQS) Date:	Bond Rel.? ☐ Yes ☐ No

Upon completion of plugging, mail one copy of this certificate to each coal operator, owner, or lessee, if any, and one copy to the appropriate DEP Regional Oil and Gas Management Program office.

Dept. of Environmental Protection
NW Regional Office – Oil & Gas
230 Chestnut Street
Meadville, PA 16335-3481

Dept. of Environmental Protection
SW Regional Office – Oil & Gas
400 Waterfront Drive
Pittsburgh, PA 15222-4745

5500-FM-OG0005 Rev. 5/2000

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

DEP USE ONLY	
Auth #	APS #
Site #	Primary Facility #
eFACTS Client #	Sub-fac #

Notice of Intention by Well Operator to Plug a Well

☒ Well Operator ☐ Coal Operator		DEP ID#	Well API # (Permit / Reg)	Date Drilled (If Known)
Double J Resources, Inc.		161402	37-083-44648	8/27/85
Address	Phone		Well Farm Name	
1185 East Main	814 362 4263		McKay	
City	State	Zip Code	Well #	Well Serial #
Braford	PA	16701	#1 (Witco Corp.)	
☒ Agent (contractor) acting on behalf of the operator named above.			County	
James J Macfarlane			McKean	
Address	Phone		Municipality	
1185 East Main St	814 362 4263		Lafayette	
City	State	Zip Code	*Attach well record if not previously submitted.*	
Bradford	PA	16701		

Coal Operator, Owner, and Lessee

Complete this section if applicable. Prior to abandoning any well in an area underlain by a workable coal seam, the well operator or owner shall notify the coal operator, lessee, or owner of the intention to plug and abandon the well, and shall submit a plat showing the location and affix the date and time at which the work of plugging will commence.

Coal ☐ Operator ☐ Owner ☐ Lessee	Coal ☐ Operator ☐ Owner ☐ Lessee	Coal ☐ Operator ☐ Owner ☐ Lessee
Address	Address	Address
City, State, Zip	City, State, Zip	City, State, Zip
Phone Notified? ☐Yes ☐No	Phone Notified? ☐Yes ☐No	Phone Notified? ☐Yes ☐No
This Party hereby waives the rights to be notified of the date and time before plugging work will begin, and to be present at the plugging of this well. *Signature:*	This Party hereby waives the rights to be notified of the date and time before plugging work will begin, and to be present at the plugging of this well. *Signature:*	This Party hereby waives the rights to be notified of the date and time before plugging work will begin, and to be present at the plugging of this well. *Signature:*

Scheduled Date and Time of Plugging

Plugging is scheduled to begin on *(date)* May 5, 2002 at *(time)* 8:00AM.

Checklist and Additional Attached Information

- ☒ Location Plat
- ☐ Current Well Record
- ☒ Available Well Record
- ☐ Application for Approval of Alternate Method of Plugging
- ☐ Other, describe:

Signature of Applicant (Operator or Agent)

Signature: [signature] Date: 5/1/03

Print or Type Signer's Name and Title: James J Macfarlane

DEP USE ONLY

If this well has not been permitted or registered previously, DEP hereby assigns this permit / registration number to the well location described in this notice:

API# _____ Date: _____

Please refer to this number in all future correspondence.

Notice acknowledged by: Date:

DEP Rep: (Signature) _____

(Print Name)

Geologist: _____ Date:

DEP will fill in the information below and send a copy of this approved notice to the applicant and these DEP staff or offices.

DEP Oil and Gas Inspector	DEP Mine Inspector MID #	Rec'd in DEP Reg. Ofc.
Name	Name	Plugging must begin within 30 days of:
Address	Address	
City, State, Zip	City, State, Zip	
Phone	Phone	

ER-OG-4: Rev. 2/80

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

Office Use Only

1985 MAR 12 PM 2:50

WELL RECORD

PERMIT NO. 37-083-44648-00 PROJECT NO. TYPE OF WELL Oil

WELL OPERATOR	Witco Corporation
TELEPHONE NO.	814-368-6111
ADDRESS	77 North Kendall Avenue, Bradford, Pa.
ZIP	16701
FARM NAME	McKay
FARM NO.	1
SERIAL NO.	
ACRES	105
TOWNSHIP	Lafayette TWP.
COUNTY	McKean
DRILLING COMMENCED	8/16/85
DRILLING COMPLETED	8/27/85
ELEVATION	2120'
QUADRANGLE	Cyclone, Pa. [X] 7½' [ ] 15'

CASING AND TUBING RECORD

CASING SIZE	AMOUNT IN WELL	MATERIAL USED FOR PACKER: CEMENT (SKS.)	GEL (SKS.)	PACKER TYPE	PACKER SIZE	PACKER DEPTH	RUN
8"	15'						8/16/85
6 5/8"	500'	75 SKS. Casing was cemented back to surface by Halliburton.	2 SKS.				8/19/85

PERFORATION RECORD

DATE	INTERVAL PERFORATED FROM	TO
	None	

STIMULATION RECORD

DATE	INTERVAL TREATED	AMOUNT FLUID	AMOUNT SAND	INJECTION RATE
None				

NATURAL OPEN FLOW	N.A.	NATURAL ROCK PRESSURE N.A. HRS. DAYS
AFTER TREATMENT OPEN FLOW		AFTER TREATMENT ROCK PRESSURE HRS. DAYS

REMARKS: Well has been capped and is waiting evaluation.

N.A. - Not available

(FORMATION ON REVERSE SIDE)

4-2-86

K

FORMATIONS

NAME	TOP	BOTTOM	GAS AT	OIL AT	WATER AT (FRESH OR SALT WATER)	SOURCE OF DATA
rock, sand, slate	0	100			show fresh water @ 75'	Drillers log
slate	100	400			Fresh water @ 125'	Elec. log
Slate, red rock	400	700				
slate	700	800				
slate, red rock	800	900				
slate	900	1479				
Clarendon	1479	1494	*	*		
slate	1494	1544				
Chipmunk	1544	1608	*	*		
slate	1608	1646				
Tiona	1646	1662	*	*		
slate	1662	1701				
Bradford 2nd	1701	1736	*	*		
slate	1736	1811				
Upper Sliverville	1811	1818	*	*		
slate	1818	1887				
Lower Sliverville	1887	1890	*	*		

slate	1890	2041				
Bradford 3rd	2041	2101	*	*		
slate	2101	2269				
Upper Kane	2269	2279	*	*		
slate	2279	2289				
Lower Kane	2289	2350	*	*		
slate	2350	2370				
T.D.	2370					

* Oil & Gas are present in this zone.

March 14, 19 86
DATE

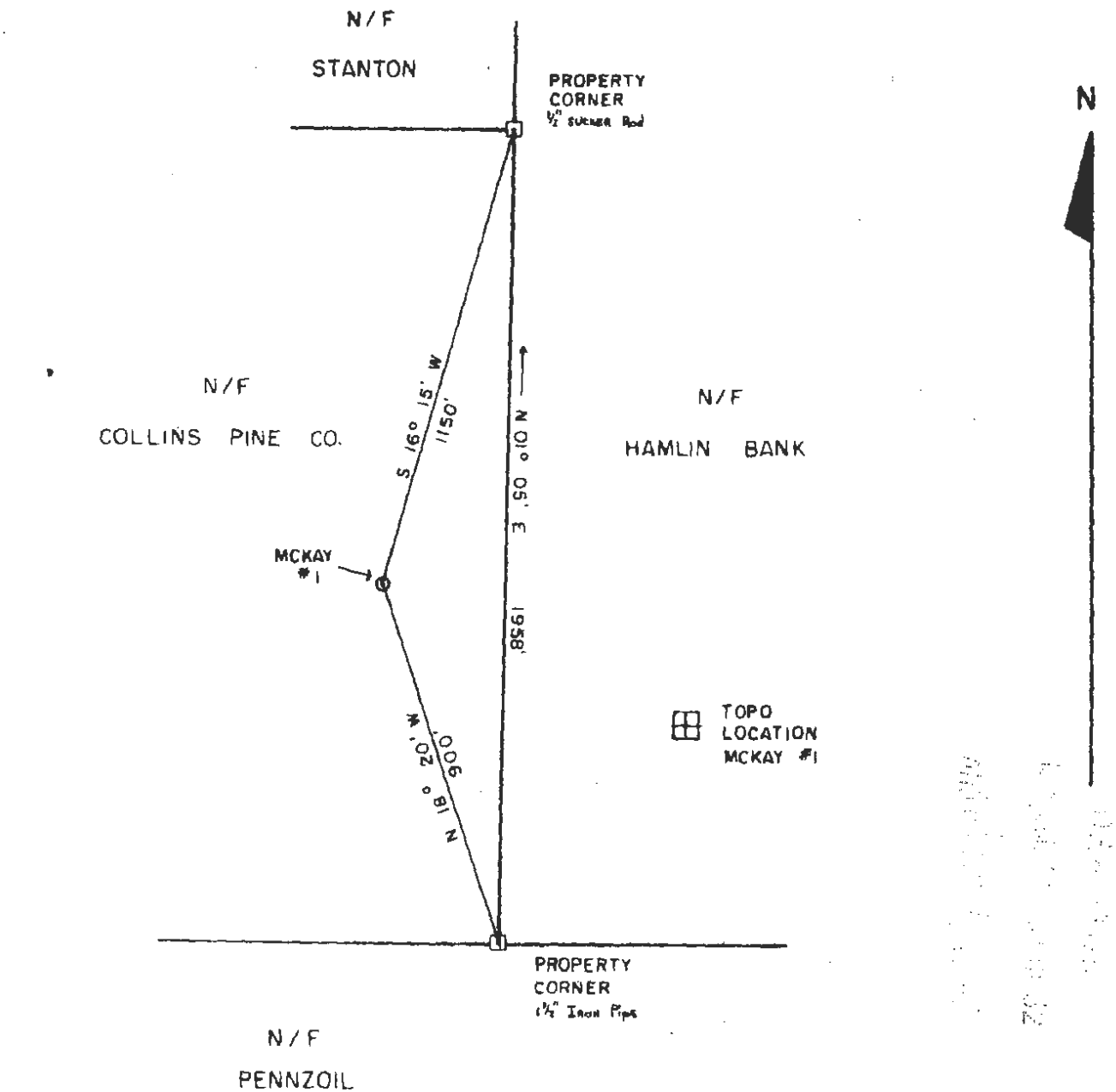
James M. Moyer
APPROVED BY James M. Moyer

Engineering Staff Technician
TITLE

EPA-GG-2: Rev. 3/85

WELL LOCATION PLAT

Well is located on topo map 9700 feet south of LATITUDE 41 ° 50 · 00 "



Well is located on topo map 6750 feet west of LONGITUDE 78 ° 35 · 00 "

Include description of the property and courses and distances of the well(s) location to two or more permanent identifiable points or land marks, all buildings and water supplies within 200', all springs, bodies of water and streams within 100' identified on the most current 7½" topographic map and wetlands within 100'.
Reference to buildings, springs, bodies of water and wetlands is not required for well plugging.

⊞ Denotes location of well on 7½" topo map Permit #_____ Project # _____

WITCO OIL & GAS DIVISION Well Operator	Revision ☐ Re-Issue ☐ Alteration ☐ Storage Recondition ☐ New Location ■ Drill Deeper ☐ Abandonment ☐ Registration ☐ Plugging ☐	C. G. LANG P.L.S. Surveyor/Engineer
377 NORTH KENDALL AVENUE Address		J0210A Drawing Number
BRADFORD, PA. 16701		7/10/85 Date
COLLINS PINE COMPANY Surface Owner		1" = 400' Scale
Surface Lessor (if any) McKAY	Surface landowner and water purveyor with water supply within 1,000'	Approximate course and distance to water supply
Farm Name McKAY #1	COLLINS PINE - Surf.	
Well No. 105 / Serial No. 2120		
Acres CYCLONE / Ground Elevation 4		
Topo Quadrangle McKEAN / Section LAFAYETTE TWP.		
County NONE / Political Subdivision 2350	Workable Coal Seams Owner/Operator: NONE	Name of Seam
Angle of Deviation / Anticipated TD		

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

FJG 8/2/85

ER-OG-8 Rev. 9/85

RS

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

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

To Steve Dunn

CERTIFICATE OF PLUGGING WELL

cyclone

______ ☐ Coal Operator ☐ Owner ☐ Lessee
______ Address
______ ☐ Coal Operator ☐ Owner ☐ Lessee
______ Address
______ ☐ Coal Operator ☐ Owner ☐ Lessee
______ Address

COMPLETE ABOVE SECTION IF APPLICABLE

Type of Well: Exploratory - Oil   44648-P

Name of Well Operator: Witco Corporation, Oil & Gas Division

77 North Kendall Ave., Bradford, PA 16701
Address

July 14, 1987
Date

Lafayette
Political Subdivision, Borough, City or Township

McKean County

Farm: McKay-

Well (Farm) No. 1   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 May 28, 1986, and that the well was plugged as follows:

FILLING MATERIAL AND PLUGS	FROM	TO	Casing and Tubing SIZE	PULLED	LEFT
Coarse Plug-back Sand	2360	2120	8"	0	15
25 Sacks Cement	2120	2030	6 5/8"	0	500
Fluid-filled Interval	2030	530			
Casing Bridge Set @	530				
12 Sacks Cement	530	470			
Fluid-filled Interval	470	50			
Top-hole Bridge @	50		Depth of Coal Seam, if Any		
25' Mud & Stone, 5 Sacks Cement	50	Surface			
			Description of Monument		
			2" Pipe Marker		

I certify that the work of plugging and filling said well was completed on the 29 day of May, 1986 and that the above information is true and accurate.

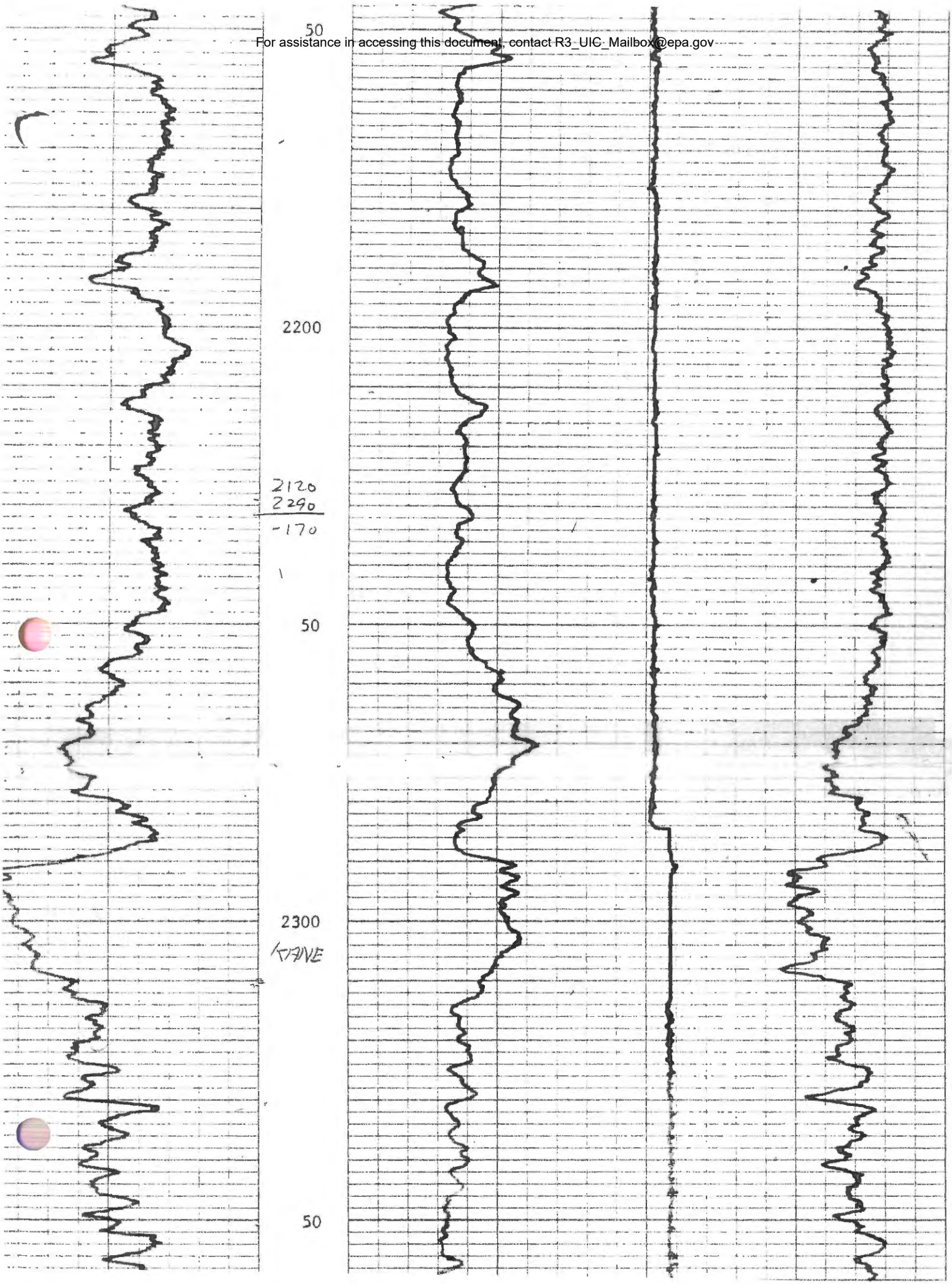
Witco Corporation - Oil & Gas Division
(Well Operator)

[signature]
(Qualified Participant)

PERMIT/REGISTRATION NO. 37-083-44648-P

[signature]
(Qualified Participant)

PROJECT NO. ______



5500-FM-OG0004 Rev. 2/2001

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

Well Record and Completion Report

DEP USE ONLY	
Site ID	Primary Fac ID 661819
Client Id 207300	Subfacility Id

ll Operator	DEP ID#	Well API # (Permit / Reg)	Project Number	Acres
OTTER EXPLORATION INC	207300	37-083-50070-00	OEI-2	

Address	Well Farm Name & Well #	Serial #
104 COLLEGE ST, PO BOX 2239	ISHMAN 1I	

City	State	Zip Code	County	Municipality
HUDSON	OH	44236	McKean	Lafayette

Phone	Fax	USGS 7.5 min. quadrangle map
(330) 650-6754		Cyclone

Check all that apply: ☒ Original Well Record ☒ Original Completion Report ☐ Amended Well Record ☐ Amended Completion Report

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

Well Type ☐ Gas ☐ Oil ☒ Combination Oil & Gas ☐ Injection ☐ Storage ☐ Disposal

Drilling Method ☒ Rotary – Air ☐ Rotary – Mud ☐ Cable Tool

Date Drilling Started	Date Drilling Completed	Surface Elevation	Total Depth – Driller	Total Depth - Logger
5/23/05	5/24/05	2103 ft.	1971 ft.	1971 ft.

Casing and Tubing

Cement returned on surface casing? ☐ Yes ☒ No
Cement returned on coal protective casing? ☐ Yes ☐ No ☒ N/A

Hole Size	Pipe Size	Wt.	Thread / Weld	Amount in Well (ft)	Material Behind Pipe Type and Amount	Packer / Hardware / Centralizers Type	Size	Depth	Date Run
10"	9 5/8"		T&C	19					
8 3/4"	7"		T&C	518.4	80 sks class A Cement	2 centralizers	7" x 10"	100', 300'	6/26/05
6 1/4"	2"		T&C	1858					

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ENVIRONMENTAL PROTECTION

COMPLETION REPORT

Perforation Record

Date	Interval Perforated From	To
9/12/05	1592	
9/12/05	1600	
9/12/05	1713	
9/12/05	1722	
9/12/05	1730	
9/12/05	1738	

Stimulation Record

Date	Interval Treated	Fluid Type	Fluid Amount	Propping Agent Type	Propping Agent Amount	Average Injection
9/13/05	1952	H_2O	6338	20/40	80 sks	19
9/13/05	1600	H_2O	5068	20/40	60 sks	19.5
9/13/05	1713	H_2O	8886	20/40	100 sks	18.4
9/13/05	1722	H_2O	5254	20/40	60 sks	18
9/13/05	1730	H_2O	8493	20/40	100 sks	18.2
9/13/05	1738	H_2O	5776	20/40	60 sks	18.1

Natural Open Flow	0	Natural Rock Pressure	50 psig Hours 2 Days
After Treatment Open Flow	Show Gas/Oil	After Treatment Rock Pressure	150 psig Hours 2 Days

Well Service Companies -- Provide the name, address, and phone number of all well service companies involved.

Name	Address	City - State - Zip	Phone
Dallas-Morris Drilling, Inc.	29 Morris Lane	Bradford, PA. 16701	814 362-6493
R&R Ventures Ltd.	15640 Tionesta Rd.	Pleasantville, PA. 16341	814 589-7051
Appalacian Well Services, Inc.	P.O. Box 636	Indiana, PA 15701	724 354-4400

COMPLETION REPORT

Perforation Record			Stimulation Record						
	Interval Perforated				Fluid		Propping Agent		Average
Date	From	To	Date	Interval Treated	Type	Amount	Type	Amount	Injection Rate
9/12/05	1742	9	9/13/05	1742	H_2O	5083	20/40	60 sks	18
9/12/05	1746		9/13/05	1746	H_2O	5029	20/40	50 sks	17
9/12/05	1780		9/13/05	1780	H_2O	4672	20/40	50 sks	17.7
9/12/05	1824		9/13/05	1824	H_2O	6487	20/40	80 sks	18.2
9/12/05	1828		9/13/05	1828	H_2O	8832	20/40	100 sks	18

OTTER EXPLORATION, INC.

Ishman 11

Well API # 37-083-50070-00

LOG OF FORMATIONS

Well API#: 37-083-50070-00-00

(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

Well Operator's Signature

John McNally

Title: President

Date: 11/7/05

DEP USE ONLY

Reviewed by:

Date: 27 Dec 05

Comments:

DALLAS MORRIS DRILLING, INC.

WELL OWNER: Otter Exploration, Inc.	WELL NO.: 1I
LEASE: Ishman	SPUD DATE: 5/23/05
TOWNSHIP: Lafayette	T.D. DATE: 5/24/05
COUNTY: McKean	TOTAL DEPTH: 1960'
PERMIT NO.: 37-083-50070-00	RIG NO.: RD20-4

19	FT	CONDUCTOR CASING	9 5/8"	SIZE	CEMENT
	FT	CONDUCTOR CASING		SIZE	
518.4	FT	SURFACE CASING	7"	SIZE	
	FT	PRODUCTION CASING		SIZE	
90	FT	FRESH WATER DEPTH	2 GPM	SIZE	
160	FT	FRESH WATER DEPTH	4 GPM	SIZE	
190	FT	FRESH WATER DEPTH	10 GPM	SIZE	
Bits Used:					
Fuel Use:	Spud: 22899	T. D.: 23475		Rig Hours:	

TOP	BOTTOM	FORMATIONS	TOP	BOTTOM	FORMATIONS
0	10	Fill & Dirt			
10	15	Coal			
15	60	Shale			
60	85	Brown Shale			
85	125	Shale			
125	200	Sand			
200	440	Shale			
440	500	Red Rock			
500	525	Sand & Shale			
525	715	Red Rock			
715	785	Sand & Shale			
785	830	Red Rock			
830	910	Sand			
910	1190	Shale			
1190	1245	Sand (gas)			
1245	1260	Red Rock			
1260	1335	Shale			
1335	1340	Red Rock			
1340	1510	Shale			
1510	1560	Sand (gas)			
1560	1630	Shale			
1630	1670	Sand (gas)			
1670	1820	Shale			
1820	1855	Sand			
1855	1960	Shale			
1960		Total Depth			

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

Well Record and Completion Report

DEP USE ONLY	
Site ID	Primary Fac ID: 661819
Client Id: 207300	Subfacility Id

Operator	DEP ID#	Well API # (Permit / Reg)	Project Number	Acres
OTTER EXPLORATION INC	207300	37-083-50070-00	OEI-2	

Address	Well Farm Name & Well #	Serial #
104 COLLEGE ST, PO BOX 2239	ISHMAN 1I	

City	State	Zip Code	County	Municipality
HUDSON	OH	44236	McKean	Lafayette

Phone	Fax	USGS 7.5 min. quadrangle map
(330) 650-6754		Cyclone

Check all that apply: [X] Original Well Record [X] Original Completion Report [ ] Amended Well Record [ ] Amended Completion Report

WELL RECORD

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

Well Type: [ ] Gas [ ] Oil [X] Combination Oil & Gas [ ] Injection [ ] Storage [ ] Disposal

Drilling Method: [X] Rotary – Air [ ] Rotary – Mud [ ] Cable Tool

Date Drilling Started	Date Drilling Completed	Surface Elevation	Total Depth – Driller	Total Depth - Logger
5/23/05	5/24/05	2103 ft.	1971 ft.	1971 ft.

Casing and Tubing

Cement returned on surface casing? [ ] Yes [X] No

Cement returned on coal protective casing? [ ] Yes [ ] No [X] N/A

Hole Size	Pipe Size	Wt.	Thread / Weld	Amount in Well (ft)	Material Behind Pipe Type and Amount	Packer / Hardware / Centralizers Type	Size	Depth	Date Run
10"	9 5/8"		T&C	19					
8 3/4"	7"		T&C	518.4	80 sks class A Cement	2 centralizers	7" x 10"	100' 380'	5/26/05
	2"		T&C	1858					

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RECEIVED JAN 17 2006

RECEIVED APR 14 2006

ENVIRONMENTAL PROTECTION NORTHWEST REGIONAL OFFICE

COMPLETION REPORT

Perforation Record

Date	Interval Perforated From	To
9/12/05	1592	
9/12/05	1600	
9/12/05	1713	
9/12/05	1722	
9/12/05	1730	
9/12/05	1738	

Stimulation Record

Date	Interval Treated	Fluid Type	Fluid Amount	Propping Agent Type	Propping Agent Amount	Average Injection
9/13/05	1952	H_2O	6338	20/40	80 sks	19
9/13/05	1600	H_2O	5068	20/40	60 sks	19.5
9/13/05	1713	H_2O	8886	20/40	100 sks	18.4
9/13/05	1722	H_2O	5254	20/40	60 sks	18
9/13/05	1730	H_2O	8493	20/40	100 sks	18.2
9/13/05	1738	H_2O	5176	20/40	60 sks	18.1

Natural Open Flow	Show Gas	Natural Rock Pressure	100 psig	Hours	7 Days
After Treatment Open Flow	15 Mcf / 3 BOPD	After Treatment Rock Pressure	400 psig	Hours	7 Days

Well Service Companies -- Provide the name, address, and phone number of all well service companies involved.

Name	Name	Name
Dallas-Morris Drilling, Inc.	R & R Ventures Ltd.	Appalacian Well Services, Inc.
Address: 29 Morris Lane	Address: 15640 Tionesta Rd.	Address: P.O. Box 636
City - State - Zip: Bradford, PA. 16701	City - State - Zip: Pleasantville, PA. 1634	City - State - Zip: Indiana, PA 15701
Phone: 814 362-6493	Phone: 814 589-7051	Phone: 724 354-4400

COMPLETION REPORT

Perforation Record			Stimulation Record						
	Interval Perforated				Fluid		Propping Agent		Average
Date	From	To	Date	Interval Treated	Type	Amount	Type	Amount	Injection Rate
9/12/05	1742	9	9/13/05	1742	H_2O	5083	20/40	60 sks	18
9/12/05	1746		9/13/05	1746	H_2O	5029	20/40	50 sks	17
9/12/05	1780		9/13/05	1780	H_2O	4672	20/40	50 sks	17.7
9/12/05	1824		9/13/05	1824	H_2O	6487	20/40	80 sks	18.2
9/12/05	1828		9/13/05	1828	H_2O	8832	20/40	100 sks	18

OTTER EXPLORATION, INC.

Ishman 11

Well API # 37-083-50070-00

5500-FM-OG0004 Rev. 2/2001

LOG OF FORMATIONS

Well API#: 37-083-50070-00-00

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

ormation Name or Type	Top (feet)	Bottom (feet)	Gas at (feet)	Oil at (feet)	Water at (fresh / brine; ft.)	Source of Data

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NORTHWEST REGIONAL OFFICE

RECEIVED
JAN 09 2006
ENVIRONMENTAL PROTECTION
NORTHWEST REGIONAL OFFICE

Ishman 1i

Well Operator's Signature

Title: President Date: 1/6/06

DEP USE ONLY

Reviewed by: Date: 22 MAR 06

Comments:

DALLAS-MORRIS DRILLING, INC.

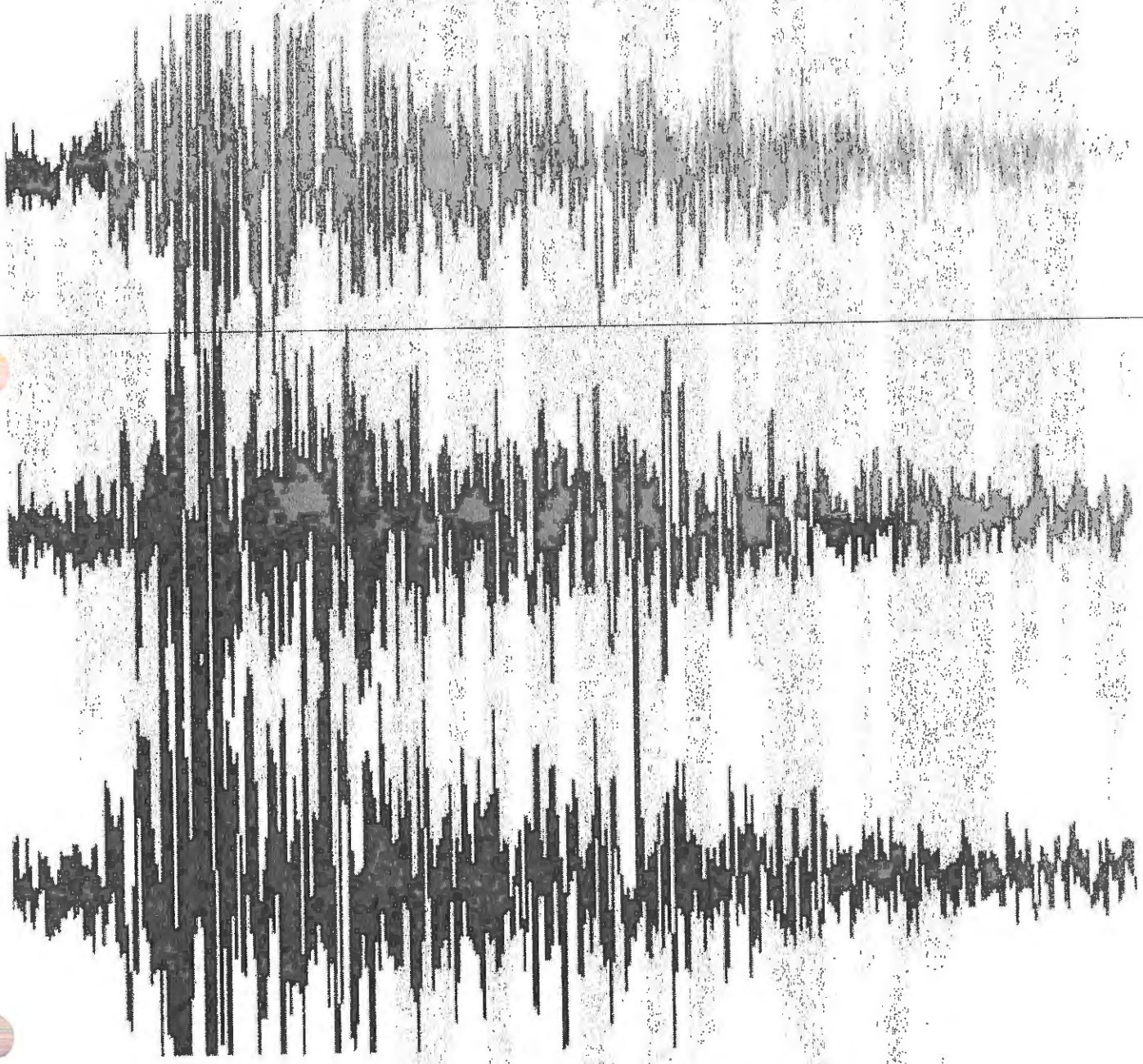
WELL OWNER: Otter Exploration, Inc.	WELL NO.: 1I
LEASE: Ishman	SPUD DATE: 5/23/05
TOWNSHIP: Lafayette	T.D. DATE: 5/24/05
COUNTY: McKean	TOTAL DEPTH: 1960'
PERMIT NO.: 37-083-50070-00	RIG NO.: RD20-4

19	FT	CONDUCTOR CASING	9 5/8"	SIZE	CEMENT
	FT	CONDUCTOR CASING		SIZE	
518.4	FT	SURFACE CASING	7"	SIZE	
	FT	PRODUCTION CASING		SIZE	
90	FT	FRESH WATER DEPTH	2 GPM	SIZE	
160	FT	FRESH WATER DEPTH	4 GPM	SIZE	
190	FT	FRESH WATER DEPTH	10 GPM	SIZE	
Bits Used:					
Fuel Use:	Spud: 22899	T. D.: 23475	Rig Hours:		

TOP	BOTTOM	FORMATIONS	TOP	BOTTOM	FORMATIONS
0	10	Fill & Dirt			
10	15	Coal			
15	60	Shale			
60	85	Brown Shale			
85	125	Shale			
125	200	Sand			
200	440	Shale			
440	500	Red Rock			
500	525	Sand & Shale			
525	715	Red Rock			
715	785	Sand & Shale			
785	830	Red Rock			
830	910	Sand			
910	1190	Shale			
1190	1245	Sand (gas)			
1245	1260	Red Rock			
1260	1335	Shale			
1335	1340	Red Rock			
1340	1510	Shale			
1510	1560	Sand (gas)			
1560	1630	Shale			
1630	1670	Sand (gas)			
1670	1820	Shale			
1820	1855	Sand			
1855	1960	Shale			
1960		Total Depth			

Educational Series 10

Earthquake Hazard in Pennsylvania



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF
CONSERVATION AND NATURAL RESOURCES
BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY

COMMONWEALTH OF PENNSYLVANIA
Edward G. Rendell, Governor
DEPARTMENT OF
CONSERVATION AND NATURAL RESOURCES
Michael DiBerardinis, Secretary
OFFICE OF CONSERVATION AND ENGINEERING SERVICES
Larry G. Williamson, Deputy Secretary
BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY
Jay B. Parrish, Director

Pennsylvania web site: www.state.pa.us
Department of Conservation and Natural Resources
web site: www.dcnr.state.pa.us
Bureau of Topographic and Geologic Survey web site:
www.dcnr.state.pa.us/topogeo

First Edition, June 1989
Second Edition, May 2003
Third Printing, Slightly Revised, June 2006
Fourth Printing, June 2007

ON THE COVER: A seismograph recording (in purple-blue) of a Richter magnitude 5.3 earthquake that had an epicenter near Au Sable Forks, N. Y. It includes all three components of ground motion: vertical (top), north-south (middle) and east-west (bottom). Recorded at Millersville University, Millersville, Pa., on April 20, 2002.

Educational Series 10

Earthquake Hazard in Pennsylvania

by Charles K. Scharnberger
Millersville University

PENNSYLVANIA GEOLOGICAL SURVEY
FOURTH SERIES
HARRISBURG

2003

Contents

Earthquake Hazard in Pennsylvania

by
Charles K. Scharnberger

Introduction

Compared to other states, especially California and Alaska, Pennsylvania is relatively free of earthquake activity. Even considering only the eastern half of North America, Pennsylvania has experienced fewer and milder earthquakes than most other states or Canadian provinces. Nevertheless, earthquakes do occur in our commonwealth, and Pennsylvania may be subject to the effects of earthquakes that have epicenters located outside our borders. Therefore, it is worth considering how much hazard earthquakes present to Pennsylvanians.

What Is an Earthquake?

Earthquakes occur when there is a sudden release of stored energy from a portion of a fault plane within the earth. Faults are fractures in the lithosphere—the rather brittle outer layer of the solid earth. Energy in the form of ***strain,*** small elastic distortion of the lithosphere, accumulates over a period of time due to ***stress*** acting on the rock of the lithosphere. The origin of this stress is believed by most geophysicists to be slow convective motion, driven by heat energy, which occurs below the lithosphere in the mantle. One consequence of this convection is the fragmentation of the lithosphere into tectonic plates, and the slow movement of these plates relative to each other. Much of our understanding of earthquakes, as well as other geologic phenomena such as volcanic eruptions and mountain building, is based on this theory of ***plate tectonics.***

The rock of the lithosphere can accommodate only so much strain energy. Eventually, the rock must fracture. When this happens, strain is relieved, the stress level drops, some energy is converted into heat, some movement (slip) occurs along the plane of fracture (the fault plane), and some energy is radiated away from the area of fracture in the form of elastic waves—called ***seismic waves***—which travel through the earth or along the surface of the earth. The arrival of these seismic waves at a point on the surface causes rapid and complex motions of the ground. This is what we feel as an earthquake. Once a

fault has formed as the result of an initial fracture, earthquakes are likely to recur along the same fault, because this plane is now a zone of weakness in the lithosphere.

Figure 1 shows the relationship of a fault plane to the origin point of the seismic waves (called the ***hypocenter*** or ***focus*** of the earthquake) and the ***epicenter,*** the point on the surface of the earth directly above the hypocenter. Note that, unless the attitude of the fault plane is vertical, the epicenter will be located some distance from the trace of the fault along the surface of the earth.

Earthquake Magnitude

Seismic waves are detected and measured by seismographs. The energies of earthquakes are compared on the basis of their magnitudes, a concept first defined in the 1930s by Charles Richter of the California Institute of Technology. Richter wished to have a single number to describe an earthquake, independent of the distance from the epicenter at which the earthquake waves were recorded. The system he devised is commonly called the ***Richter Scale,*** a term that

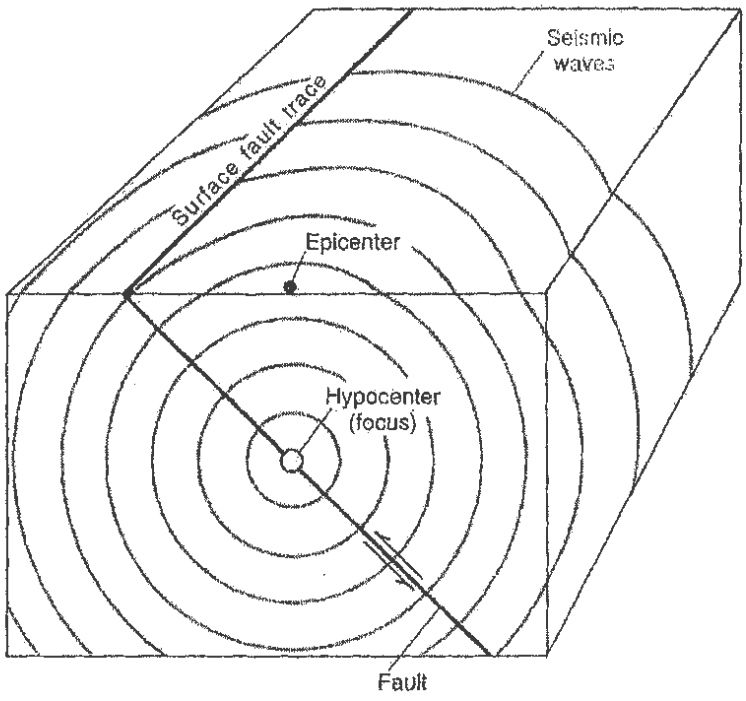


Figure 1. Relationships among the fault plane, the fault trace on the surface of the earth, the earthquake hypocenter (focus), the epicenter, fault slip (arrows), and seismic waves. (Based on Plummer, C. C., and McGeary, David, Physical geology, 4th ed., Wm. C. Brown Publishers, Figure 16.2, p. 345. Copyright © 1988. Reproduced with permission of The McGraw-Hill Companies.)

frequently leads to the mistaken impression that there is a kind of physical instrument—a scale similar to those used to measure weights—to which the term applies. In fact, the Richter Scale—Richter himself preferred to call it the *magnitude scale*—is a scale of numbers that expresses the relative sizes of earthquakes. The numbers of the magnitude scale are logarithms, that is, numbers that express powers of 10. As originally defined by Richter on the basis of California earthquakes recorded locally on a particular type of seismograph, the magnitude represented the maximum amount of ground movement at a distance of 100 kilometers (62 miles) from the epicenter of an earthquake. Each whole number on the scale represented a tenfold difference in this amplitude of ground motion.

As the concept of magnitude came to be used worldwide and had to be calculated from many different types of seismographs, new ways of defining the magnitude were introduced, so that today several different magnitude numbers might be found for the same earthquake. Thus, magnitudes are useful mostly for comparing earthquakes (the purpose Richter had in mind), rather than for finding the actual energy of an earthquake with more than rough precision.

There is no upper or lower limit to the Richter Scale, but as a matter of historical fact, no magnitude greater than about 9.5 has ever been calculated for an earthquake. Earthquakes in eastern North America seldom have magnitudes greater than 5.

Earthquake Intensity

Before the development of the magnitude scale, earthquakes were compared on the basis of *intensity*. Today, intensity values are an important supplement to the magnitudes because intensity is a semiquantitative expression of the effects caused by an earthquake. These may be effects on people, on man-made structures, or on natural features of the landscape. Intensities are determined after the earthquake on the basis of field observations made by trained personnel, or from survey forms filled out by persons who experienced the earthquake. The U.S. Geological Survey (USGS) uses reports sent in by postmasters and compiles intensity data by postal ZIP code.

Obviously, intensity is not a single number for a particular earthquake, but varies from place to place. Usually, the intensity is greatest in the immediate vicinity of the epicenter and decreases with increasing distance from the epicenter. However, many factors affect intensity; among them are topography, type and thickness of soil, direction from the epicenter relative to regional rock structure, and type of

bedrock. The greatest intensities are commonly caused by landslides or other modes of ground failure induced by the seismic waves rather than by the direct effects of seismic shaking.

In the United States, intensities are expressed in terms of the *Modified Mercalli scale.* This scale was first proposed in Italy by Giuseppi Mercalli in the early 1900s and was modified in 1931 by the American seismologists H. O. Wood and F. Neumann (for this reason, it is also called the Wood-Neumann scale). Table 1 is an abridged version of the Modified Mercalli scale; Roman numerals are usually used to avoid confusion with earthquake magnitude.

Earthquakes Beyond Pennsylvania

Historically, large earthquakes have occurred in three regions of eastern North America: (1) the Mississippi Valley, especially near the town of New Madrid, Mo.; (2) the St. Lawrence Valley; and (3) Charleston, S. C.

New Madrid, Missouri

Three great earthquakes struck the vicinity of New Madrid in December 1811, January 1812, and February 1812. Although there were no seismographs to record these events, each earthquake in the series is estimated to have had a magnitude in excess of 7. These earthquakes were felt in western Pennsylvania, but no damage is known to have occurred there (Abdypoor and Bischke, 1982; all other references to the effects of large historic earthquakes in Pennsylvania are from this source). It is unlikely that future New Madrid earthquakes would be any greater than those of 1811–12, so Pennsylvanians probably do not have to worry about a threat from that quarter.

The St. Lawrence Region

One of the largest earthquakes in eastern North America occurred on February 28, 1925, and had an epicenter in the La Malbaie-Charlevoix region of Quebec. This earthquake had a magnitude near 7. Earthquakes having magnitudes estimated to have exceeded 6.5 occurred in the same region in 1663 and 1870 (Johnston and others, 1994; most magnitudes given in this section are from this source). At least a dozen earthquakes strong enough to be felt in Pennsylvania have originated in the St. Lawrence Seismic Zone since the time of European settlement, the most recent on November 25, 1988. Earthquake activity in Ontario, western New York, northwestern Pennsyl-

Table 1. ***The Modified Mercalli Scale of 1931 (Abridged Version)***

I. Not felt except by a very few under especially favorable circumstances.

II. Felt only by a few persons at rest, especially on the upper floors of buildings. Delicately suspended objects may swing.

III. Felt quite noticeably indoors, especially on the upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration is like the passing of a truck. Duration is estimated.

IV. During the day felt indoors by many, outdoors by few. At night some are awakened. Dishes, windows, and doors are disturbed; walls make a creaking sound. Sensation is like a heavy truck striking a building. Standing motor cars are rocked noticeably.

V. Felt by nearly everyone; many are awakened. Some dishes, windows, etc., are broken; a few instances of cracked plaster occur; unstable objects are overturned. Disturbance of trees, poles, and other tall objects is sometimes noticed. Pendulum clocks may stop.

VI. Felt by all; many are frightened and run outdoors. Some heavy furniture is moved; a few instances of fallen plaster or damaged chimneys occur. Damage is slight.

VII. Everybody runs outdoors. Damage is *negligible* in buildings of good design and construction; *slight* to *moderate* in well-built ordinary structures; *considerable* in poorly built or badly designed structures. Some chimneys are broken. Noticed by persons driving motor cars.

VIII. Damage is *slight* in specially designed structures; *considerable* in ordinary substantial buildings, with partial collapse; *great* in poorly built structures. Panel walls are thrown out of frame structures. Chimneys, factory stacks, columns, walls, and monuments fall; heavy furniture is overturned. Sand and mud are ejected from the ground in small amounts. Changes occur in well water. Persons driving motor cars are disturbed.

IX. Damage is *considerable* in specially designed structures; well-designed frame structures are thrown out of plumb; damage is *great* in substantial buildings, with partial collapse. Buildings are shifted off their foundations. Ground is cracked conspicuously. Underground pipes are broken.

X. Some well-built wooden structures are destroyed; most masonry and frame structures are destroyed along with their foundations. Ground is badly cracked. Rails are bent. Considerable landslides occur on river banks and steep slopes. Sand and mud are shifted. Water is splashed (slopped) over banks.

XI. Few, if any, masonry structures remain standing. Bridges are destroyed. Broad fissures occur in the ground. Underground pipelines are completely out of service. Earth slumps and land slips occur in soft ground. Rails are bent greatly.

XII. Damage is total. Waves are seen on the ground surface. Lines of sight and level are distorted. Objects are thrown upward into the air.

vania, and eastern Ohio may represent a westward extension of this zone. An earthquake of unknown magnitude with an epicenter near Attica, N. Y., is reported to have cracked walls in Sayre (Bradford County), Pa., on August 12, 1929. On November 1, 1935, an earthquake with an epicenter near Timiskaming, Ontario (northwest of the St. Lawrence Seismic Zone proper), and an estimated magnitude of 6.4, was felt with intensity IV in northwestern Pennsylvania and, at lower intensities, throughout the commonwealth. The lower St. Lawrence region is too far away for even a large future earthquake to be likely to cause damage in Pennsylvania. If an earthquake having a magnitude of 6 or greater were to occur on the western extension of the St. Lawrence Seismic Zone, however, at least moderate damage might be expected in one or more of the counties of Pennsylvania's "northern tier."

Charleston, South Carolina

Charleston was the site of the largest historic earthquake to have struck the eastern seaboard of the United States, and one of the 10 largest earthquakes to occur anywhere in the world away from an active tectonic plate margin. The earthquake on August 31, 1886, had a magnitude estimated to have been around 7.5. Intensity reached X on the Modified Mercalli scale, and the city of Charleston was heavily damaged. Although this earthquake was felt in most of Pennsylvania, intensity here did not exceed IV, so a recurrence of the great Charleston earthquake would pose little hazard to Pennsylvanians.

Other East Coast Areas

Eastern Massachusetts experienced strong earthquake shocks in 1658, 1727, 1755, and 1925. The largest of these was the earthquake of November 18, 1755, which had an estimated magnitude of about 6.3. The epicenter is generally thought to have been offshore of Cape Ann, north of Boston, although the exact location is uncertain. This earthquake was felt with intensities of IV and V in eastern Pennsylvania. Intensity as high as VI might be expected from a magnitude 7 earthquake originating in the vicinity of Boston.

Southeastern New York and northern New Jersey have been the sites of moderate earthquakes. Two of these events, in 1737 and 1884, produced intensities as high as VII in New York City and were felt at intensity IV in eastern Pennsylvania. If an earthquake of magnitude 6 or greater were to occur in this area, it is likely that damage would result in the easternmost counties of Pennsylvania.

Earthquakes in Pennsylvania

Figure 2 shows the locations of historic epicenters in Pennsylvania; a list of Pennsylvania earthquakes by county is given in Table 2. Ambiguities always exist in lists of earthquakes, and no two lists for the same region are likely to agree in every detail. Some events identified as earthquakes in some lists may, in fact, have been something else—blasting in the course of mining operations, for example. Table 2 includes only those events that the author considers to be earthquakes with a high degree of certainty. Aftershocks—smaller earthquakes following a larger one in approximately the same location—are listed only if they occurred more than a year after the main shock; otherwise they are mentioned in the "Remarks" column. Earthquakes that can be considered foreshocks of larger events have been listed separately from their main shocks only if they occurred months to years earlier. It is likely that some earthquakes having magnitudes less than 3, other than aftershocks, have occurred in Pennsylvania but were not detected by seismographs or recognized as earthquakes and reported by persons who felt them. It is also possible that evidence for some earthquakes that occurred prior to the mid-twentieth century has not yet been discovered in historical documents. For example, the entire earthquake history of Lancaster County prior to 1885 was unknown to the scientific community until Armbruster and Seeber (1987) published the results of their search of newspapers and other archives.

Earthquakes having magnitudes greater than 5 can occur in Pennsylvania, as demonstrated by the earthquake of September 25, 1998 (Armbruster and others, 1998) (Table 2, Crawford County). Southeastern Pennsylvania, the state's most seismically active region, is not known to have experienced an earthquake with magnitude greater than 4.7, but the historical record goes back only about 200 years. No obvious reason exists to conclude that an earthquake of magnitude between 5 and 6 could not occur there also. An earthquake with magnitude greater than 6 is much less likely, but the fact that such large earthquakes have occurred elsewhere in the East means that this possibility cannot be ruled out entirely for Pennsylvania.

What is the Level of Earthquake Hazard in Pennsylvania?

Geologic History and Faults

The great majority of earthquakes occur along boundaries between tectonic plates. The reason for this is not completely clear, but it appears

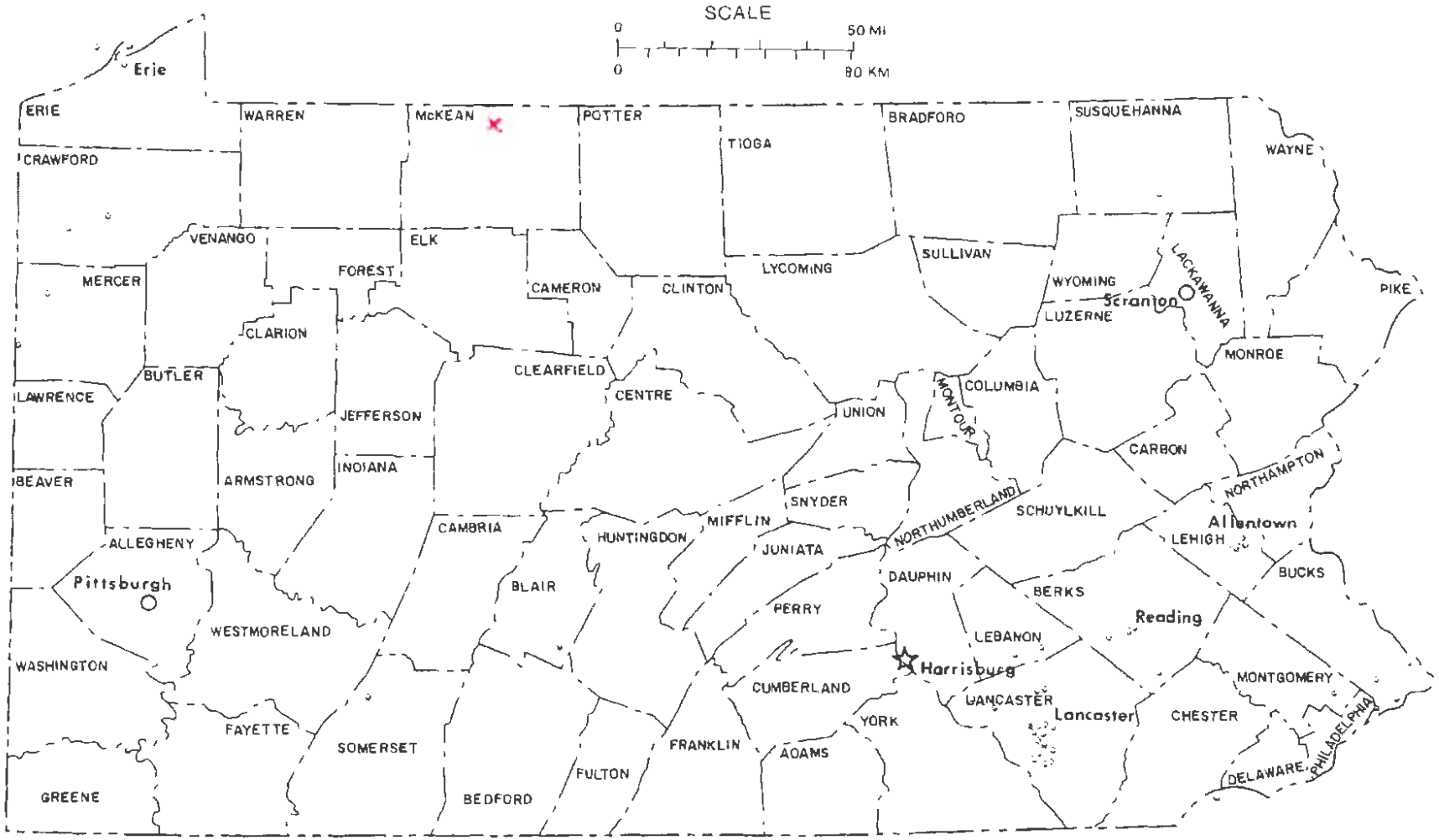


Figure 2. Locations of historic earthquake epicenters in Pennsylvania. Many locations are approximate.

Table 2. ***Selected Earthquakes in Pennsylvania Through March 2006***

Date (local time)		Where strongly felt	Magnitude	Remarks
		ADAMS COUNTY		
May 26,	1994		2.8	
		BERKS COUNTY		
Nov. 21,	1777	Unknown	Unknown	
May 28,	1906	Geigertown	Unknown	
June 8,	1937	Reading	Unknown	
Jan. 7,	1954	Sinking Spring	3.2 (est.)	Aftershocks for 1 year
June 25,	1972	Wyomissing	Unknown	Start of series of small earthquakes lasting a few days
Aug. 12,	1973	Wyomissing	Unknown	
May 10,	1993	Spring Twp.	2.8	
Jan. 15,	1994	Spring Twp.	4.0, 4.6	Two events about 1 hour apart. Long aftershock sequence into the late 1990s
Oct. 28,	1996	Wyomissing	2.5	May be delayed aftershock of Jan. 15, 1994, earthquake
		BLAIR COUNTY		
July 15,	1938	Clover Creek	3.2 (est.)	
		BUCKS COUNTY		
Dec. 27,	1961	Bristol-Levittown	Unknown	Epicenter may have been in New Jersey
Nov. 14,	1981	Bristol-Levittown	Unknown	Epicenter may have been in New Jersey
Apr. 12,	1982	Bristol-Levittown	2.5	Epicenter may have been in New Jersey
May 12,	1982	Bristol-Levittown	2.5	Epicenter may have been in New Jersey
May 12,	1982		2.4	
May 10,	1984		2.2	
Feb. 2,	1989		Unknown	
		CENTRE COUNTY		
Mar. 25,	1937		Unknown	
Aug. 15,	1991	Centre Hall	3.0	
		CHESTER COUNTY		
Dec. 17,	1752		3.6	
Jan. 25,	1821	New London	3.1	
Oct. 17,	1996	Nottingham	2.3	Epicenter may have been in Maryland
		CRAWFORD COUNTY		
Sept. 15,	1852	Meadville	Unknown	
Apr. 14,	1985	Conneaut Lake	3.2	
Sept. 25,	1998	Jamestown (Mercer Co.)	5.2	Largest known Pennsylvania earthquake; many aftershocks
		ERIE COUNTY		
Nov. 1,	1870	Erie	3.5	
Sept. 26,	1921	Erie	2.9	
Feb. 16,	1930	Erie	2.9	
Oct. 29,	1934	Erie	3.2 (est.)	Strongest aftershock felt at Albion on Nov. 5
Dec. 17,	1990	Erie	2.5	
Aug. 30,	1998	Erie	2.1	
Oct. 30,	1999	Erie	2.5	
		FAYETTE COUNTY		
Dec. 8,	1896	Dunbar	3.8	
Oct. 8,	1965	Connellsville	3.3	
		FRANKLIN COUNTY		
Mar. 19,	1880	Chambersburg	3.5	Epicenter may have been in Maryland

Table 2. *Continued.*

Date (local time)		Where strongly felt	Magnitude	Remarks
		LACKAWANNA COUNTY		
Sept. 27,	1940	Unknown	Unknown	May be mining-related event
		LANCASTER COUNTY		
Dec. 17,	1752	Lancaster	3.6 (est.)	Epicenter may have been in Chester County
Jan. 11,	1798	Lancaster	Unknown	
Nov. 20,	1800	Lititz	3.9 (est.)	
Jan. 27,	1801	Lancaster	Unknown	
Mar. 19,	1818	Lancaster	Unknown	
Aug. 21,	1820	Mt. Joy	3.4 (est.)	
May 4,	1822	Lancaster	Unknown	
May 1,	1825	Millersville	3.1	Reported from "Millerstown," which was the name of present-day Millersville in 1825
Sept. 5,	1829	Lancaster	Unknown	
Feb. 5,	1834	Marticville	3.8 (est.)	
Jan. 20,	1861	Lancaster	3.5	
Sept. 17,	1865	Willow Street	Unknown	
Nov. 7,	1866	Lancaster	Unknown	
Mar. 8,	1885	Lancaster	Unknown	
Sept. 26,	1886	Elizabethtown	Unknown	
Mar. 8,	1889	Conestoga	4.1 (est.)	
May 6,	1892	Terre Hill	Unknown	
Dec. 7,	1972	Lititz	3.5 (est.)	
July 16,	1978	Conestoga	3.1	
Oct. 6,	1978	Manheim Twp.	3.0	
Apr. 22,	1984	Marticville	4.1	Magnitude 3 foreshock 4 days earlier; many aftershocks
Sept. 19,	1984	Lancaster	Unknown	
May 2,	1986	Conestoga	2.6	May be delayed aftershock of Apr. 22, 1984, earthquake
Mar. 11,	1995	East Petersburg	2.0, 2.4	Two events about 1 hour apart
Nov. 14,	1997	Lititz	3.0	
Oct. 5,	2000	Conestoga	2.3	May be delayed aftershock of Apr. 22, 1984, earthquake
		LEBANON COUNTY		
Jan. 15,	1885	Schaefferstown	2.7 (est.)	
May 12,	1964	Cornwall	3.2 (est.)	
		LEHIGH COUNTY		
May 31,	1884	Allentown	2.9 (est.)	
May 31,	1908	Allentown	3.1 (est.)	
June 22,	1928	Allentown	2.4 (est.)	
Nov. 23,	1951	Allentown	3.3 (est.)	
Sept. 14,	1961	Allentown	Unknown	
		LUZERNE COUNTY		
Feb. 24,	2000		2.3	
		MERCER COUNTY		
Aug. 17,	1873	Sharon	Unknown	Epicenter may have been in Ohio
Dec. 11,	1890	Greenville	2.9	
Aug. 26,	1936	Greenville	2.9	
		MONROE COUNTY		
Oct. 24,	1942	Stroudsburg	3.4	Epicenter may have been in New Jersey
		MONTGOMERY COUNTY		
Mar. 5,	1980	Abington	3.5	Strongest of a series of 6 earthquakes over 9 days felt in Montgomery and lower Bucks Counties

Table 2. *Continued.*

Date (local time)		Where strongly felt	Magnitude	Remarks
		PHILADELPHIA AREA[1]		
Dec. 18,	1737			
Nov. 27,	1755			
Mar. 23,	1758			
Mar. 22,	1763			
Oct. 13,	1763			
Oct. 30,	1763			
Apr. 25,	1772			
Nov. 22–23,	1777			
Nov. 29,	1780			
Mar. 17,	1800			
Nov. 29,	1800			
Nov. 12,	1801			
Dec. 8–9,	1811			
Dec. 16,	1811			
Jan. 8,	1817			
Aug. 17,	1840			
Nov. 11 and 14,	1840			
June 17,	1871			
Mar. 25,	1879			
		SOMERSET COUNTY		
Feb. 3,	1982	Jennerstown	2.6	
		SULLIVAN COUNTY		
Oct. 28,	1946	Unknown	Unknown	May be mining-related event
		SUSQUEHANNA COUNTY		
Aug. 14,	1982	Hop Bottom	Unknown	
		TIOGA COUNTY		
Dec. 16,	1869	Tioga	3.1	
Dec. 14,	1990	Tioga	3.0	
		WARREN COUNTY		
July 8,	1995	Warren	2.4	
		YORK COUNTY		
June 16,	1997	Dillsburg	2.4	

[1]Earthquakes whose epicenters are unknown and that were felt in Philadelphia.

that stress levels are higher along plate boundaries, and that strain energy builds up more rapidly in those areas. Eastern North America, including Pennsylvania, today is far from the nearest plate boundary—the Mid-Atlantic Ridge, some 2,000 miles to the east. Nevertheless, the eastern states and eastern provinces of Canada do experience a moderate level of earthquake activity, including occasional earthquakes with magnitudes greater than 6 that are capable of producing significant damage. Seismicity in the East may be related to what happened here about 200 million years ago. At that time, the supercontinent called Pangaea broke up and the Atlantic Ocean began to form. This event, called ***rifting*** by geologists, produced many faults, and some of these faults may be experiencing reactivation by the present-day

stress, which is squeezing eastern North America in a roughly east-west direction. Johnston and others (1994) found that nearly 70 percent of earthquakes with magnitudes of at least 6 in so-called stable continental regions occur in areas that experienced rifting sometime during the past 200 million years.

It might seem, then, that a straightforward approach to earthquake hazard evaluation in the East would be to locate all the faults, or at least those that are 200 million years old or younger. Unfortunately, this approach does not work very well because it is impossible to demonstrate that any particular fault is active, even when earthquake epicenters are located in the vicinity of the fault's surface trace. Actual displacement of the earth's surface along a fault line during an earthquake is extremely rare in the East. Complicating the problem is the fact that the vast majority of mapped faults in our region have no seismicity at all associated with them. Therefore, simply knowing where the faults are tells us little, if anything, about earthquake hazard.

Despite the difficulty of identifying specific faults that are responsible for earthquakes in the East, regions of perisistent earthquake activity have been delineated and named. An example in Pennsylvania is the Lancaster Seismic Zone (Armbruster and Seeber, 1987), which encompasses all seismicity in Lancaster, York, Lebanon, and Berks Counties. As indicated in Table 2, this is the most active seismic zone in Pennsylvania.

A Probabilistic Approach

It appears that the best guides to seismic hazard in Pennsylvania and elsewhere in the East are the earthquakes themselves. The earthquake history of a region can be the basis for conducting a probabilistic earthquake-hazard analysis.

As part of the National Earthquake Hazard Reduction Program, seismologists working for the USGS have used earthquake history to estimate the probabilities of earthquakes of various magnitudes occurring in various locations over a given period of time. They have produced a series of maps that show the results as ground-motion hazard maps. These maps have been designed to be useful for the determination of building codes. Usually, 50 years is the time frame considered because that is what architects and structural engineers take to be the useful lifetime of a new building. The expected decrease in intensity with distance from the epicenter is also taken into consideration to arrive at an estimate of the probability that certain levels of ground shaking will be experienced at any given location.

The expected level of ground shaking is expressed in terms of some measure of ground acceleration or velocity, such as the peak hori-

zontal ground acceleration (the largest acceleration recorded during an earthquake). These terms are used because building codes are written to indicate how much horizontal force a building should be able to withstand during an earthquake. Table 3 gives the levels of peak acceleration and the *roughly* equivalent values of earthquake intensity on the Modified Mercalli scale. Figure 3 shows contours of peak horizontal ground acceleration having a 2 percent probability of being experienced in any 50-year period, as calculated by USGS seismologists. The contour values are percentages of the acceleration due to gravity (g), which is 9.8 meters/second/second, or 32 feet/second/second. The original map on which Figure 3 is based, as well as other seismic-hazard maps, may be viewed on the USGS web site at http://eqhazmaps.usgs.gov/.

Table 3. *Approximate Correlation of Peak Horizontal Ground Acceleration (PHGA) with Modified Mercalli Intensity (MMI)*

PHGA (percent of g, acceleration due to gravity)	MMI
<6	<VI
6–8	VI
8–16	VII
16–32	VIII
>32	IX+

The Pennsylvania Department of Environmental Protection requires that structures built in areas that can expect peak horizontal ground acceleration to exceed 10 percent g with a probability of 10 percent in 250 years (which is equivalent to 2 percent probability in 50 years) incorporate specific seismic safety design features.

Conclusion

Two of the areas that have generated the largest historical earthquakes in eastern North America—New Madrid, Mo., and Charleston, S. C.—are too far away for earthquakes having epicenters there to cause damage in Pennsylvania, although earthquakes occurring in those areas that have magnitudes near 7 would be felt in Pennsylvania. Eastern Massachusetts is closer, and a magnitude 7 earthquake there could produce intensity VI effects in northeastern Pennsylvania.

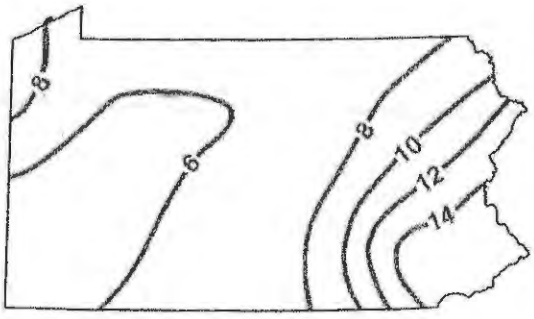


Figure 3. An earthquake-hazard map for Pennsylvania. The contours represent earthquake ground motions that have a 2 percent probability of being experienced in 50 years. The numbers are percentages of g, the acceleration due to gravity. See Table 3 for approximate corresponding values of Modified Mercalli intensity. From Frankel and others (2002).

Similar intensities might be expected in north-central and northwestern Pennsylvania from earthquakes that have epicenters in the western part of the St. Lawrence zone. The possibility that a magnitude 7 earthquake could occur having an epicenter near New York City cannot be completely discounted, and such an earthquake could produce significant damage (intensity VIII) in eastern Pennsylvania.

Pennsylvanians probably will continue to feel small earthquakes generated on local faults, although the exact identity of those faults is likely to remain elusive. A large local earthquake, one with magnitude greater than 6, though unlikely, is not impossible. A probabilistic analysis that takes into consideration the threat from earthquakes both outside and inside Pennsylvania's borders indicates a relatively low level of earthquake hazard in our commonwealth. Nevertheless, some precautions might be in order. These include contingency planning by emergency management agencies and emergency response services; incorporation of at least moderate earthquake resistance into the design of new buildings and other engineered structures, such as bridges and pipelines; and individual preparedness that would include having on hand a flashlight, battery-powered radio, water and food supply, and first-aid kit—as one might prepare for the possibility of a disaster of any sort. Further information about how to prepare for earthquakes and other emergencies may be obtained from the Southeastern Pennsylvania Chapter of the American Red Cross, 23rd and Chestnut Streets, Philadelphia, PA 19103, or from their web site at http://www.redcross-philly.org.

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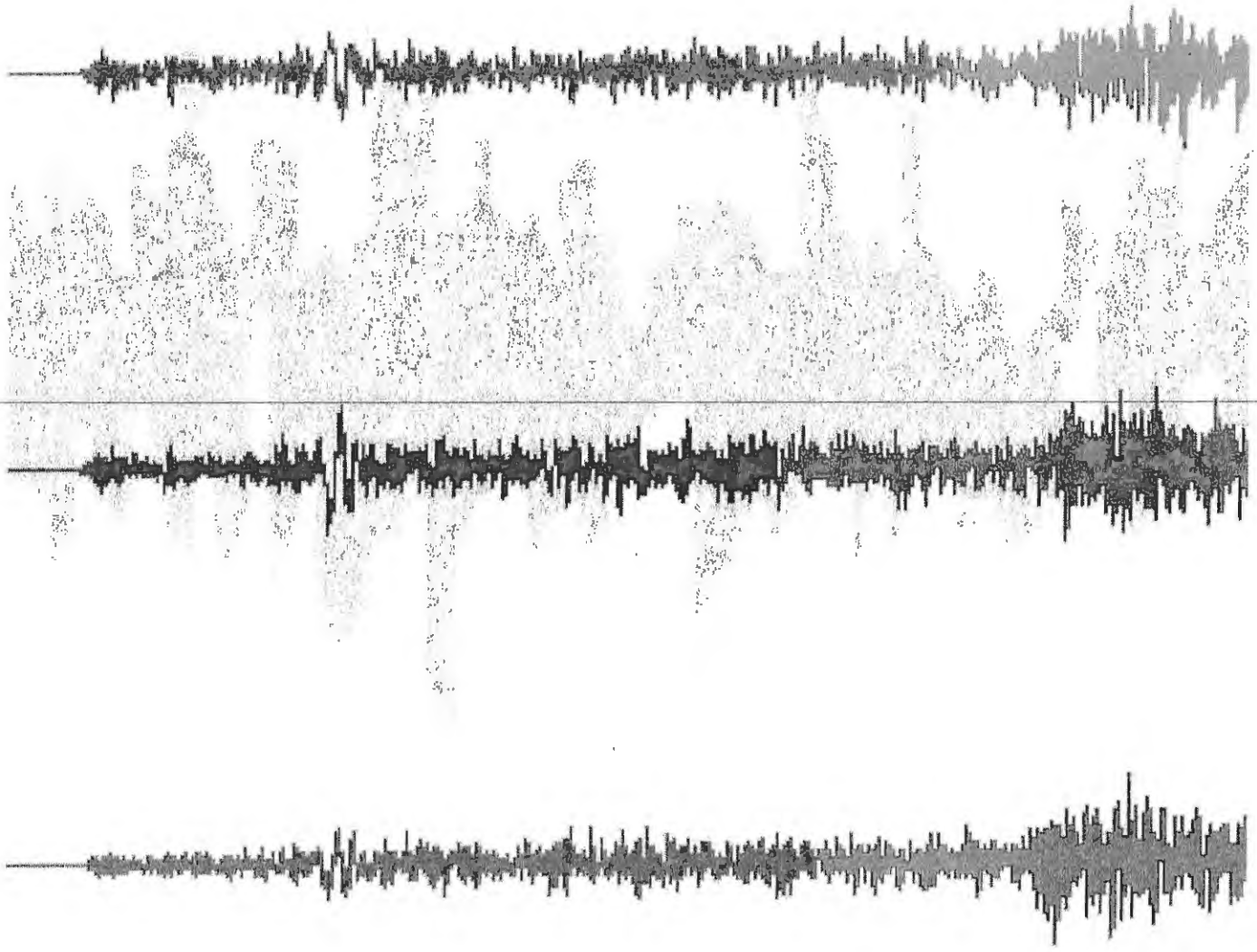
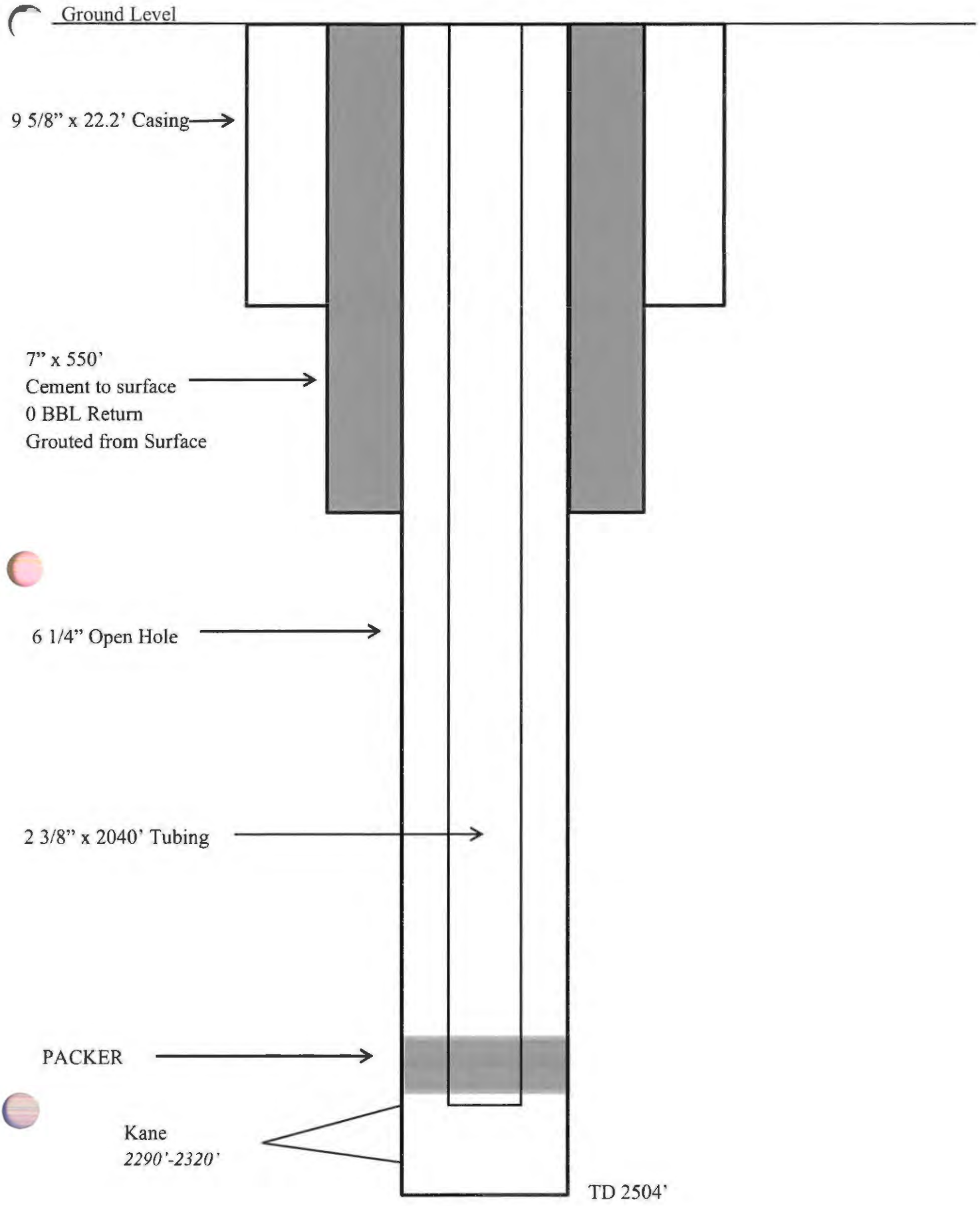


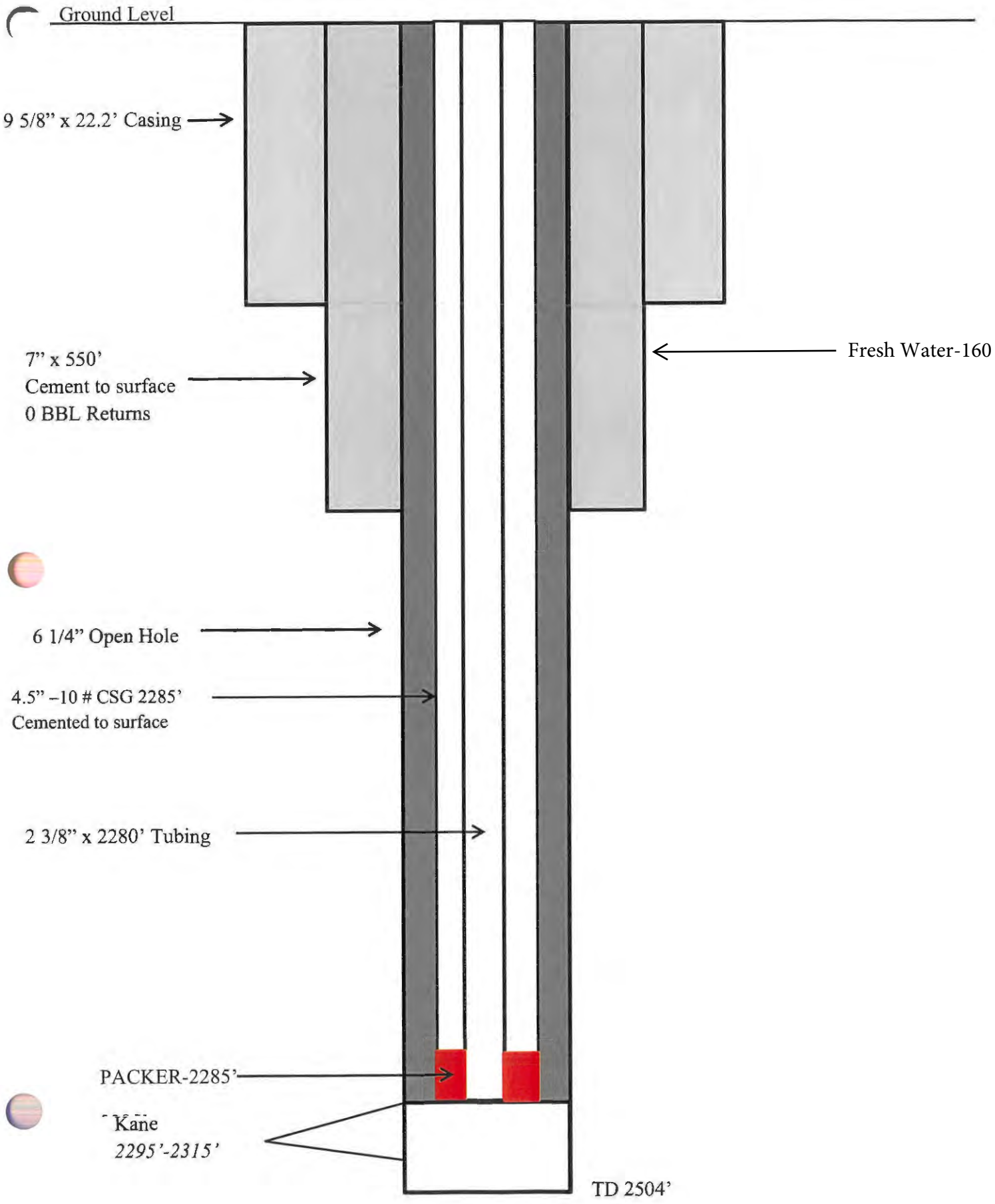
ATTACHEMENT C

Well Construction/ Conversion Information

Construction Diagram McKay Well #7



Well Schematic Diagram McKay 7A – Injection Well



Well Conversion Procedures

1. *Move in service rig and release packer, remove 2-3/8" tbg and packer.*
2. *Set gravel plug at 2290'.*
3. *Run 2285' of 4.5" -10.5# casing with cement shoe and 15 centralizers spaced approximately 150' apart.*
4. *Cement 4.5" casing from 2285' to surface with 218 sks of Class A common cement. Displace cement plug with 37 bbls of water and shut-in. Wait on cement overnight to cure.*
5. *Move in wireline unit to run bond log from bottom of 4.5" to surface.*
6. *Rig up to drill out wooden plug and bridge plug. Flush hole to TD 2500'. Remove work string from well bore.*
7. *Rig up to re-run 2-3/8" tubing with 4.5" packer to be set at 2285'. Prior to setting packer, we will load annular space with condition fluid.*
8. *Install well head and rig up to perform MIT tests.*

Cementing Calculations

1740'—6.25" open hole = 178ft³
550'--- 7" casing = 68 ft³
Total cubic feet = 246

246 / 1.18ft ³ per sks = 208 sks

208 sks x 1.1(10% excess) = 229 sks

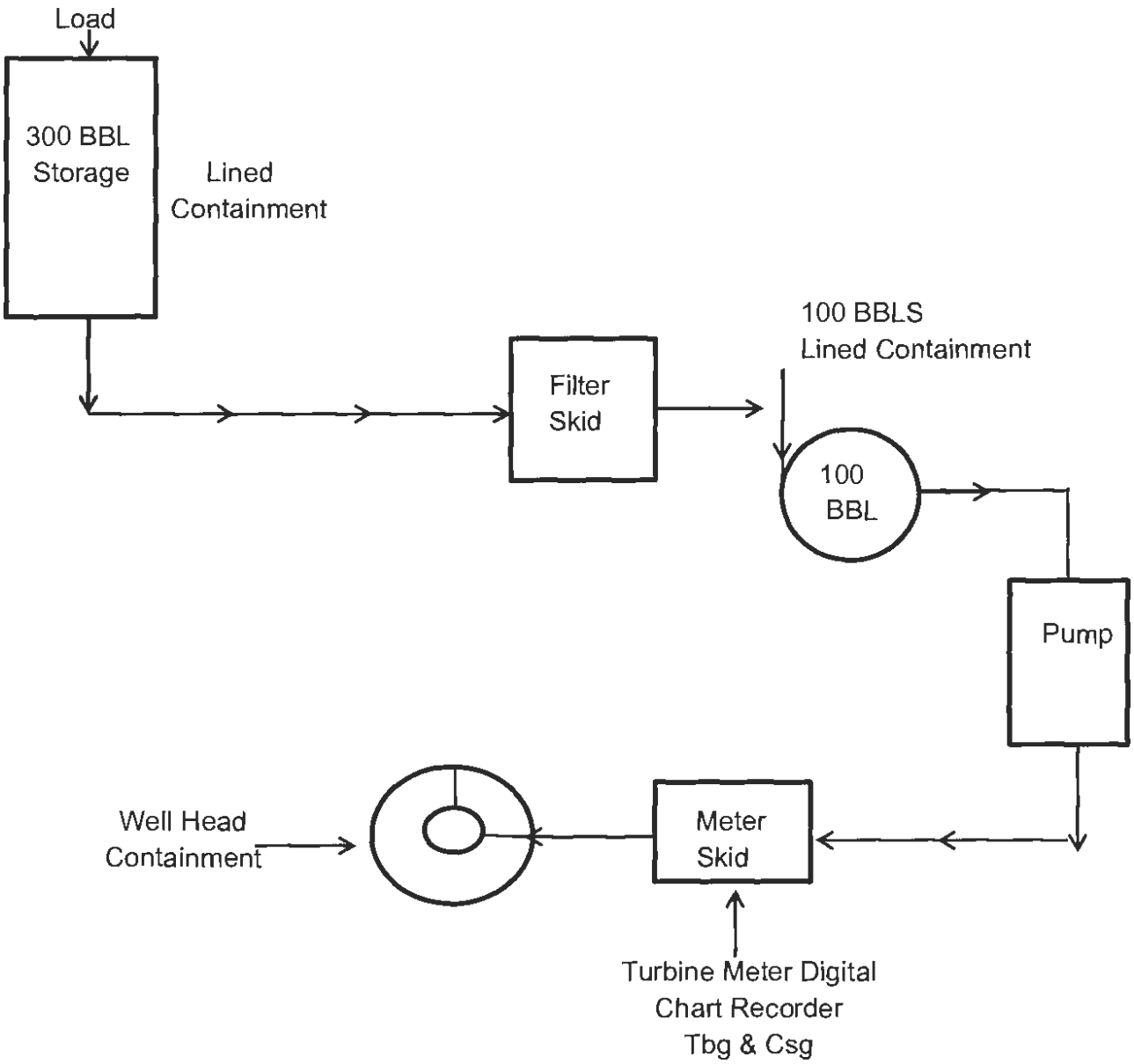
See Attachment B Drillers log and Geophysical log for well completion and cementing records on McKay 7A.

ATTACHEMENT D

Injection Operation and Monitoring Program

Injection Operation and Monitoring Program

FLOW/SURFACE DIAGRAM



CONTINGENCY PLAN

- All tanks will be placed in lined dyke
- A lined containment area will be placed around well head
- If pump is needed High- Low controls will be installed to kill pump if pressures become too high or too low. As well as High-Low flow rates.
- Pressure gauges will be installed on both Tbg & Csg
- Chart recorders installed to chart Csg & Tbg
  Pressures 24 hr/day- 7 days/week
- 4 ½ cement to surface
- Relief Valve set to 1200 psi (max pressure) and plumbed to holding tanks
- Altronic Digital Flow recorder to collect daily and total volume from ½ turbine meter

INJECTION OPERATION

- Average of 100 BBLs/day rate with a maximum of 250 BBLs/day to be injected.
- Fluids will be collected from Sandstone Development, LLC: Moody and Andrus-McDowell, Lot 2284, Lot 16 and Bingham fields located in McKean County PA. The formations fluids are being produced from multiple sands. The names of producing sands are as follows. Bradford 1st, Sugar Run, Chipmunk, Bradford 2nd, Harrisburg Run, Bradford 3rd, Lewis Run and Kane.
- Based on the injection test. Average injection tubing pressure will be on a vacuum with maximum injection pressure being 1250psig. This was based on depth of 2300', an ISIP of 1400 psi and specific gravity of 1.08 for the injection fluid.
- *See attached SG from Microbac Laboratories and Produced Water Analysis from White Oak Laboratory.*
- *Annular fluid volume will be 41 bbls. Fluid matrix will consist of 55 gallons of Biocide mixed with 1667 gallons fresh water.*

WHITE OAK LABORATORY

2997 Ridgway Johnsonburg Road
Ridgway, PA 15853 (814) 772-5927
www.whiteoaklaboratory.com
PA DEP Lab ID 24-05897

May 3, 2024

Jim Barnes
Sandstone Development
464 Bingham Rd.
Cyclone, PA 16726

RE: Project: Brine
White Oak Laboratory ID: 24D0190

Dear Jim Barnes,

Enclosed are the analytical results for the sample(s) received by White Oak Laboratory on April 15, 2024.

Analyses were performed according to our laboratory's quality assurance program and any applicable state requirements. The test results reported herein meet all applicable state and federal requirements unless otherwise noted in project narrative or in the body of the report.

If you have any questions concerning this report, please feel free to contact us.

Sincerely,

Lauren B. Geer
Operations Manager
lauren@whiteoaklaboratory.com

Enclosures

WHITE OAK LABORATORY

2997 Ridgway Johnsonburg Road
Ridgway PA 15853 (814) 772-5927
www.whiteoaklaboratory.com
PA DEP Lab ID 24-05897

REPORT OF LABORATORY ANALYSIS

Client:	Sandstone Development	Sample Collector:	Jim Barnes
Project Manager / Contact:	Jim Barnes	Matrix:	NP
Address:	464 Bingham Road	Date/Time Received:	4/15/2024 14:30
	Cyclone, PA 16726		

White Oak Laboratory Sample ID: 24D0190-1B
Client Sample ID: Brine
Sample Date & Time: 4/15/2024 12:30

Analyte	Method	Result	Quantitation Limit	Units	Date of Analysis	Time of Analysis	Analyst Initials	Qualifers
Bromide	EPA 300.0 Rev. 2.1	916	50.0	mg/L	4/22/2024	18:39	AC	
Chloride	EPA 300.0 Rev. 2.1	92,400	10,000	mg/L	4/22/2024	19:07	AC	
Sulfate	EPA 300.0 Rev. 2.1	476	500	mg/L	4/22/2024	18:39	AC	Q17
pH	SM4500-H+B -2011	6.34	0.10	pH at 20.4°C	4/15/2024	17:04	AC	A7

Notes: Current MDL for Sulfate is 54 mg/L

WHITE OAK LABORATORY

2997 Ridgway Johnsonburg Road
Ridgway PA 15853 (814) 772-5927
www.whiteoaklaboratory.com
PA DEP Lab ID 24-05897

REPORT OF LABORATORY ANALYSIS

Client:	Sandstone Development	Sample Collector:	Jim Barnes
Project Manager / Contact:	Jim Barnes	Matrix:	NP
Address:	464 Bingham Road	Date/Time Received:	4/15/2024 14:30
	Cyclone, PA 16726		

White Oak Laboratory Sample ID: 24D0190-1B
Client Sample ID: Brine
Sample Date & Time: 4/15/2024 12:30

Analyte	Method	Result	Quantitation Limit	Units	Date of Analysis	Time of Analysis	Analyst Initials	Qualifers
Total Dissolved Solids	SM 2540C-2015	150,000	2500	mg/L	4/19/2024	16:00	NM/JC	
Total Suspended Solids	SM 2540D-2015	84	49	mg/L	4/18/2024	15:40	Q5	

Notes:

WHITE OAK LABORATORY

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PA DEP Lab ID 24-05897

REPORT OF LABORATORY ANALYSIS

Client:	Sandstone Development	Sample Collector:	Jim Barnes
Project Manager / Contact:	Jim Barnes	Matrix:	NP
Address:	464 Bingham Road	Date/Time Received:	4/15/2024 14:30
	Cyclone, PA 16726		

White Oak Laboratory Sample ID: 24D0190-1B
Client Sample ID: Brine
Sample Date & Time: 4/15/2024 12:30

Analyte	Method	Result	Quantitation Limit	Units	Date of Analysis	Time of Analysis	Analyst Initials	Qualifers
Chemical Oxygen Demand	SM 5220D-2011	<250	250	mg/L	4/18/2024	17:05	AC	
Ammonia-N	SM 4500-NH B,F-2011	11.3	2.50	mg/L	4/19/2024	18:17	AC	

Notes:

WHITE OAK LABORATORY

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www.whiteoaklaboratory.com
PA DEP Lab ID 24-05897

Project Narrative:

TCLP extraction and analysis, metals, RADs, and specific gravity analysis subcontracted to Summit Environmental Technologies. Please see attached report.

Definitions:

	Unless otherwise noted, results for solid analysis are reported on a dry-weight basis.
	Quantitation limits are adjusted accordingly when samples are analyzed at a dilution.
QL	Quantitation Limit – The minimum concentration of the analyte that can be reported with a specified degree of confidence.
<	Represents "less than". Use indicates that the result was less than the Quantitation Limit.
>	Represents "greater than". Use indicates that the result was more than the maximum quantitation range of the test.
P/A	Present or Absent
[calc]	Calculated result. Calculations use results from the performance of accredited methods, unless otherwise noted.

Data Qualifier Codes:

A1:	Sample received without proper chemical preservation.
A2:	Sample received with improper preservation.
A3:	Sample was received without proper thermal preservation.
A4:	Sample contained residual chlorine. Sample was from a non-chlorinated source.
A5:	Sample contained residual chlorine. Sample was not properly dechlorinated.
A6:	Sample was not collected in the required container.
A7:	Sample was received at the laboratory after the expiration of the holding time.
A8:	Sample Contains headspace. Valid sample collection requires no headspace.
A9:	Description on Chain of Custody does not match sample received at the laboratory.
A10:	Collection information does not meet sample acceptance criteria.
A11:	Sample was compromised during transit.
A12:	Insufficient sample quantity supplied to the laboratory to meet method or QC requirements.
S1:	White Oak Laboratory LLC does not hold accreditation from the PA-DEP for this field of accreditation.
S2:	This test was subcontracted. Please see attached report for laboratory ID and results.
[redacted]1:	Sample analyzed with 18-hour Colilert.
[redacted]2:	Sample received at the laboratory un-filtered. Sample is required to be 0.45µm filtered within 15 minutes of sampling. Results are estimated.
P3:	Combined Nitrite-N and Nitrite-N analysis performed from a H_2SO_4 preserved bottle.
E1:	Refrigerator did not maintain the required temperature for sample storage. Results are estimated.
E2:	Sample was incubated longer than the acceptable time range. Results are estimated.
E3:	Sample was incubated shorter than the acceptable time range. Results may be biased low.
E4:	Incubator temperature was outside the acceptable temperature range. Results are estimated.
E5:	Water bath temperature was outside the acceptable tempereture range. Results are estimated.
E6:	Oven temperature was outside the acceptable temperature range. Results are estimated.
E7:	Hotplate or Hotblock temperature was outside the acceptable temperature range. Results are estimated.
Q1:	Results obtained from an initial calibration that does not meet acceptance criteria. Results are estimated.
Q2:	Target analyte was measured in the laboratory method blank at or above the quantitation limit.
Q3:	Target analyte was found in the field blank and/or trip blank.
Q4:	The laboratory control sample (LCS) recovery was above acceptance limits. Results may be biased high.
Q5:	The laboratory control sample (LCS) recovery was below acceptance limits. Results may be biased low.
Q6:	The continuing calibration verification (CCV) recovery was above acceptance limits. Results may be biased high.
Q7:	The continuing calibration verification (CCV) recovery was below acceptance limits. Results may be biased low.
Q8:	The duplicate RPD was outside acceptance limits. Results are estimated.
Q9:	The initial calibration verification (ICV) recovery was above acceptance limits. Results may be biased high.
Q10:	The initial calibration verification (ICV) recovery was below acceptance limits. Results may be biased low.
Q11:	Sample was prepared outside the required holding time. Results may be biased low.
Q12:	Sample was analyzed outside the required holding time. Results may be biased low.
Q13:	The matrix spike recovery was above acceptance limits. Results may be biased high.
Q14:	The matrix spike recovery was below the acceptance limits. Results may be biased low.
Q15:	The BOD/CBOD analysis did not meet the minimum DO depletion of at least 2 mg/L.
Q16:	The BOD/CBOD analysis did not meet the minimum residual DO of at least 1 mg/L.
Q17:	The results are below the quantitation limit but above the method detection limit. Results are estimated.
Q18:	The result exceeds the upper limit of quantitation. Results are estimated.
Q19:	Plate count was outside the target range of positive organisms. Results are estimated.
Q20:	The sample matrix interfered with the analytical equipment or test method. Results are estimated.
[redacted]Q21:	Breakthrough into second column is greater than 10%. Result may be biased low.
[redacted]Q22:	Sample analysis did not achieve method requirement of 2.5-200mg of residue. Results are estimated.
Q23:	The BOD/CBOD dilution water exceeded the maximum DO depletion of 0.2 mg/L.
Q24:	Replicate Analysis RPD exceeded acceptance limits. Results are estimated.

SUMMIT ENVIRONMENTAL TECHNOLOGIES, INC
Analytical Laboratories

Summit Environmental Technologies, Inc.
3310 Win St.
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Website: http://www.settek.com

May 01, 2024

Lauren Geer
White Oak Laboratory, LLC
2997 Ridgway Johnsonburg Road
Ridgway, PA 45853
TEL: (814) 772-5927
FAX:

RE: 24D0190 BRINE

Dear Lauren Geer:

Order No.: 24041346

Summit Environmental Technologies, Inc. received 1 sample(s) on 4/17/2024 for the analyses presented in the following report.

There were no problems with the analytical events associated with this report unless noted in the Case Narrative.

Quality control data is within laboratory defined or method specified acceptance limits except where noted.

If you have any questions regarding these tests results, please feel free to call the laboratory.

Sincerely,

Holly Florea

Project Manager

3310 Win St.
Cuyahoga Falls, Ohio 44223

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Case Narrative

WO#: **24041346**
Date: **5/1/2024**

CLIENT: White Oak Laboratory, LLC
Project: 24D0190 BRINE

WorkOrder Narrative:
This report in its entirety consists of the following documents: Cover Letter, Case Narrative, Analytical Results, QC Summary Report, Applicable Accreditation Information, Chain-of-Custody, Cooler Receipt Form, and other applicable forms as necessary. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report. Please refer to the "Accreditation Program Analytes Report" for accredited analytes list.

The information contained in this analytical report is the sole property of Summit Environmental Technologies, Inc. and that of the customer. It cannot be reproduced in any form without the consent of Summit Environmental Technologies, Inc. or the customer for which this report was issued. The results contained in this report are only representative of the samples received. Conditions can vary at different times and at different sampling conditions. Summit Environmental Technologies, Inc. is not responsible for use or interpretation of the data included herein.

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

This report is believed to meet all of the requirements of the accrediting agency, where applicable. Any comments or problems with the analytical events associated with this report are noted below.

WorkOrder Comments:
24041346: State required accreditation not specified; results may not be reported as certified data.

Analytical Sequence Sample Notes:
24041346-001C Mtl-ICPMS_NPW(200.8): Corresponding Spike recovery indicates matrix interference. The method is in control as indicated by the laboratory control sample (LCS).

24041346-001B Mtl-ICP_NPW(200.7): Corresponding MS/MSD exhibited outlying recoveries for Barium. LCS-74721 demonstrates control for this analyte.

24041346-001C Radium-228_NPW(904.0): Sample reanalysis confirms original detection.

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Case Narrative

WO#: **24041346**
Date: **5/1/2024**

CLIENT: White Oak Laboratory, LLC
Project: 24D0190 BRINE

24041346-001C Radium-226_NPW(903.0): Sample reanalysis confirms original detection.

Original

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Workorder Sample Summary

WO#: **24041346**
01-May-24

CLIENT: White Oak Laboratory, LLC
Project: 24D0190 BRINE

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
24041346-001	24D0190 BRINE		4/15/2024 12:30:00 PM	4/17/2024 10:05:00 AM	Non-Potable Water
24041346-001	24D0190 BRINE		4/15/2024 12:30:00 PM	4/17/2024 10:05:00 AM	Non-Potable Water
24041346-001	24D0190 BRINE		4/15/2024 12:30:00 PM	4/17/2024 10:05:00 AM	Non-Potable Water
24041346-001	24D0190 BRINE		4/15/2024 12:30:00 PM	4/17/2024 10:05:00 AM	Non-Potable Water

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WO#: **24041346**
Date Reported: **5/1/2024**
Company: White Oak Laboratory, LLC
Address: 2997 Ridgway Johnsonburg Road
Ridgway PA 45853
Received: 4/17/2024
Project#: 24D0190 BRINE

TCLP Metals

Client ID#	Lab ID#	Collected	Analyte	Rep Lmt	Result	Units	Matrix	Method	DF	RegLvl	Run	Analyst
24D0190 BRINE	001	4/15/2024	TCLP Arsenic(As)	0.500	ND	mg/L	Non-Potable Water	EPA 6010 D	1	5.00	4/21/2024	RJE
24D0190 BRINE	001	4/15/2024	TCLP Barium(Ba)	1.00	1.45	mg/L	Non-Potable Water	EPA 6010 D	1	100	4/21/2024	RJE
24D0190 BRINE	001	4/15/2024	TCLP Cadmium(Cd)	0.100	ND	mg/L	Non-Potable Water	EPA 6010 D	1	1.00	4/21/2024	RJE
24D0190 BRINE	001	4/15/2024	TCLP Chromium(Cr)	0.200	ND	mg/L	Non-Potable Water	EPA 6010 D	1	5.00	4/21/2024	RJE
24D0190 BRINE	001	4/15/2024	TCLP Lead(Pb)	0.500	ND	mg/L	Non-Potable Water	EPA 6010 D	1	5.00	4/21/2024	RJE
24D0190 BRINE	001	4/15/2024	TCLP Selenium(Se)	0.0500	ND	mg/L	Non-Potable Water	EPA 6010 D	1	1.00	4/21/2024	RJE
24D0190 BRINE	001	4/15/2024	TCLP Silver(Ag)	0.500	ND	mg/L	Non-Potable Water	EPA 6010 D	1	5.00	4/21/2024	RJE

TCLP-AddMTL_6010D

Client ID#	Lab ID#	Collected	Analyte	Rep Lmt	Result	Units	Matrix	Method	DF	RegLvl	Run	Analyst
24D0190 BRINE	001	4/15/2024	TCLP Copper	0.200	ND	mg/L	Non-Potable Water	EPA 6010 D	1		4/21/2024	RJE
24D0190 BRINE	001	4/15/2024	TCLP Nickel	0.200	ND	mg/L	Non-Potable Water	EPA 6010 D	1		4/21/2024	RJE
24D0190 BRINE	001	4/15/2024	TCLP Zinc	0.200	0.256	mg/L	Non-Potable Water	EPA 6010 D	1		4/21/2024	RJE

TCLP Mercury

Client ID#	Lab ID#	Collected	Analyte	Rep Lmt	Result	Units	Matrix	Method	DF	RegLvl	Run	Analyst
24D0190 BRINE	001	4/15/2024	TCLP Mercury	0.00200	ND	mg/L	Non-Potable Water	EPA 7470 A	1	0.200	4/24/2024	KLC

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Analytical Report

(consolidated)

WO#: **24041346**

Date Reported: **5/1/2024**

CLIENT: White Oak Laboratory, LLC
Collection Date: 4/15/2024 12:30:00 PM
Project: 24D0190 BRINE
Lab ID: 24041346-001
Matrix: NON-POTABLE WATER
Client Sample ID: 24D0190 BRINE

Analyses	Result	RL	Qual	Units	Uncertainty	DF	Date Analyzed
GROSS ALPHA BY COPRECIPITATION (SM7110C)					**A7110C**	**E900**	Analyst: **HDJ**
ALPHA, Gross	ND	3.00		pCi/L	± 0.580	1	4/26/2024 8:30:00 AM
RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **DHF**
Radium-226	32.3	10.0		pCi/L	± 3.16	1	4/30/2024 10:50:00 AM
Yield	1.00					1	4/30/2024 10:50:00 AM
RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **DHF**
Radium-228	71.6	10.0		pCi/L	± 9.57	1	4/29/2024 2:20:00 PM
Yield	1.00					1	4/29/2024 2:20:00 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
ND	Not Detected	PL	Permit Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit
W	Sample container temperature is out of limit as specified at testcode		

Original

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Analytical Report

(consolidated)

WO#: **24041346**

Date Reported: **5/1/2024**

CLIENT: White Oak Laboratory, LLC
Project: 24D0190 BRINE
Lab ID: 24041346-001
Client Sample ID: 24D0190 BRINE

Collection Date: 4/15/2024 12:30:00 PM
Matrix: NON-POTABLE WATER

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
METALS (EPA 200.7)				**E200.7**	**E200.7**	Analyst: **RJE**
Barium(Ba)	0.983	0.0100	QM+	mg/L	1	4/21/2024 2:56:00 PM
Strontium(Sr)	82.9	5.00		mg/L	100	4/22/2024 2:11:00 PM
METALS ANALYSIS BY ICP/MS (EPA200.8)				**E200.8**	**E200.8**	Analyst: **RJE**
Uranium	ND	0.00100	QM+	mg/L	1	4/19/2024 1:55:48 PM
CALCULATION OF SPECIFIC GRAVITY (D-4052)				**ASTM-D4052**		Analyst: **CXS**
Specific Gravity	1.099			@60°F	1	4/18/2024 3:47:22 PM

Qualifiers:

B	Analyte detected in the associated Method Blank
H	Holding times for preparation or analysis exceeded
ND	Not Detected
R	RPD outside accepted recovery limits
W	Sample container temperature is out of limit as specified at testcode
E	Value above quantitation range
M	Manual Integration used to determine area response
PL	Permit Limit
RL	Reporting Detection Limit

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QC SUMMARY REPORT

WO#: **24041346**
01-May-24

Client: White Oak Laboratory, LLC
Project: 24D0190 BRINE **BatchID:** **74721**

Sample ID: **MB-74721**	SampType: **MBLK**	TestCode: **Mtl-ICP_NPW**	Units: **mg/L**	Prep Date: **4/18/2024**	RunNo: **184120**
Client ID: **PBW**	Batch ID: **74721**	TestNo: **E200.7**	**E200.7**	Analysis Date: **4/21/2024**	SeqNo: **4991511**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Barium(Ba)	ND	0.0100		0	0		0.011				
Strontium(Sr)	ND	0.0500		0	0		0.022				

Sample ID: **LCS-74721**	SampType: **LCS**	TestCode: **Mtl-ICP_NPW**	Units: **mg/L**	Prep Date: **4/18/2024**	RunNo: **184120**
Client ID: **LCSW**	Batch ID: **74721**	TestNo: **E200.7**	**E200.7**	Analysis Date: **4/21/2024**	SeqNo: **4991512**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Barium(Ba)	0.202	0.0100	0.2000	0	101	85	115				
Strontium(Sr)	1.05	0.0500	1.000	0	105	85	115				

Sample ID: **24041337-001AMS**	SampType: **MS**	TestCode: **Mtl-ICP_NPW**	Units: **mg/L**	Prep Date: **4/18/2024**	RunNo: **184120**
Client ID: **BatchQC**	Batch ID: **74721**	TestNo: **E200.7**	**E200.7**	Analysis Date: **4/21/2024**	SeqNo: **4991519**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Barium(Ba)	0.254	0.0100	0.2000	0.04290	106	70	130				
Strontium(Sr)	1.14	0.0500	1.000	0.07380	106	70	130				

Sample ID: **24041337-001AMSD**	SampType: **MSD**	TestCode: **Mtl-ICP_NPW**	Units: **mg/L**	Prep Date: **4/18/2024**	RunNo: **184120**
Client ID: **BatchQC**	Batch ID: **74721**	TestNo: **E200.7**	**E200.7**	Analysis Date: **4/21/2024**	SeqNo: **4991520**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Barium(Ba)	0.247	0.0100	0.2000	0.04290	102	70	130	0.2539	2.59	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceede
M	Manual Integration used to determine area response	ND	Not Detected	PL	Permit Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit	S	Spike Recovery outside accepted recovery limits
W	Sample container temperature is out of limit as specified at testcode				

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Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **24041346**

01-May-24

Client: White Oak Laboratory, LLC
Project: 24D0190 BRINE **BatchID:** **74721**

Sample ID: **24041337-001AMSD**	SampType: **MSD**	TestCode: **Mtl-ICP_NPW**	Units: **mg/L**	Prep Date: **4/18/2024**	RunNo: **184120**
Client ID: **BatchQC**	Batch ID: **74721**	TestNo: **E200.7**	**E200.7**	Analysis Date: **4/21/2024**	SeqNo: **4991520**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Strontium(Sr)	1.10	0.0500	1.000	0.07380	102	70	130	1.135	3.45	20	

Sample ID: **24041346-001BMS**	SampType: **MS**	TestCode: **Mtl-ICP_NPW**	Units: **mg/L**	Prep Date: **4/18/2024**	RunNo: **184120**
Client ID: **24D0190 BRINE**	Batch ID: **74721**	TestNo: **E200.7**	**E200.7**	Analysis Date: **4/21/2024**	SeqNo: **4991536**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Barium(Ba)	1.30	0.0100	0.2000	0.9828	159	70	130				S
Strontium(Sr)	ND	0.0500	1.000	0	0	70	130				S

Sample ID: **24041346-001BMSD**	SampType: **MSD**	TestCode: **Mtl-ICP_NPW**	Units: **mg/L**	Prep Date: **4/18/2024**	RunNo: **184120**
Client ID: **24D0190 BRINE**	Batch ID: **74721**	TestNo: **E200.7**	**E200.7**	Analysis Date: **4/21/2024**	SeqNo: **4991537**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Barium(Ba)	1.25	0.0100	0.2000	0.9828	134	70	130	1.301	3.89	20	S
Strontium(Sr)	ND	0.0500	1.000	0	0	70	130	0	0	20	S

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceede
M	Manual Integration used to determine area response	ND	Not Detected	PL	Permit Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit	S	Spike Recovery outside accepted recovery limits
W	Sample container temperature is out of limit as specified at testcode				

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QC SUMMARY REPORT

WO#: **24041346**
01-May-24

Client: White Oak Laboratory, LLC
Project: 24D0190 BRINE

BatchID: **74727**

Sample ID: **MB-74727**	SampType: **MBLK**	TestCode: **Mtl-ICPMS_N**	Units: **mg/L**	Prep Date: **4/19/2024**	RunNo: **184217**
Client ID: **PBW**	Batch ID: **74727**	TestNo: **E200.8**	**E200.8**	Analysis Date: **4/23/2024**	SeqNo: **4994087**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Uranium	ND	0.00100									QC+

Sample ID: **LCS-74727**	SampType: **LCS**	TestCode: **Mtl-ICPMS_N**	Units: **mg/L**	Prep Date: **4/19/2024**	RunNo: **184217**
Client ID: **LCSW**	Batch ID: **74727**	TestNo: **E200.8**	**E200.8**	Analysis Date: **4/23/2024**	SeqNo: **4994088**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Uranium	0.0548	0.00100	0.0500	0	110	85	115				QC+

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceede
M	Manual Integration used to determine area response	ND	Not Detected	PL	Permit Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit	S	Spike Recovery outside accepted recovery limits
W	Sample container temperature is out of limit as specified at testcode				

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QC SUMMARY REPORT

WO#: **24041346**
01-May-24

Client: White Oak Laboratory, LLC
Project: 24D0190 BRINE

BatchID: 74727

Sample ID: **MB-74727**	SampType: **MBLK**	TestCode: **Mtl-ICPMS_N**	Units: **mg/L**	Prep Date: **4/19/2024**	RunNo: **184091**
Client ID: **PBW**	Batch ID: **74727**	TestNo: **E200.8**	**E200.8**	Analysis Date: **4/19/2024**	SeqNo: **4990510**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Uranium	ND	0.00100									

Sample ID: **LCS-74727**	SampType: **LCS**	TestCode: **Mtl-ICPMS_N**	Units: **mg/L**	Prep Date: **4/19/2024**	RunNo: **184091**
Client ID: **LCSW**	Batch ID: **74727**	TestNo: **E200.8**	**E200.8**	Analysis Date: **4/19/2024**	SeqNo: **4990511**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Uranium	0.0501	0.00100	0.0500	0	100	85	115				

Sample ID: **24041346-001CMS**	SampType: **MS**	TestCode: **Mtl-ICPMS_N**	Units: **mg/L**	Prep Date: **4/19/2024**	RunNo: **184091**
Client ID: **24D0190 BRINE**	Batch ID: **74727**	TestNo: **E200.8**	**E200.8**	Analysis Date: **4/19/2024**	SeqNo: **4990551**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Uranium	0.0686	0.00100	0.0250	0	274	70	130				S

Sample ID: **24041346-001CMSD**	SampType: **MSD**	TestCode: **Mtl-ICPMS_N**	Units: **mg/L**	Prep Date: **4/19/2024**	RunNo: **184091**
Client ID: **24D0190 BRINE**	Batch ID: **74727**	TestNo: **E200.8**	**E200.8**	Analysis Date: **4/19/2024**	SeqNo: **4990552**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Uranium	0.0747	0.00100	0.0250	0	299	70	130	0.0686	8.54	20	S

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceede
M	Manual Integration used to determine area response	ND	Not Detected	PL	Permit Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit	S	Spike Recovery outside accepted recovery limits
W	Sample container temperature is out of limit as specified at testcode				

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QC SUMMARY REPORT

WO#: **24041346**
01-May-24

Client: White Oak Laboratory, LLC
Project: 24D0190 BRINE

BatchID: 74727

Sample ID: **24041192-001CDUP** SampType: **DUP** TestCode: **Mtl-ICPMS_N** Units: **mg/L** Prep Date: **4/19/2024** RunNo: **184091**
Client ID: **BatchQC** Batch ID: **74727** TestNo: **E200.8** **E200.8** Analysis Date: **4/19/2024** SeqNo: **4990554**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Uranium	0.00155	0.00100						0.00164	5.77	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceede
M	Manual Integration used to determine area response	ND	Not Detected	PL	Permit Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit	S	Spike Recovery outside accepted recovery limits
W	Sample container temperature is out of limit as specified at testcode				

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QC SUMMARY REPORT

WO#: **24041346**
01-May-24

Client: White Oak Laboratory, LLC
Project: 24D0190 BRINE

BatchID: 74732

Sample ID: **MB-74732**	SampType: **MBLK**	TestCode: **Mtl-TCLP-Ad**	Units: **mg/L**	Prep Date: **4/19/2024**	RunNo: **184120**
Client ID: **PBS**	Batch ID: **74732**	TestNo: **SW6010**	**SW3010A**	Analysis Date: **4/21/2024**	SeqNo: **4991713**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TCLP Copper	ND	0.200									
TCLP Nickel	ND	0.200									
TCLP Zinc	ND	0.200									

Sample ID: **LCS-74732**	SampType: **LCS**	TestCode: **Mtl-TCLP-Ad**	Units: **mg/L**	Prep Date: **4/19/2024**	RunNo: **184120**
Client ID: **LCSS**	Batch ID: **74732**	TestNo: **SW6010**	**SW3010A**	Analysis Date: **4/21/2024**	SeqNo: **4991714**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TCLP Copper	1.91	0.200	2.000	0	95.6	80	120				
TCLP Nickel	2.00	0.200	2.000	0	100	80	120				
TCLP Zinc	2.00	0.200	2.000	0	100	80	120				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceede
M	Manual Integration used to determine area response	ND	Not Detected	PL	Permit Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit	S	Spike Recovery outside accepted recovery limits
W	Sample container temperature is out of limit as specified at testcode				

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QC SUMMARY REPORT

WO#: **24041346**
01-May-24

Client: White Oak Laboratory, LLC
Project: 24D0190 BRINE

BatchID: 74732

Sample ID: **MB-74732**	SampType: **MBLK**	TestCode: **MTL-TCLP-7(**	Units: **mg/L**	Prep Date: **4/19/2024**	RunNo: **184120**
Client ID: **PBS**	Batch ID: **74732**	TestNo: **SW6010**	**SW3010A**	Analysis Date: **4/21/2024**	SeqNo: **4991668**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TCLP Arsenic(As)	ND	0.500									
TCLP Barium(Ba)	ND	1.00									
TCLP Cadmium(Cd)	ND	0.100									
TCLP Chromium(Cr)	ND	0.200									
TCLP Lead(Pb)	ND	0.500									
TCLP Selenium(Se)	ND	0.0500									
TCLP Silver(Ag)	ND	0.500									

Sample ID: **LCS-74732**	SampType: **LCS**	TestCode: **MTL-TCLP-7(**	Units: **mg/L**	Prep Date: **4/19/2024**	RunNo: **184120**
Client ID: **LCSS**	Batch ID: **74732**	TestNo: **SW6010**	**SW3010A**	Analysis Date: **4/21/2024**	SeqNo: **4991669**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TCLP Arsenic(As)	1.98	0.500	2.000	0	98.9	80	120				
TCLP Barium(Ba)	1.84	1.00	2.000	0	91.9	80	120				
TCLP Cadmium(Cd)	2.00	0.100	2.000	0	100	80	120				
TCLP Chromium(Cr)	1.98	0.200	2.000	0	98.8	80	120				
TCLP Lead(Pb)	2.02	0.500	2.000	0	101	80	120				
TCLP Selenium(Se)	1.85	0.0500	2.000	0	92.4	80	120				
TCLP Silver(Ag)	1.01	0.500	1.000	0	101	80	120				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceede
M	Manual Integration used to determine area response	ND	Not Detected	PL	Permit Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit	S	Spike Recovery outside accepted recovery limits
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QC SUMMARY REPORT

WO#: **24041346**
01-May-24

Client: White Oak Laboratory, LLC
Project: 24D0190 BRINE **BatchID:** **74732**

Sample ID: **24041138-002AMS** SampType: **MS** TestCode: **MTL-TCLP-7(** Units: **mg/L** Prep Date: **4/19/2024** RunNo: **184120**
Client ID: **BatchQC** Batch ID: **74732** TestNo: **SW6010** **SW3010A** Analysis Date: **4/21/2024** SeqNo: **4991672**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TCLP Arsenic(As)	10.1	2.50	10.00	0	101	70	130				
TCLP Barium(Ba)	13.2	5.00	10.00	3.232	99.8	70	130				
TCLP Cadmium(Cd)	9.67	0.500	10.00	0.001500	96.7	70	130				
TCLP Chromium(Cr)	9.65	1.00	10.00	0	96.5	70	130				
TCLP Lead(Pb)	9.63	2.50	10.00	0	96.3	70	130				
TCLP Selenium(Se)	9.54	0.250	10.00	0	95.4	70	130				
TCLP Silver(Ag)	5.06	2.50	5.000	0	101	70	130				

Sample ID: **24041138-002AMSD** SampType: **MSD** TestCode: **MTL-TCLP-7(** Units: **mg/L** Prep Date: **4/19/2024** RunNo: **184120**
Client ID: **BatchQC** Batch ID: **74732** TestNo: **SW6010** **SW3010A** Analysis Date: **4/21/2024** SeqNo: **4991673**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TCLP Arsenic(As)	10.3	2.50	10.00	0	103	70	130	10.14	1.76	20	
TCLP Barium(Ba)	13.6	5.00	10.00	3.232	103	70	130	13.21	2.69	20	
TCLP Cadmium(Cd)	9.86	0.500	10.00	0.001500	98.6	70	130	9.674	1.90	20	
TCLP Chromium(Cr)	9.84	1.00	10.00	0	98.4	70	130	9.651	1.89	20	
TCLP Lead(Pb)	9.82	2.50	10.00	0	98.2	70	130	9.628	1.96	20	
TCLP Selenium(Se)	9.73	0.250	10.00	0	97.3	70	130	9.539	1.97	20	
TCLP Silver(Ag)	5.15	2.50	5.000	0	103	70	130	5.063	1.70	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceede
M	Manual Integration used to determine area response	ND	Not Detected	PL	Permit Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit	S	Spike Recovery outside accepted recovery limits
W	Sample container temperature is out of limit as specified at testcode				

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QC SUMMARY REPORT

WO#: **24041346**

01-May-24

Client: White Oak Laboratory, LLC
Project: 24D0190 BRINE

BatchID: **74821**

Sample ID: **24041652-001ADUP** SampType: **DUP** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **4/23/2024** RunNo: **184670**
Client ID: **BatchQC** Batch ID: **74821** TestNo: **E904.0** **E903-904** Analysis Date: **4/29/2024** SeqNo: **5005304**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	ND	1.00		0	0			0	0	30	
Yield	1.00			0	0			1.000	0		

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceede
M	Manual Integration used to determine area response	ND	Not Detected	PL	Permit Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit	S	Spike Recovery outside accepted recovery limits
W	Sample container temperature is out of limit as specified at testcode				

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QC SUMMARY REPORT

WO#: **24041346**
01-May-24

Client: White Oak Laboratory, LLC
Project: 24D0190 BRINE

BatchID: **74821**

Sample ID: **MB-74821**	SampType: **MBLK**	TestCode: **Radium-228_**	Units: **pCi/L**	Prep Date: **4/23/2024**	RunNo: **184670**
Client ID: **PBW**	Batch ID: **74821**	TestNo: **E904.0**	**E903-904**	Analysis Date: **4/29/2024**	SeqNo: **5005296**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	ND	1.00		0	0						
Yield	1.00			0	0						

Sample ID: **LCS-74821**	SampType: **LCS**	TestCode: **Radium-228_**	Units: **pCi/L**	Prep Date: **4/23/2024**	RunNo: **184670**
Client ID: **LCSW**	Batch ID: **74821**	TestNo: **E904.0**	**E903-904**	Analysis Date: **4/29/2024**	SeqNo: **5005297**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	3.75	1.00	5.000	0	75.0	50	130				
Yield	1.00			0	0						

Sample ID: **LCSD-74821**	SampType: **LCSD**	TestCode: **Radium-228_**	Units: **pCi/L**	Prep Date: **4/23/2024**	RunNo: **184670**
Client ID: **LCSS02**	Batch ID: **74821**	TestNo: **E904.0**	**E903-904**	Analysis Date: **4/29/2024**	SeqNo: **5005298**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	3.43	1.00	5.000	0	68.6	50	130	3.750	8.91	20	
Yield	0.990			0	0			1.000	1.01		

Sample ID: **24041634-001BDUP**	SampType: **DUP**	TestCode: **Radium-228_**	Units: **pCi/L**	Prep Date: **4/23/2024**	RunNo: **184670**
Client ID: **BatchQC**	Batch ID: **74821**	TestNo: **E904.0**	**E903-904**	Analysis Date: **4/29/2024**	SeqNo: **5005302**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	ND	1.00		0	0			0	0	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceede
M	Manual Integration used to determine area response	ND	Not Detected	PL	Permit Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit	S	Spike Recovery outside accepted recovery limits
W	Sample container temperature is out of limit as specified at testcode				

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QC SUMMARY REPORT

WO#: **24041346**
01-May-24

Client: White Oak Laboratory, LLC
Project: 24D0190 BRINE

BatchID: **74821**

Sample ID: **24041634-001BDUP** SampType: **DUP** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **4/23/2024** RunNo: **184670**
Client ID: **BatchQC** Batch ID: **74821** TestNo: **E904.0** **E903-904** Analysis Date: **4/29/2024** SeqNo: **5005302**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Yield	1.00			0	0			1.000	0		

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceede
M	Manual Integration used to determine area response	ND	Not Detected	PL	Permit Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit	S	Spike Recovery outside accepted recovery limits
W	Sample container temperature is out of limit as specified at testcode				

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QC SUMMARY REPORT

WO#: **24041346**
01-May-24

Client: White Oak Laboratory, LLC
Project: 24D0190 BRINE

BatchID: **74821**

Sample ID: **24041652-001ADUP** SampType: **DUP** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **4/23/2024** RunNo: **184681**
Client ID: **BatchQC** Batch ID: **74821** TestNo: **E903.0** **E903-904** Analysis Date: **4/30/2024** SeqNo: **5005483**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00						0	0	30	
Yield	1.00							1.000	0	0	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceede
M	Manual Integration used to determine area response	ND	Not Detected	PL	Permit Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit	S	Spike Recovery outside accepted recovery limits
W	Sample container temperature is out of limit as specified at testcode				

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QC SUMMARY REPORT

WO#: **24041346**
01-May-24

Client: White Oak Laboratory, LLC
Project: 24D0190 BRINE **BatchID:** **74821**

Sample ID: **MB-74821**	SampType: **MBLK**	TestCode: **Radium-226_**	Units: **pCi/L**	Prep Date: **4/23/2024**	RunNo: **184681**
Client ID: **PBW**	Batch ID: **74821**	TestNo: **E903.0**	**E903-904**	Analysis Date: **4/30/2024**	SeqNo: **5005476**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00									
Yield	1.00										

Sample ID: **LCS-74821**	SampType: **LCS**	TestCode: **Radium-226_**	Units: **pCi/L**	Prep Date: **4/23/2024**	RunNo: **184681**
Client ID: **LCSW**	Batch ID: **74821**	TestNo: **E903.0**	**E903-904**	Analysis Date: **4/30/2024**	SeqNo: **5005477**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	4.87	1.00	5.000	0	97.4	70	130				

Sample ID: **LCSD-74821**	SampType: **LCSD**	TestCode: **Radium-226_**	Units: **pCi/L**	Prep Date: **4/23/2024**	RunNo: **184681**
Client ID: **LCSS02**	Batch ID: **74821**	TestNo: **E903.0**	**E903-904**	Analysis Date: **4/30/2024**	SeqNo: **5005478**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	5.09	1.00	5.000	0	102	70	130	4.870	4.42	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceede
M	Manual Integration used to determine area response	ND	Not Detected	PL	Permit Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit	S	Spike Recovery outside accepted recovery limits
W	Sample container temperature is out of limit as specified at testeade				

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QC SUMMARY REPORT

WO#: **24041346**
01-May-24

Client: White Oak Laboratory, LLC
Project: 24D0190 BRINE **BatchID:** **74844**

Sample ID: **MB-74844**	SampType: **MBLK**	TestCode: **HG_TCLP(74**	Units: **PPM**	Prep Date: **4/23/2024**	RunNo: **184307**
Client ID: **PBS**	Batch ID: **74844**	TestNo: **SW7470A**	**SW7470A**	Analysis Date: **4/24/2024**	SeqNo: **4996578**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TCLP Mercury	ND	0.00200									

Sample ID: **24041196-002AMS**	SampType: **MS**	TestCode: **HG_TCLP(74**	Units: **PPM**	Prep Date: **4/23/2024**	RunNo: **184307**
Client ID: **BatchQC**	Batch ID: **74844**	TestNo: **SW7470A**	**SW7470A**	Analysis Date: **4/24/2024**	SeqNo: **4996584**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TCLP Mercury	0.00422	0.00200	0.00400	0	106	75	125				

Sample ID: **24041196-002AMSD**	SampType: **MSD**	TestCode: **HG_TCLP(74**	Units: **PPM**	Prep Date: **4/23/2024**	RunNo: **184307**
Client ID: **BatchQC**	Batch ID: **74844**	TestNo: **SW7470A**	**SW7470A**	Analysis Date: **4/24/2024**	SeqNo: **4996585**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TCLP Mercury	0.00432	0.00200	0.00400	0	108	75	125	0.00422	2.34	20	

Sample ID: **LCS-74844**	SampType: **LCS**	TestCode: **HG_TCLP(74**	Units: **PPM**	Prep Date: **4/23/2024**	RunNo: **184307**
Client ID: **LCSS**	Batch ID: **74844**	TestNo: **SW7470A**	**SW7470A**	Analysis Date: **4/24/2024**	SeqNo: **4996608**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TCLP Mercury	0.00478	0.00200	0.00400	0	120	80	120				

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceede
M	Manual Integration used to determine area response	ND	Not Detected	PL	Permit Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit	S	Spike Recovery outside accepted recovery limits
W	Sample container temperature is out of limit as specified at testcode				

Original

SUMMIT ENVIRONMENTAL TECHNOLOGIES, INC.
Analytical Laboratories

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **24041346**
01-May-24

Client: White Oak Laboratory, LLC
Project: 24D0190 BRINE

BatchID: **R183982**

Sample ID: **LCS-R183982**	SampType: **LCS**	TestCode: **SpecGrav_Oi**	Units: **@60°F**	Prep Date:	RunNo: **183982**
Client ID: **LCSW**	Batch ID: **R183982**	TestNo: **ASTM-D4052**		Analysis Date: **4/18/2024**	SeqNo: **4987883**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Gravity	1.002		1.000	0	100	70	130				

Sample ID: **24041361-001ADUP**	SampType: **DUP**	TestCode: **SpecGrav_Oi**	Units: **@60°F**	Prep Date:	RunNo: **183982**
Client ID: **BatchQC**	Batch ID: **R183982**	TestNo: **ASTM-D4052**		Analysis Date: **4/18/2024**	SeqNo: **4987885**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Specific Gravity	0.8644							0.8644	0	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	E	Value above quantitation range	H	Holding times for preparation or analysis exceede
M	Manual Integration used to determine area response	ND	Not Detected	PL	Permit Limit
R	RPD outside accepted recovery limits	RL	Reporting Detection Limit	S	Spike Recovery outside accepted recovery limits
W	Sample container temperature is out of limit as specified at testcode				

SUMMIT ENVIRONMENTAL TECHNOLOGIES, INC
Analytical Laboratories
Summit Environmental Technologies, In
3310 Win S
Cuyahoga Falls, Ohio 4422
TEL: (330) 253-8211 FAX: (330) 253-44
Website: http://www.settek.co

Qualifiers and Acronyms

WO#: 24041346
Date: 5/1/2024

These commonly used Qualifiers and Acronyms may or may not be present in this report.

Qualifiers

U	The compound was analyzed for but was not detected above the MDL.
J	The reported value is greater than the Method Detection Limit but less than the Reporting Limit.
H	The hold time for sample preparation and/or analysis was exceeded. Not Clean Water Act compliant.
D	The result is reported from a dilution.
E	The result exceeded the linear range of the calibration or is estimated due to interference.
MC	The result is below the Minimum Compound Limit.
*	The result exceeds the Regulatory Limit or Maximum Contamination Limit.
m	Manual integration was used to determine the area response.
d	Manual integration in which peak was deleted
N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.
P	The second column confirmation exceeded 25% difference.
C	The result has been confirmed by GC/MS.
X	The result was not confirmed when GC/MS Analysis was performed.
B	The analyte was detected in the Method Blank at a concentration greater than the RL.
MB+	The analyte was detected in the Method Blank at a concentration greater than the MDL.
G	The ICB or CCB contained reportable amounts of analyte.
QC-/+	The CCV recovery failed low (-) or high (+).
R/QDR	The RPD was outside of accepted recovery limits.
QL-/+	The LCS or LCSD recovery failed low (-) or high (+).
QLR	The LCS/LCSD RPD was outside of accepted recovery limits.
QM-/+	The MS or MSD recovery failed low (-) or high (+).
QMR	The MS/MSD RPD was outside of accepted recovery limits.
QV-/+	The ICV recovery failed low (-) or high (+).
S	The spike result was outside of accepted recovery limits.
W	Samples were received outside temperature limits (0° – 6° C). Not Clean Water Act compliant.
Z	Deviation; A deviation from the method was performed; Please refer to the Case Narrative for additional information

Acronyms

ND	Not Detected	**RL**	Reporting Limit
QC	Quality Control	**MDL**	Method Detection Limit
MB	Method Blank	**LOD**	Level of Detection
LCS	Laboratory Control Sample	**LOQ**	Level of Quantitation
LCSD	Laboratory Control Sample Duplicate	**PQL**	Practical Quantitation Limit
QCS	Quality Control Sample	**CRQL**	Contract Required Quantitation Limit
DUP	Duplicate	**PL**	Permit Limit
MS	Matrix Spike	**RegLvl**	Regulatory Limit
MSD	Matrix Spike Duplicate	**MCL**	Maximum Contamination Limit
RPD	Relative Percent Different	**MinCL**	Minimum Compound Limit
ICV	Initial Calibration Verification	**RA**	Reanalysis
ICB	Initial Calibration Blank	**RE**	Reextraction
CCV	Continuing Calibration Verification	**TIC**	Tentatively Identified Compound
CCB	Continuing Calibration Blank	**RT**	Retention Time
RLC	Reporting Limit Check	**CF**	Calibration Factor

This list of Qualifiers and Acronyms reflects the most commonly utilized Qualifiers and Acronyms for reporting. Please refer to the Analytical Notes in the Case Narrative for any Qualifiers or Acronyms that do not appear in this list or for additional information regarding the use of these Qualifiers on reported data.

WHITE OAK LABORATORY

SUBCONTRACT ORDER FORM

24041346

Sending Laboratory:	Receiving Laboratory:	DEP PWS? (Y / N)
White Oak Laboratory LLC	Summit Environmental Technologies, Inc.	PWSID#
2997 Ridgway Johnsonburg Road	3310 Win Street	System Name:
Ridgway, PA 15853	Cuyahoga Falls, Ohio 44223	County:
(814) 772-5927	(330) 253-4489	Location Code:
Project Manager:	**Project Manager:**	Sample Type:
Lauren Geer	Holly Florea	PWS Contact Info:
lauren@whiteoaklaboratory.com	hflorea@settek.com	

Matrix Key: **DW:** Drinking Water **NP:** Non Potable Water **S:** Solid **O:** Other **Bottle Type Key:** **P:** Plastic **G:** Glass **V:** VOA

Sample ID: 2400190 BRINE Collector: JB Due Date:

Bottle ID	Date & Time	Matrix	Bottle Size (mL)	Bottle Type	Preservative	Grab / Comp	Analysis	Sub Lab Info:
1A	4-15-24 1230	NP	500	P	none	G	TCLP 8 RCRA+Cu,Ni,Zn	pH
1E	↓ ↓	↓	500	↓	HNO_3	↓	Barium, Strontium	1
1F, 1G 1H	↓ ↓	↓	(3)1L	↓	HNO_3	↓	Gross Alpha, Radium 226 Radium 228, Uranium	cpm 7,16,2
1I	↓ ↓	↓	500	↓	none	↓	Specific Gravity	pH 1, 1, 1

Comments: Please email final report and invoice to accounts@whiteoaklaboratory.com.

4.0 - 0.2 = 3.8°C; UPS, Cooler; Ice

Method of Delivery: [ ] Sending Lab Courier [ ] Receiving Lab Courier [ ] USPS [ ] FedEx [ ] UPS [ ] Other:

Relinquished: Missy Stoll Date/Time: 4-16-24 920 Received: Date/Time: 4/17/24, 1005

Relinquished: Date/Time: Received: Date/Time:

SUMMIT ENVIRONMENTAL TECHNOLOGIES, INC.
Analytical Laboratories

Summit Environmental Technologies, Inc
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Sample Log-In Check List

Client Name: WHI-PA-15853 Work Order Number: 24041346 RcptNo: 1

Logged by:	Anthony W. Britton	4/17/2024 10:05:00 AM	Anthony Britton
Completed By:	Anthony W. Britton	4/18/2024 9:18:47 AM	Anthony Britton
Reviewed By:	Holly Florea	4/18/2024 11:24:09 AM	Holly Florea

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☐	No ☑	Not Present ☐
2.	How was the sample delivered?	UPS		

Log In

3.	Coolers are present?	Yes ☑	No ☐	NA ☐
4.	Shipping container/cooler in good condition?	Yes ☑	No ☐	
	Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
	No. Seal Date:	Signed By:		
5.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
6.	Were all samples received at a temperature of >0° C to 6.0°C	Yes ☑	No ☐	NA ☐
7.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
8.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
9.	Are samples (except VOA and ONG) properly preserved?	Yes ☑	No ☐	
10.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
11.	Is the headspace in the VOA vials less than 1/4 inch or 6 mm?	Yes ☐	No ☐	No VOA Vials ☑
12.	Were any sample containers received broken?	Yes ☐	No ☑	
13.	Does paperwork match bottle labels? (Note discrepancies on chain of custody)	Yes ☑	No ☐	
14.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
15.	Is it clear what analyses were requested?	Yes ☑	No ☐	
16.	Were all holding times able to be met? (If no, notify customer for authorization.)	Yes ☑	No ☐	

Special Handling (if applicable)

17.	Was client notified of all discrepancies with this order?	Yes ☐	No ☐	NA ☑

Person Notified: _____ Date: _____
By Whom: _____ Via: ☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding: _____
Client Instructions: _____

18. Additional remarks:

Project address not included on coc

Cooler Information

Cooler No	Temp °C	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	3.8	Good	Not Present			

WHITE OAK LABORATORY

2997 Ridgway Johnsonburg Road, Ridgway, PA 15853 · (814) 772-5927 · info@whiteoaklaboratory.com · www.whiteoaklaboratory.com

Chain of Custody / Request for Analysis

This chain of custody is a legal document, fill document completely. All writing must be legible, and in blue or black ink.

Client: Sandstone Development		Contact Person: Jim Barnes	
Mailing Address:		Phone Number: 814-598-4852	
Physical Address: 4104 Bingham Rd., Cyclone, PA 16726		Reporting Email: rjbwellservices@gmail.com	CC: Ridgway Borough
Additional Info:		Invoicing Email: ↓	Monthly / Weekly / Single

Matrix Codes: DW: Drinking Water NP: Non Potable Water S: Solid O: Other

Preservative Codes: 1: Thermal 2: $Na_2S_2O_3$ 3: NaOH/ZnAct 4: NaOH 5: HCl 6: HNO_3 7: H_2SO_4 8: Other (Specify)

DEP Compliance Drinking Water? Y / N (N circled)

PWSID#

Sample Type:

DOH Compliance Beach / Pool? Y / N (N circled)

Field Data:

Sample Collector Name: Jim Barnes

Analysis Requested:

Sample Location:	Date Collected:	Time Collected:	Grab (G) or Composite (C)	Matrix Code (see above)	Preservative Code (see above)	# of containers	Container Size (mL)	Plastic (P) or Glass (G) or VOA (V)	TCLP 8 RCRA + Cu, Ni, Zn	Bromide, Chloride, Sulfate, pH	TDS, TSS	Ammonia, COD	Barium, Strontium	Gross Alpha, Radium 226, Radium 228, Uranium	Specific Gravity					Bottle ID (Lab Use Only)
Brine	4-15-24	12:30	G	NP	1	1	500	P	X											1A
			G	NP	1	1	500	P		X										1B
			G	NP	1	1	1L	P			X									1C
			G	NP	7	1	250	P				X								7D
			G	NP	6	1	500	P					X							6E
			G	NP	6	3	1L	P						X						6F, 6G, 6H
			G	NP	1	1	500	P							X					1I

Relinquished By: RJB	Date/Time: 4/15/24 2:30pm →	Received By:	Date/Time:
Relinquished By:	Date/Time: →	Received By:	Date/Time:
Relinquished By:	Date/Time: →	Received By: [signature]	Date/Time: 4-15-24 14:30

Laboratory ID # 24D0190

Laboratory ID # 24D0190 Date/Time of Checks: 4-15-24 1430 Initials: LG

Observed Temperature °C: 12.8 Corrected Temperature °C: 12.5 Thermometer ID: IR-01

Adequate Thermal Preservation? ☐ YES ☐ NO ☑ Cooldowr ☐ N/A
(On ice, Micro <10°C, Wet Chemistry <6°C)
If no, explain:

CoC completed properly? ☑ YES ☐ NO ☐ N/A
If no, explain:

Correct sample container(s) and label(s)? ☑ YES ☐ NO ☐ N/A
If no, explain:

Bottles intact? ☑ YES ☐ NO ☐ N/A
If no, explain:

Received in hold time? ☒ YES ☒ NO ☐ N/A
If no, explain: pH

Do any samples have short hold time? ☐ YES ☑ NO ☐ N/A
(3 hr) ☐ Micro ☐ (C)BOD ☐ NO_2 NO_3
If yes, circle or list:

Do any analytes require subcontracting? ☒ YES ☐ NO ☐ N/A
☒ Metals ☐ Ammonia ☐ Organics
If yes, circle or list: TCLP, RADS, Sp.Grav.

Client Contacted? ☐ YES ☒ NO ☐ N/A
If yes, explain:

Bottle ID	pH	Adjusted (✓)
1A	5	
1B	5	
1C	5	
1D	1	
1E	1	
1F	1	
1G	1	
1H	1	
1I	5	

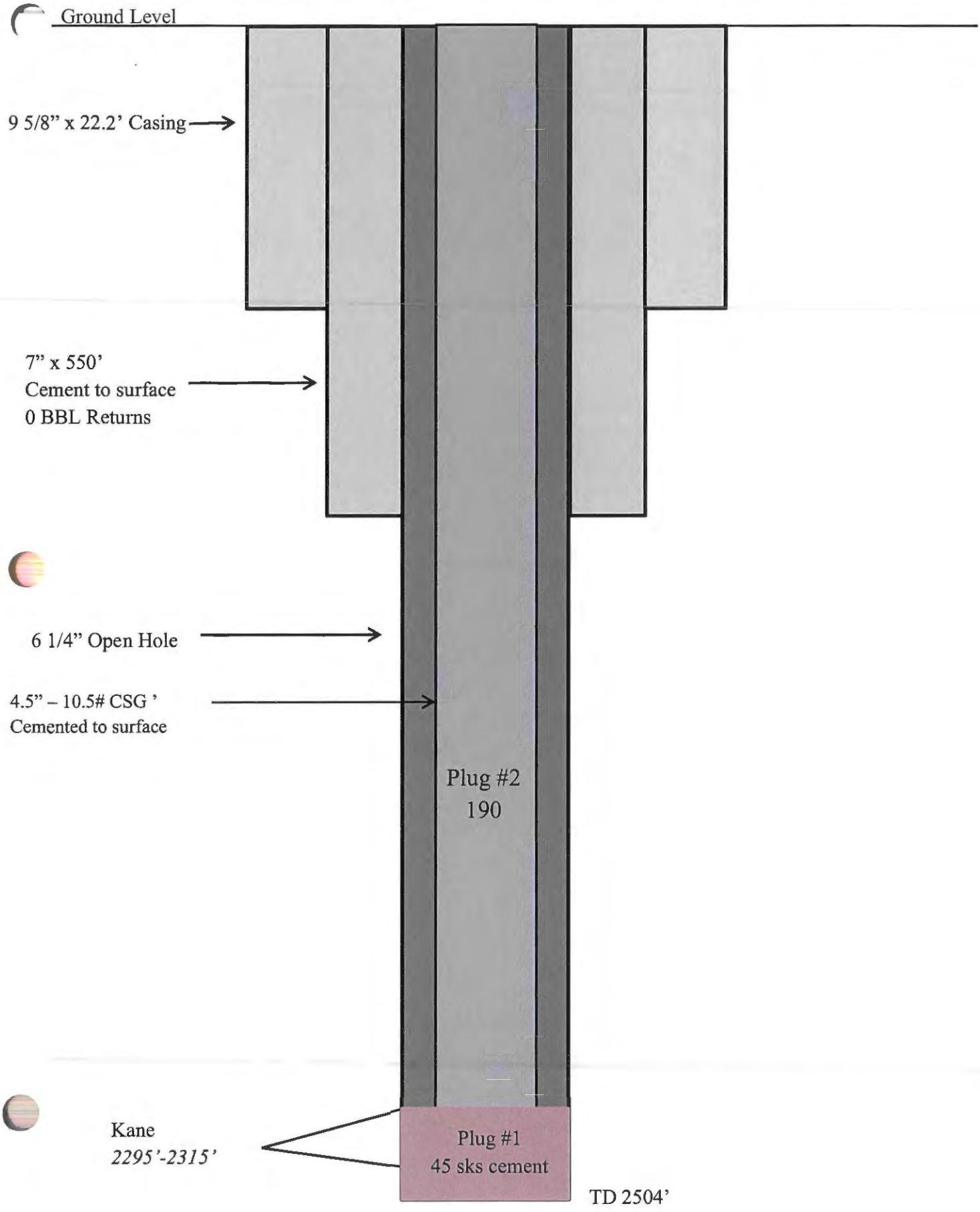
pH paper lot #: 225123
(do not check: Micro, Oil & Grease, VOA vials, subcontracter lab provided bottles)

Correct pH? ☒ YES ☐ NO ☐ N/A
If no, explain:

ATTACHEMENT E

Plugging and Abandonment Plan

Plugging Diagram McKay 7A



Plugging and Abandonment Plan

In the event that the McKay 7A well has to be plugged the following plan will be improvised.

The 2 3/8" tbg and packer will be removed. A solid cement plug will be put from total depth of 2500' to the inside of the 4 1/2" casing to 2285'. This plug will be a 45sks of Class A common cement and with WOC of 8hrs. After the WOC time, the plug will be tagged to verify depth of 2285'. Plug number 2 will be from 2285' to surface inside the 4 ½" casing. The 2nd plug will be 190sks of Class A common cement.

The 7" casing and 4 1/2" are already cemented to surface. Therefore, all annular spaces are filled completely with cement.

H&R Resources LLC
274 Catlin Hill RD
Sugar Grove, PA 16350
United States

INVOICE

Date: 11/13/23

Bill To:

Sandstone Development LLC
464 Bingham Rd
Cyclone, PA 16726

Item Description	Qty	Rate	Amount
Service Rig Time	16	125	2000.00
Class A Common Cement	230	15.25	3507.50

Subtotal	5507.50	
Sales Tax	0.00	
Total	$5,507.50	

Notes
Estimated plugging rates for McKay well 7A injection well

Greatly appreciate the work
It was great doing business with you.

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

United States Environmental Protection Agency

EPA

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

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

Sandstone Development LLC.
464 Bingham Road
Cyclone, PA 16726
(814)362-9570
rjbwellservices@gmail.com

Permit or EPA ID Number	API Number	Full Well Name
	37-083-48829	McKay 7A

State	County
PA	McKean

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

Latitude 41-50-00

Surface Location

Longitude -78-35-00

[ ] 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
[x] Class II	Date Expected to Commence [ ]	[x] 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.

See attached plugging and abandonment plan

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
R. James Barnes, Member		4/8/24

EPA Form 7520-19 (Rev. 4-19)

INSTRUCTIONS FOR FORM 7520-19

This form replaces forms 7520-12 and 7520-14. Use this form only when work is planned or has occurred that affects the well's construction or operation as an injection well, including work on the casing, tubing or packer (or for shallow Class V wells, the subsurface fluid emplacement network). Use one form per injection well. While reports or other information developed by contractors or service companies may be attached, this form must be signed by a responsible entity as described at 40 CFR 144.32. Note: operators closing Class V wells should use Form 7520-17.

NAME, ADDRESS, PHONE AND/OR EMAIL OF PERMITTEE: Enter the name and street address, city/town, state, and ZIP code of the permittee. Also provide an email address (if available) and/or a phone number.

PERMIT OR EPA ID NUMBER: Enter the well identification number or permit number assigned to the well by the EPA or the permitting authority.

API NUMBER: Enter the number assigned by the local jurisdiction (usually a State Oil and Gas Agency) using the American Petroleum Institute standard numbering system.

FULL WELL NAME: Enter the full name of the well or project.

Enter the **STATE** and **COUNTY** where the well is located. For States that do not have counties, use the name of that State's equivalent jurisdiction at a more local level.

WELL LOCATION: Fill in the complete township, range, and section to the nearest quarter-quarter section. A township is north or south of the baseline, and a range is east or west of the principal meridian (e.g., T12N, R34W). Also include the distance, in feet, from the nearest north or south line and nearest east or west line of the quarter-section. Also, enter the **latitude** and **longitude** of the well in decimal degrees, to five or six places if possible; be sure to include a negative sign for the longitude of a well in the Western Hemisphere and a negative sign for the latitude of a well in the Southern Hemisphere.

Enter the **WELL CLASS,** i.e., the class of injection well as defined in 40 CFR 144.6.

TIMING OF THE ACTION: Check ***Notice prior to work*** if the activity has not yet occurred (i.e., is planned). Check ***Report after work*** if the activity described has already occurred. As appropriate, include the date the activity is expected to start or the date the activity was completed. (Note this may not be available, e.g., for a plugging plan submitted with a permit application.)

TYPE OF ACTION: Check the appropriate box to describe the kind of activity being reported. Check ***Well Rework*** for work that was/will be performed on the well after it has already been in operation as an injection well. Check ***Plugging and Abandonment*** to report on plans for or descriptions of final closure/plugging after use as an injection well. Check ***Conversion to a Non-Injection Well*** if the well is to be converted to something other than an injection well.

Provide a **NARRATIVE DESCRIPTION** of the work planned to be performed, or that was performed. The narrative should include a description of the main procedures planned or that occurred during the work activity. A service company report, daily report, or similar document may be attached if it includes all the requested information and is clear and legible.

For well reworks, include the following information: The reason for the well rework; depths of activity; type of activity; changes to injection well configuration, well casing, or cement behind casing; any plug added to the well and its depth; any newly drilled interval and its depth; method(s) to demonstrate that the well has mechanical integrity (as applicable); and any deviations from the approved rework plan (as applicable).

For a well plugging plan, include the following information: Reason for the well plugging; number of plugs placed, and their depths; materials used as plugs (e.g., cast iron bridge plug, cement, cement retainer); method to set plugs; and wait-on-cement times, if any. Also provide one or more cost estimates from an independent firm in the business of plugging and abandoning wells to plug the well as described in the plan.

For well plugging affidavit, include the following information: Reason for the well plugging; number of plugs placed, and their depths; materials used as plugs (e.g., cast iron bridge plug, cement, cement retainer); method to set plugs; wait-on-cement times, if any; and any deviations from the approved plugging plan (if applicable).

For conversion to a non-injection well, include the following information: Depths of activity; type of activity; changes to injection well configuration, well casing, or cement behind casing; any plug added to the well and its depth; any newly drilled interval and its depth; depths of new perforations; and method(s) to demonstrate that the well has mechanical integrity (as applicable).

For all of the above activities, include a well sketch depicting the work, results of well tests/logging performed, service company tickets, and any other available information demonstrating how the work was/is to be performed. Also, specify whether depths are below ground surface, relative to Kelly bushing, etc.

CERTIFICATION: This form must be signed and dated by either: a responsible corporate officer for a corporation, by a general partner for a partnership, by the proprietor of a sole proprietorship, or by a principal executive or ranking elected official for a public agency.

PAPERWORK REDUCTION ACT NOTICE: The public reporting and recordkeeping burden for this collection of information is estimated to average between 6.0 and 7.9 hours per response, depending on the injection well class. Burden means the total time, effort, or financial resource expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal Agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to the collection of information; search data sources; complete and review the collection of information; and, transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including the use of automated collection techniques to Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822), 1200 Pennsylvania Ave., NW., Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed forms to this address.

ATTACHEMENT F

Financial Assurance

HAMLIN BANK AND TRUST COMPANY
TRUST DEPARTMENT

May 17, 2024

US EPA Region 3
c/o James Bennett
1650 Arch Street
Philadelphia, PA 19103-2029

RE: Trust #881; Sandstone Development LLC T/U/A

Dear Mr. Bennett:

Enclosed please find the required documentation which shows that, as of May 10, 2024, Sandstone Development LLC holds a Standby Trust Agreement with the Trust Department of Hamlin Bank and Trust Company containing Hamlin Bank and Trust Company Certificate of Deposit #73879 in the amount of $5,507.50 (copy attached).

Reporting of this holding to the US EPA Region 3, as well as Sandstone Development LLC, will commence on June 1, 2024, and every January thereafter (this will include the other CD held on behalf of Sandstone from the March 9, 2021 Standby Trust Agreement).

If you should have any questions or concerns regarding this matter, please call the undersigned at (814) 887-5555 extension 1117. You can also correspond with us via email at trust@hamlinbank.com.

Thank you for your assistance in this matter.

Sincerely,

Jeanmarie A. McClure, ATFA
Trust Officer

/jam
Encls.

cc: James Barnes, Sandstone Development LLC

P.O. Box 367 • Smethport, PA 16749-0367 • (814) 887-5555 Fax: (814) 887-9306 • E-mail: trust@hamlinbank.com

TIME CERTIFICATE OF DEPOSIT
NOT NEGOTIABLE – NOT SUBJECT TO CHECK

132 73879

THIS CERTIFICATE EVIDENCES A DEPOSIT IN THE NAME(S) OF: SANDSTONE DEVELOPMENT LLC/U/A

Certificate Number _____

Account Number _____

Date MAY 10, 2024

IN THE AMOUNT OF _____ **DOLLARS $** 5,507.50

TERM, MATURITY AND DESCRIPTION: This certificate has a term of 30 MONTHS. It will (first) mature on NOVEMBER 10, 2026.

The minimum balance is $ 1,000.00

INTEREST: Your deposit will earn interest at the rate of 4.50 % per year to the first maturity date. We calculate interest using the actual/365 days per year method. We will compound interest (accrue interest on interest) _____

We will pay interest SEMI-ANNUALLY BY CHECK TO THE TRUST DEPT.

UNLESS WE TELL YOU OTHERWISE IN A SEPARATE DOCUMENT, INTEREST WILL NOT ACCRUE ON THIS DEPOSIT AFTER FINAL MATURITY.

RENEWALS: ☒ If checked, we will automatically renew this certificate on each succeeding maturity date. Each renewal term will be the same as the original term, beginning on the maturity date. We will not automatically renew this certificate (1) if you tell us not to do so, in writing, on or before the next maturity date; or (2) if you present this certificate to us for payment (or other disposition) on or within 10 calendar days after the maturity date if it has a term of more than 31 days, and one calendar day if it has a term of seven to 31 days.

SINGLE MATURITY: ☐ If checked, we will not automatically renew this certificate. It will mature once on the maturity date.

HAMLIN BANK AND TRUST COMPANY

BY Shirley J. Bigley

PERSONAL ACCOUNTS: You have requested and intend the type of account marked below.

- ☐ Individual
- ☐ Joint Account - With Survivorship (and not as tenants in common)
- ☐ Joint Account - No Survivorship (as tenants in common)
- ☐ Trust: Separate Agreement Dated _____
- ☐ _____
- ☐ Pay-On-Death or ☐ Revocable Trust

Designation as defined in this agreement (Beneficiaries named below)

REVOCABLE TRUST OR PAY-ON-DEATH ACCOUNT BENEFICIARIES _____

NONPERSONAL ACCOUNTS: Depositor is a:

- ☐ Partnership ☐ Corporation
- ☒ LLC _____

Authorization dated _____

The **NUMBER OF ENDORSEMENTS** needed for withdrawal or any other purpose is:

T.I.N.: 56-2517540

SOCIAL SECURITY OR EMPLOYER'S I.D. NUMBER - A correct taxpayer identification number is required for almost every type of account. A certification of this number is also required and is contained on the first copy of this certificate.

BACKUP WITHHOLDING - A certification that you are not subject to backup withholding is necessary for almost all accounts (except for persons who are exempt altogether). This certification is contained on the first copy of this form. Failure to provide this certification when required will cause us to withhold the percentage allowed under the Internal Revenue Code of the interest earned (for payment to the IRS). Providing a false certification can result in serious federal penalties.

ENDORSEMENTS - SIGN ONLY WHEN YOU REQUEST WITHDRAWAL

X _____

X _____

X _____

READ OTHER SIDE FOR ADDITIONAL TERMS

STANDBY TRUST AGREEMENT

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

THIS TRUST AGREEMENT (the "Agreement") is entered into as of May 10, 2024 by and between **SANDSTONE DEVELOPMENT LLC**, owner or operator, a Subchapter S Corporation (the "Grantor"), and ***HAMLIN BANK AND TRUST COMPANY*** (the "Trustee"), a financial institution.

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

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

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

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

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

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

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

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

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

Section 6. Trustee Management. The Trustee shall invest and reinvest the principal and income of the Fund and keep the Fund invested as a single fund, without distinction between principal and income, in accordance with general investment policies and guidelines which the Grantor may communicate in writing to the Trustee from time to time, subject, however, to the provisions of this Section. In investing, reinvesting, exchanging, selling, and managing the Fund, the Trustee shall discharge his duties with respect to the trust fund solely in the interest of the beneficiary and with the care, skill, prudence, and diligence under the circumstances then prevailing which persons of prudence, acting in a like capacity and familiar with such matters, would use in the conduct of an enterprise of a like character and with like aims; *except that:*

(i) Securities or other obligations of the Grantor, or any other owner or operator of the facilities, or any of their affiliates as defined in the Investment Company Act of 1940, as amended, 15 U.S.C. 80a-2.(a), shall not be acquired or held, unless they are securities or other obligations of the Federal or a State government;

(ii) The Trustee is authorized to invest the Fund in time or demand deposits of the Trustee, to the extent insured by an agency of the Federal or State government; and

(iii) The Trustee is authorized to hold cash awaiting investment or distribution uninvested for a reasonable time and without liability for the payment of interest thereon.

Section 7. Commingling and Investment. The Trustee is expressly authorized in its discretion:
(a) To transfer from time to time any or all of the assets of the Fund to any common, commingled, or collective trust fund created by the Trustee in which the Fund is eligible to participate, subject to all of the provisions thereof, to be commingled with the assets of other trusts participating therein; and (b) To purchase shares in any investment company registered under the Investment Company Act of 1940, 15 U. S. C. 80a-1 *et seq.*, including one which may be created, managed, underwritten, or to which investment advice is rendered or the shares of which are sold by the Trustee. The Trustee may vote shares in its discretion.

Section 8. Express Powers of Trustee. Without in any way limiting the powers and discretions conferred upon the Trustee by the other provisions of this Agreement or by law, the Trustee is expressly authorized and empowered: (a) To sell, exchange, convey, transfer, or otherwise dispose of any property held by it, by public or private sale. No person dealing with the Trustee shall be bound to see to the application of the purchase money or to inquire into the validity or expediency of any such sale or other disposition; (b) To make, execute, acknowledge, and deliver any and all documents of transfer

and conveyance and any and all other instruments that may be necessary or appropriate to carry out the powers herein granted; (c) To register any securities held in the Fund in its own name or in the name of a nominee and to hold any security in bearer form or in book entry, or to combine certificates representing such securities with certificates of the same issue held by the Trustee in other fiduciary capacities, or to deposit or arrange for the deposit of such securities in a qualified central depository even though, when so deposited, such securities may be merged and held in bulk in the name of the nominee of such depositary with other securities deposited therein by another person, or to deposit or arrange for the deposit of any securities issued by the United States Government, or any agency or instrumentality thereof, with a Federal Reserve bank, but the books and records of the Trustee shall at all times show that all such securities are part of the Fund; (d) To deposit any cash in the Fund in interest-bearing accounts maintained or savings certificates issued by the Trustee, in its separate corporate capacity, or in any other banking institution affiliated with the Trustee, to the extent insured by an agency of the Federal or State government; and (e) To compromise or otherwise adjust all claims in favor of or against the Fund.

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

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

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

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

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

Any expenses incurred by the Trustee as a result of any of the acts contemplated by this Section shall be paid as provided in Section 9.

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

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

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

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

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

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

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

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

GRANTOR:

Sandstone Development LLC

By: James Barnes
Print Name

Its: Managing Member
Print Title

Signature:

Attest:

Before me came the individual whose identity I confirmed as James Barnes, and whose true signature is set forth above; wherefore have I set my hand and seal this 10th day of May, 2024.

Notary Public

Commonwealth of Pennsylvania - Notary Seal
Jeannine D. Gray, Notary Public
McKean County
My commission expires April 25, 2028
Commission number 1446132
Member, Pennsylvania Association of Notaries

TRUSTEE:

Hamlin Bank and Trust Company

By: Jeanmarie A. McClure, ATFA
Print Name

Its: Trust Officer
Print Title

Signature:

Attest:

Before me came the individual whose identity I confirmed as Jeanmarie A. McClure, and whose true signature is set forth above; wherefore have I set my hand and seal this 10th day of May, 2024.

Notary Public

Commonwealth of Pennsylvania - Notary Seal
Jeannine D. Gray, Notary Public
McKean County
My commission expires April 25, 2028
Commission number 1446132
Member, Pennsylvania Association of Notaries

SCHEDULE A

Identification of Facilities and Cost Estimates

Schedule A is referenced in the standby trust agreement dated May 10, 2024 by and between Sandstone Development LLC, the Grantor and Hamlin Bank and Trust Company, the Trustee.

(Name of owner or operator)

(Name of trustee)

EPA identification number	PAS2R430MCK
Name of facility	McKay #7A
Address of facility	N 41° 48' 16.02" W 78° 36' 39.36"
Current plugging and abandonment cost estimate	$5,507.50
Date of estimate	11/13/2023
EPA identification number	
Name of facility	
Address of facility	
Current plugging and abandonment cost estimate	
Date of estimate	

H&R Resources LLC
274 Catlin Hill RD
Sugar Grove, PA 16350
United States

INVOICE

Date: 11/13/23

Bill To:

Sandstone Development LLC
464 Bingham Rd
Cyclone, PA 16726

Item Description	Qty	Rate	Amount
Service Rig Time	16	125	2000.00
Class A Common Cement	230	15.25	3507.50

Subtotal	5507.50	
Sales Tax	0.00	
Total	$5,507.50	

Notes
Estimated plugging rates for McKay well 7A injection well

Greatly appreciate the work
It was great doing business with you.

CERTIFICATE OF ACKNOWLEDGMENT
FOR
STANDBY TRUST FUND AGREEMENT

STATE OF: PENNSYLVANIA

COUNTY OF: McKEAN

On this 10th day of May, 2024, before me personally came James Barnes to me known, who, being by me duly sworn, did depose and say that he resides at 464 Bingham Road, Cyclone, PA 16726, that he is the Managing Member of Sandstone Development LLC, the Subchapter S Corporation described in and which executed the above instrument; that he knows the seal of said corporation; that the seal affixed to such instrument in such corporate seal; that it was so affixed by order of the Managing and Sole Member of said corporation, and that he signed his name thereto by like order.

James Barnes

Notary Public

Commonwealth of Pennsylvania - Notary Seal
Jeannine D. Gray, Notary Public
McKean County
My commission expires April 25, 2028
Commission number 1446132
Member, Pennsylvania Association of Notaries

Pennsylvania Department of State
Bureau of Corporations and Charitable Organizations
PO Box 8722 | Harrisburg, PA 17105-8722
T: 717.787.1057
dos.pa.gov/BusinessCharities

April 22, 2024

SANDSTONE DEVELOPMENT, LLC
R JAMES BARNES
464 BINGHAM ROAD
CYCLONE, PA 16726

Entity Name:	SANDSTONE DEVELOPMENT, LLC
Amendment Date:	April 22, 2024
Amendment Number:	0013813358
Amendment Type:	Change of Registered Office by Entity

The Bureau of Corporations and Charitable Organizations is happy to send your filed document. The Bureau is here to serve you and we would like to thank you for doing business in Pennsylvania.

Beginning in 2025, annual reports are required for all domestic filing entities, limited liability general partnerships and registered foreign associations. More information will be forthcoming from the Bureau. However, to ensure that you receive notice of how and when to make annual reports, keep all information on file with the Bureau up-to-date, particularly registered office address.

0013813358

COMMONWEALTH OF PENNSYLVANIA
Department of State
Bureau of Corporations and Charitable Organizations
PO Box 8722
Harrisburg, Pennsylvania 17105-8722

CHANGE OF REGISTERED OFFICE

Fee: $5

Pennsylvania Department of State

-FILED-

Amendment #: 0013813358
Date Filed: 4/22/2024

DSCB: 15-1507/5507/8625/8825

In compliance with the requirements of 15 Pa.C.S. § 1507 / 5507 / 8625 / 8825 (relating to change of registered office), the undersigned domestic corporation, limited liability company, limited partnership or limited liability limited partnership, desiring to effect a change of registered office, hereby states that:

Record Information

File number	0003313651
Current name	SANDSTONE DEVELOPMENT, LLC
Filing type	Domestic Limited Liability Company

Current Registered Office or Commercial Registered Office Provider

Address	557 INTERSTATE PKWY BRADFORD, PA 16701 Mckean

New Registered Office

The address of this association's proposed registered office in this Commonwealth is

R JAMES BARNES
464 BINGHAM ROAD
CYCLONE, PA 16726

MCKEAN

Electronic Signature

IN TESTIMONY WHEREOF, the undersigned has caused this Statement or Certificate of Change of Registered Office to be signed by a duly authorized officer, general partner, member or manager.

Attorney	*Erik A. Ross*	*04/22/2024*
Signer's Capacity	Sign Here	Date

ATTACHEMENT J

Description of Business

Description of Business

Sandstone Development is a privately held Exploration and Production Company established in 2005 and is engaged in developing oil and natural gas resource in the Application region of Northwestern Pennsylvania and Southwest New York. Sandstone Development acquired its assets from private lease holds.

ATTACHEMENT K

Optional Additional Project Information

1. PROJECT INFORMATION

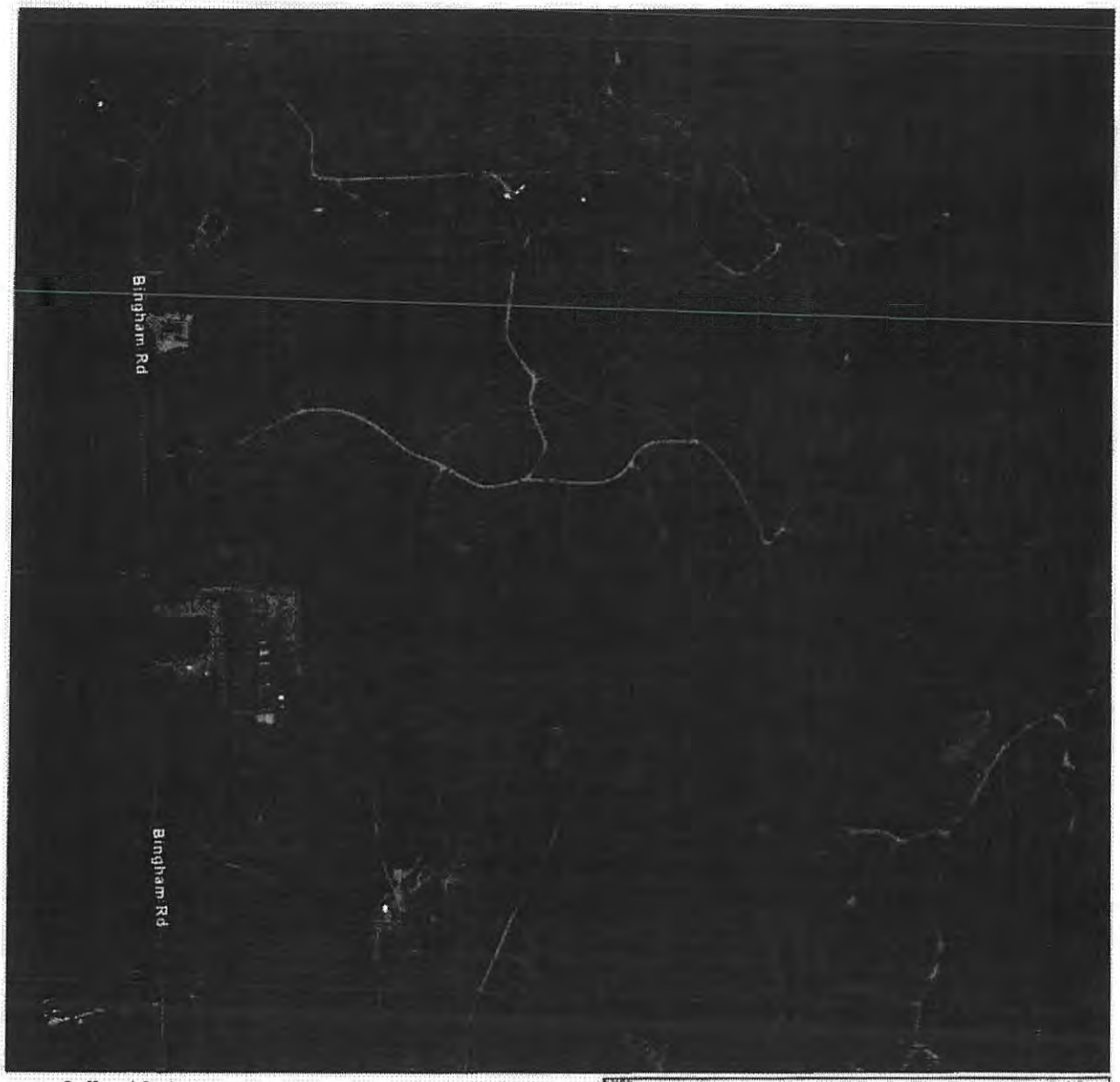
Project Name: **SANDSTONE DEVELOPMENT MCKAY 7A**
Date of Review: **11/30/2023 01:25:37 PM**
Project Category: **Energy Storage, Production, and Transfer, Energy Production (generation), Oil or Gas - new wells, expansion of well field**
Project Area: **2.82 acres**
County(s): **McKean**
Township/Municipality(s): **LAFAYETTE TOWNSHIP**
ZIP Code:
Quadrangle Name(s): **CYCLONE**
Watersheds HUC 8: **Upper Allegheny**
Watersheds HUC 12: **Kinzua Creek Headwaters**
Decimal Degrees: **41.804596, -78.610554**
Degrees Minutes Seconds: **41° 48' 16.5457" N, 78° 36' 37.9944" W**

2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	No Known Impact	No Further Review Required
PA Department of Conservation and Natural Resources	No Known Impact	No Further Review Required
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

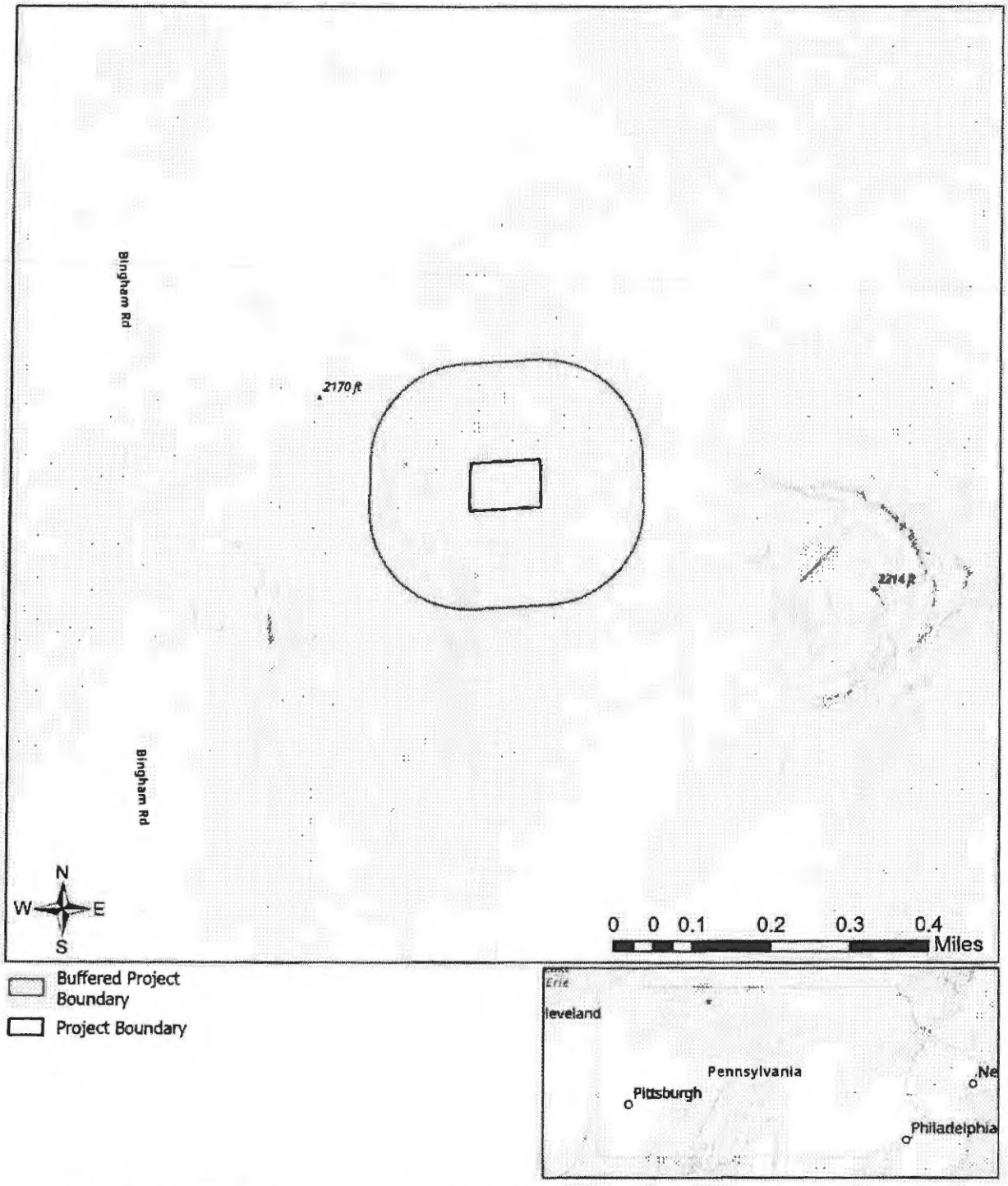
As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate no known impacts to threatened and endangered species and/or special concern species and resources within the project area. Therefore, based on the information you provided, no further coordination is required with the jurisdictional agencies. This response does not reflect potential agency concerns regarding impacts to other ecological resources, such as wetlands.

SANDSTONE DEVELOPMENT MCKAY 7A



Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

SANDSTONE DEVELOPMENT MCKAY 7A



Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for two years** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jurisdictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission
RESPONSE:

No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Department of Conservation and Natural Resources
RESPONSE:

No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

PA Fish and Boat Commission
RESPONSE:

No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service
RESPONSE:

No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq. is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. Two review options are available to permit applicants for handling PNDI coordination in conjunction with DEP's permit review process involving either T&E Species or species of special concern. Under sequential review, the permit applicant performs a PNDI screening and completes all coordination with the appropriate jurisdictional agencies prior to submitting the permit application. The applicant will include with its application, both a PNDI receipt and/or a clearance letter from the jurisdictional agency if the PNDI Receipt shows a Potential Impact to a species or the applicant chooses to obtain letters directly from the jurisdictional agencies. Under concurrent review, DEP, where feasible, will allow technical review of the permit to occur concurrently with the T&E species consultation with the jurisdictional agency. The applicant must still supply a copy of the PNDI Receipt with its permit application. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. The applicant and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at https://conservationexplorer.dcnr.pa.gov/content/resources.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a preliminary screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552
Harrisburg, PA 17105-8552
Email: RA-HeritageReview@pa.gov

U.S. Fish and Wildlife Service
Pennsylvania Field Office
Endangered Species Section
110 Radnor Rd; Suite 101
State College, PA 16801
Email: IR1_ESPenn@fws.gov
NO Faxes Please

PA Fish and Boat Commission
Division of Environmental Services
595 E. Rolling Ridge Dr., Bellefonte, PA 16823
Email: RA-FBPACENOTIFY@pa.gov

PA Game Commission
Bureau of Wildlife Management
Division of Environmental Review
2001 Elmerton Avenue, Harrisburg, PA 17110-9797
Email: RA-PGC_PNDI@pa.gov
NO Faxes Please

7. PROJECT CONTACT INFORMATION

Name:_____
Company/Business Name:_____
Address:_____
City, State, Zip:_____
Phone:(____)_____Fax:(____)_____
Email:_____

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

_____ _____
applicant/project proponent signature date