Underground Injection Control

PERMIT RENEWAL APPLICATION

FOR

CLASS II-D

PRODUCTION FLUID DISPOSAL WELL

RENEWAL EPA PERMIT VAS2D907BDIC

P-143

VIRGINIA OPERATIONS

NORA FIELD

ERVINTON DISTRICT, DICKENSON COUNTY

ENERVEST OPERATING, LLC

809 HAPPY VALLEY DRIVE

CLINTWOOD, VA 24228

MARCH 2020

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

EnerVest Operating, LLC
300 Capitol Street, Suite 200
Charleston, WV 25301
Phone: 276-926-1292

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

EnerVest Operating, LLC
809 Happy Valley Dr.
Clintwood, VA 24228
jlawson@enervest.net

III. Commercial Facility

- [ ] Yes
- [x] No

IV. Ownership

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

V. Permit Action Requested

- [ ] New Permit
- [x] 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: Nora

IX. Class and Type of Well (see reverse)

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

X. Well Status

- [x] A. Operating — Date Injection Started: 12/31/1991
- [ ] B. Conversion — Date Well Constructed: 01/23/1991
- [ ] C. Proposed

XI. Well Information

API Number: 45-051-0020300

Permit (or EPA ID) Number: VAS2D907BDIC

Full Well Name: P-143 SWD

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: 37.069442

Longitude: -82.264101

XIII. Attachments

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

XIV. Certification

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

Name and Official Title *(Please Type or Print)*	Signature	Date Signed
Kevin Miller, Vice President & General Manager	Kevin J. Miller	03/26/2020

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.

March 27, 2020

Mr. James C. Bennett (3WP22)
United States Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19103-2029

Mr. Bennett:

EnerVest is submitting this permit application to renew P-143, Permit #VAS2D907BDIC Class II-D fluid disposal well in Dickenson County, Virginia. The well is a vital part of our operation. Please see the three-bound copies and digital copy of the UIC permit renewal application.

Additionally, the submittal is ahead of the requested date, a precaution with the COVID-19 virus and being cautious to ensure mail delivery is available. That said, I would like to request that the reviewer's reference the previous permit and renewal applications when available if I have failed to include replications in the rush. All efforts were made to compile a complete application, however, the work from home order from the Virginia governor made printing out everything a challenge.

Please contact me with any questions and/or further requested information (276) 926-1292.

Sincerely,

Jon Lawson
Sr. HSE Specialist
jlawson@enervest.net

UNDERGROUND INJECTION CONTROL

PERMIT RENEWAL APPLICATION

FOR CLASS II-D PRODUCTION FLUID DISPOSAL WELL

RENEWAL APPLICATION FOR WELL P-143
EPA # VAS2D907BDIC

NORA FIELD
DICKENSON COUNTY, VIRGINIA

MARCH 2020

ENERVEST, LTD.
809 HAPPY VALLEY DRIVE • CLINTWOOD, VA 24228 • 276-926-1200 • FAX: 276-926-1391 • WWW.ENERVEST.NET

United States Environmental Protection Agency
Underground Injection Control (UIC) Program
Class II Permit Application Completeness Review Checklist

Permit Number:	
Well Name:	
Well Type: ☐ **Class II EOR** ☐ **Class II SWD** ☐ **Class II Commercial SWD**	
Permit Applicant:	
Date Application Received:	
Application Reviewed By:	
CHECK BOX IF ITEM IS PROVIDED; IF NOT APPLICABLE, WRITE "NA"	
☐ Completed Permit Application Form 7520-6, including signature of an authorized representative	
Attachment A. Maps and Area of Review	
☐ **I. Well Location(s) and Permitted Area Description (if area permit)** (40 CFR 144.26; 144.33)	
☐ **II. Area of Review Size Determination – fixed radius or equation** (40 CFR 144.6)	
III. Maps (40 CFR 144.31; 146.24) Topographic Map extending one-mile beyond facility property boundary showing: ☐ injection well, well pad, and project area ☐ area of review boundary ☐ outcrops of injection and confining formation, *if present* ☐ surface water intake and discharge structures, *if present* ☐ hazardous waste treatment, storage or disposal facility, *if present* Map showing within ¼ - mile beyond facility property boundary or AOR (whichever is larger): ☐ name and location of production wells, injection wells, abandoned wells, dry holes, and all water wells, noting its type (public water system, domestic drinking water, stock, etc.), *if present* ☐ springs and surface bodies of waters, *if present* ☐ mines (surface and subsurface) and quarries, *if present* ☐ residences, schools, hospitals, and roads, *if present*	
IV. Area of Review (AOR) Wells and Corrective Action Plan (CAP) (40 CFR 144.55; 146.24) ☐ tabulation of AOR wells, *if present* ☐ well bore diagrams, CBL, completion records of AOR wells, *if available* ☐ AOR CAP, *if applicable*	
V. Landowner Information (40 CFR 144.31 and part 147) ☐ list of landowners and address within ¼-mile ☐ evidence of notification to landowner of intent to apply for permit, *if applicable*	
Attachment B. Geological and Geophysical Information	
I. Geological Data (40 CFR 146.24) ☐ list of formations from surface to the base of the injection well, identifying all the USDWs and confining and injection zone(s). List 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*
☐ known or suspected faults and fracture systems within AOR. If identified, provide proximity to the injection zone and affect fault/fracture system may have on the injection activities
☐ history of seismic activity in the area and proximity to crystalline (i.e., granitic) basement, *if applicable*

II. Formation Testing Plan (40 CFR 146.22)
☐ fluid pressure
☐ estimated fracture pressure
☐ physical and chemical characteristics of the injection zone

Attachment C. Well Construction/Conversion Information

I. Well Schematic Diagram (40 CFR 146.24)
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
☐ surface trace, *if horizontal or deviated well*
If conversion to injection well:
☐ current well schematic diagram

II. Well Construction or Conversion Procedures (40 CFR 144.52; 146.22; 146.24)
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 applicable*
☐ description of alarms and shut-down systems at the well, *if applicable*
If conversion to injection well:
☐ well completion and cementing records
☐ previously run logs/tests

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

☐ flow diagram of fluid flow through facility
☐ contingency plan(s) to respond to with well failures
☐ drawing of the surface construction
☐ location of monitoring ports (show on the map(s) referenced in section A.III. above)
☐ description of sampling and monitoring devices to monitor the nature of the injected fluids, injection pressure, annulus pressure (if applicable), flowrate, and cumulative volume
☐ description of manifold monitoring program and how the program is comparable to individual well monitoring
Operating Data Information:
☐ 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, *if applicable*
☐ analysis of the chemical and physical characteristics of the injection fluid. At a minimum, this should include pH, specific gravity, TDS, and conductivity

Attachment E. Plugging and Abandonment (P&A) Plan (40 CFR 144.31; 144.51; 146.24)

☐ P&A plan of the well on EPA Form 7520-19

P&A diagram that includes:
- ☐ 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
- ☐ method of placement of the plugs
- ☐ at least one cost estimates from an independent firm in the business of plugging and abandoning wells for third party (EPA) to complete proposed P&A plan

Attachment F. Financial Assurance (40 CFR 144.52)
- ☐ evidence of financial resources, such as a surety bond or financial statement, necessary to close, plug, or abandon the well

Attachment G. Site Security and Manifest Requirements (Commercial Wells Only; Form 7520)
- ☐ site security plan
- ☐ description of manifest system

Attachment H. Aquifer Exemption (AE) (40 CFR 144.7; 146.4)
- ☐ supporting documentation for proposed AE, *if applicable*

Attachment I. Existing EPA Permits (40 CFR 144.31)
- ☐ list of existing EPA permits, *if applicable*

Attachment J. Description of Business (40 CFR 144.31)
- ☐ description of the nature of the business

Attachment K. Optional Additional Project Information (40 CFR 144.4)
- ☐ The Wild and Scenic Rivers Act, 16 U.S.C. 1273 et seq.
  list of national wild and scenic rivers that may be impacted by the activities associated with proposed project, *if applicable*
- ☐ The National Historic Preservation Act of 1966, 16 U.S.C. 470 et seq.
  list of properties listed or eligible for listing in the National Register of Historic Places. If available, historic and cultural resource survey(s) that have been conducted, *if applicable*
- ☐ The Endangered Species Act, 16 U.S.C. 1531 et seq.
  list of endangered or threatened species that may be affected by the activities associated with proposed project. If available, previous endangered or threatened species surveys that have been conducted, *if applicable*
- ☐ The Coastal Zone Management Act, 16 U.S.C. 1451 et seq.
  list of coastal zones that may be affected by the activities associated with the proposed project, *if applicable*

INTRODUCTION

EnerVest Operating, LLC (EnerVest) in Clintwood, Virginia is submitting this permit renewal application for the P-143 Class II-D oil and gas production fluid disposal well. The current permit was submitted and approved in Summer/Fall 2010 and permit plans remain unchanged at the time of this renewal.

EnerVest obtained Range Resources' operations in 2016, prior to that acquisition; Range Resources had acquired Equitable Production Company – which first permitted the P-143 in 1991. This permit was the first of Equitable's injection wells to come into operation in Virginia.

The P-143 was a conversion of existing well, in the Lick Creek watershed of Dickenson County, Virginia. This permit renewal application will present the necessary information and supporting documentation for renewing the existing permit for the well, EPA permit number VAS2D907BDIC.

1.0 WELL LOCATION

State	Virginia
County	Dickenson
District	Ervinton
Latitude/Longitude	37.069442 N 82.264101 W
911 Address	1923 Compressor Station Rd. Dante, VA 24237

2.0 AREA OF REVIEW

The fixed radius of ¼ - miles from well P-143 was used for the area of review (AOR). All information presented and mapping provided are based upon the ¼ - mile radius using Well P-143 as the center.

On some selective mapping, a radius of one mile, using Well P-143 and the ¼-mile AOR as the center, will be the area of review as required by this permit application.

3.0 AREA OF REVIEW MAPPING

Drawing 1 identifies the area within a one mile and ¼-mile radius from the proposed renewal UIC well and all coalbed methane wells/conventional wells existing within area. Additional drawings include active mining within 1-mile of proposed UIC well; inactive mining and water monitoring points within 1-mile of proposed UIC well, and abandoned underground mine extents within 1-mile of proposed UIC well.

MAP

- See mapping insert page. Injection Well Location, Area of Review Boundary (0.25-mile, 1.00-mile, and 1.25-mile), Name and Location of all known features (wells, mining, water bodies, etc.)

- The map was created from EnerVest's GIS department using company records and Division of Gas and oil files.

4.0 AOR Review Wells

Within the one (1) mile radius of UIC Well P-143, a total of 45 wells exist, based upon EnerVest and Virginia Division of Gas and Oil records in December 2019. These 45 wells consist of:

- **Coal Bed Methane Wells** – thirty-three of the wells are coalbed methane (CBM) wells ranging in depth from 1,825 to 2,936 feet and are extracting methane gas from the shallow coal seams. Two (2) of the CBM wells are within ¼-mile of the renewal Well P-143. The CBM wells are identified further in Appendix C.

- **Underground Injection Control Well** – One (1) former UIC well (plugged) is active in the 1-mile radius of the proposed renewal well. This Class II-D UIC well is identified as:

    - Former P-148 (EPA Permit VAS2D927BDIC): injection formation Weir (plugged 4,797 to 4,815 feet below ground surface). Located approximately 0.95 mile southwest of the renewal well.

- **Conventional Natural Gas Wells** – twelve conventional wells exist within 1-mile radius of P-143. They range in depth from 5,042 feet in Berea formation to 6,345 feet in the Cleveland shale. No plugged or abandoned wells are known to exist within the ¼-mile or 1-mile radius of the proposed UIC well.

The injection zone of renewal UIC well VAS2D907BDIC is the Weir formation from 4,746 feet to 4,793 feet below surface elevation, he deepest coalbed methane well within the one-mile radius is 2,936 feet, which provides for a minimum separation of 1,810 feet from the top of the Weir to the deepest CBM in the one-mile area of review.

- **Tabulation of Area of Review Wells** - Appendix C follows this section with area of review wells. Along with drilling and completion reports for all wells in AOR.

- **Existing Well Information** – All wells within the Area of Review identified by operator's well number, state file number and well type for all known producing, abandoned, dry holes, and injection. This

information was gathered from well and map records on file with the Virginia Division of Gas and Oil and from EnerVest's company files.

5.0 CORRECTIVE ACTION PLAN

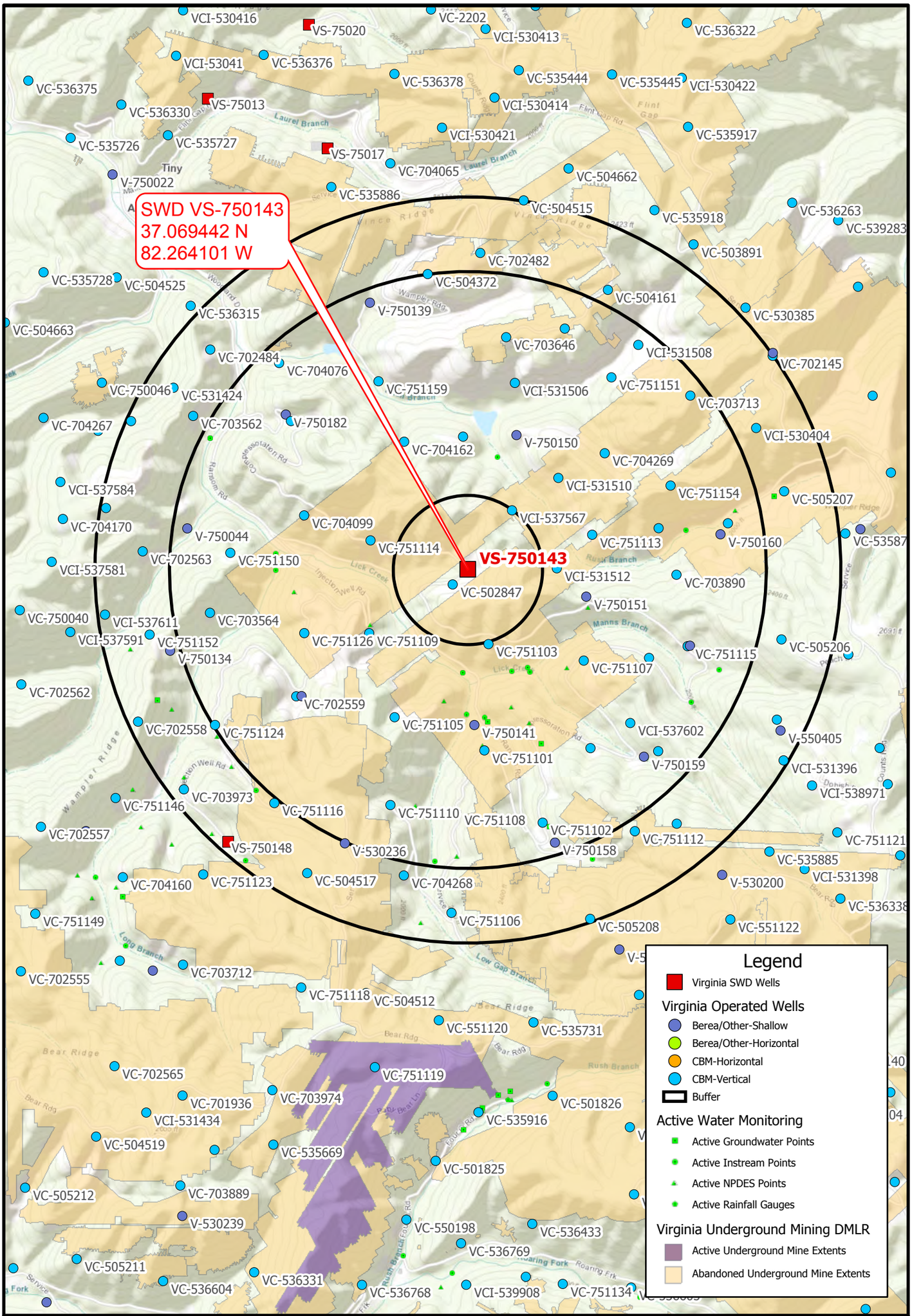
The production fluid will be injected into Well P-143 at less than fracture pressure of the Weir formation. The maximum surface injection pressure will be 990 psig (90% of Weir formation instantaneous shut-in pressure) or less. Should this pressure or other operating and injection problems be encountered in Well P-143 the following will be undertaken:

- Immediately stop all injections and allow well to stabilize.
- If stabilization does not occur a plan will be submitted to correct the problem with workover or other means.
- If well cannot be stabilized and problems encountered cannot be corrected to satisfaction of the state and federal agencies, Well P-143 will be plugged, as outlined in Attachment E of this renewal.

6.0 LANDOWNER INFORMATION

An information search for landowners in the ½ mile area of the proposed well bore includes one landowner. The ½-mile radius includes one public-owned surface owner but there are no houses or water wells on the property. The surface owner has purchased the tract from Heartwood Forest Fund since the last renewal.

Landowner	**Contact Addresses**
The Nature Conservancy c/o CF Highlands, LLC	CF Highlands, LLC c/o The Nature Conservancy 146 East Main Street Abingdon, VA 24210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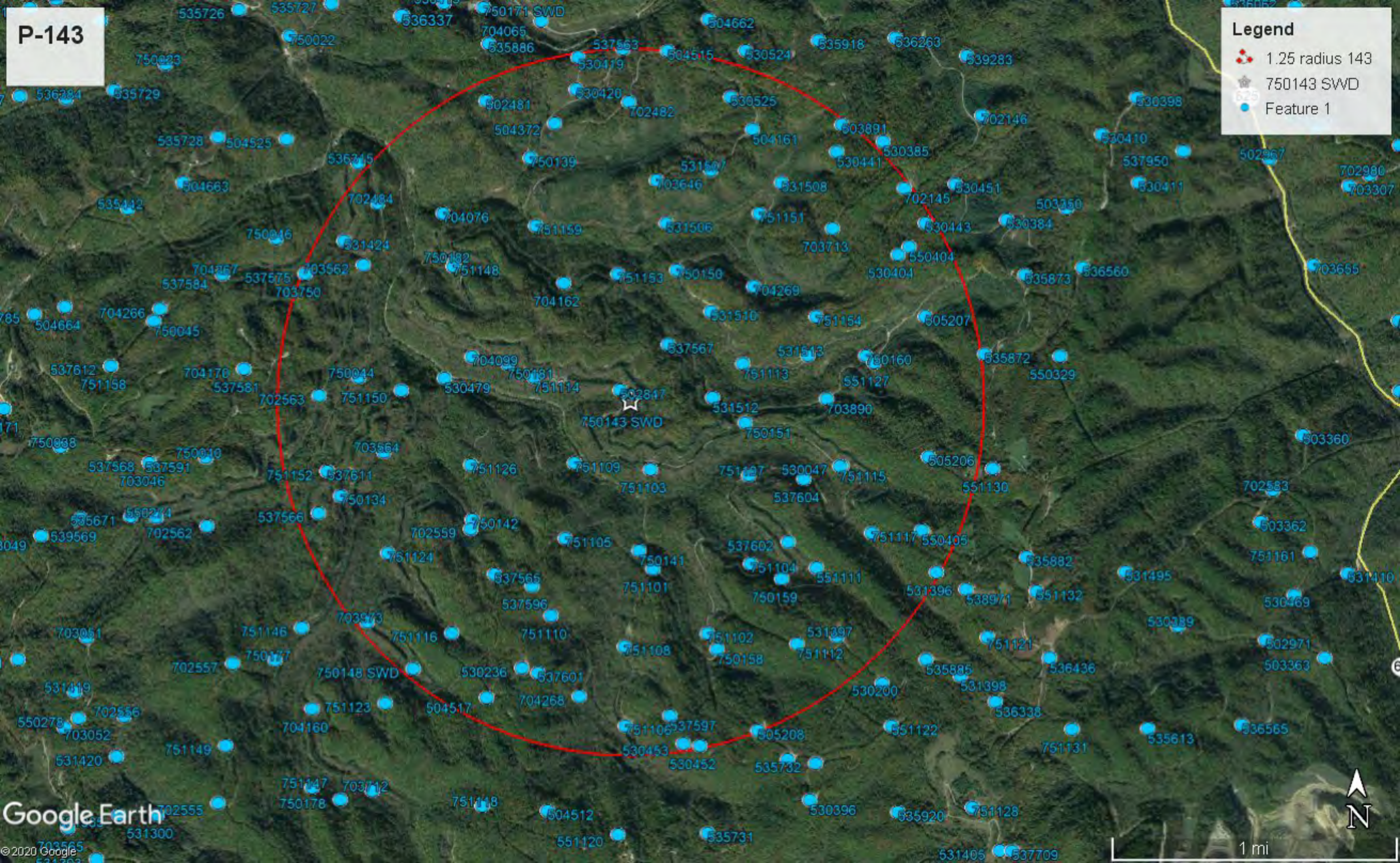
VC-505211
VC-536331
VC-536604
VC-536768
VCI-539908
VC-751134
Legend
Virginia SWD Wells
Virginia Operated Wells
Berea/Other-Shallow
Berea/Other-Horizontal
CBM-Horizontal
CBM-Vertical
Buffer
Active Water Monitoring
Active Groundwater Points
Active Instream Points
Active NPDES Points
Active Rainfall Gauges
Virginia Underground Mining DMLR
Active Underground Mine Extents
Abandoned Underground Mine Extents
Wampler Ridge
Laurel Branch
Lick Creek
Rush Branch
Manns Branch
Long Branch
Low Gap Branch
Bear Ridge
Flint Gap Rd
Injecter Well Rd
Ransom Rd
Bear Rdg
Roaring Fork
Rush Branch Rd
83
63
Buchanan
Dickenson
Russell
Wise
Location Map
N
1 inch = 2,000 feet
0
0.25
0.5
0.75
1
Miles
ENERVEST
VS-750143
Dickenson Co., Virginia
Date: 11/12/2019


P-143
Legend
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750143 SWD
750148 SWD
750171 SWD
Google Earth
© 2020 Google
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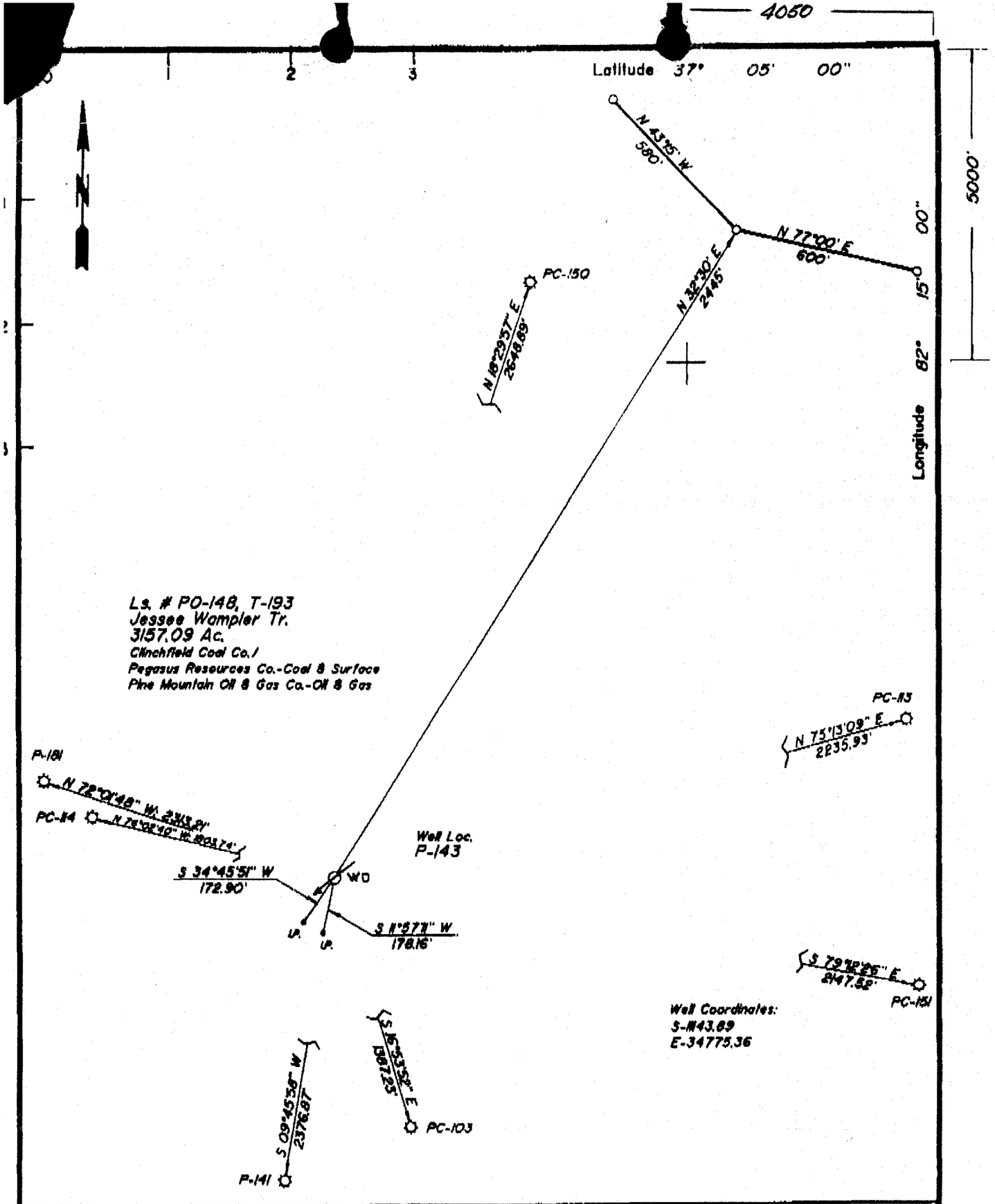


COMPANY Equitable Resources Exploration

ADDRESS 1989 E. Stone Dr., Kingsport, TN 37660

WELL NAME P-143

FARM Jessee Wampler TRACT T-193

LEASE NO. PO-148 ELEVATION 1944.34

ACRES 3157.09 QUADRANGLE Nora

COUNTY Dickenson DISTRICT Ervinton

REG. ENGINEER X REG. NO. 6992

CERT. LAND SURVEYOR ____ CERT. NO. ____

FILE NO. ____ DRAWING NO. 1995

DATE 5 - 22 - 90 SCALE 1" = 400'

This plat is X new ____ updated

This plat X is ____ is not based on a mine coordinate system established for the areas of the well location.

FORM 8

WELL LOCATION MAP

WELL NO. P-143

+ Denotes location of well on United States Topographic Maps, scale 1 to 24,000, latitude and longitude lines being represented by border lines as shown.

CERTIFICATION OF WELL PLAT

I, the undersigned, hereby certify that this plat is correct to the best of my knowledge and belief, and shows all the information required by law and the regulations of the Va. Well Review Board.

H. L. SAUNDERS

Registered Engineer ~~or Certified Land Surveyor~~ in Charge

1.0 UIC WELL P-143 – EPA # VAS2D907BDIC

EnerVest proposes to renew the permit for the existing well for the express purpose of the continued underground injection of fluids from its Virginia operations' conventional and coalbed methane (CBM) production wells. The primary fluid to be injected is the connate waters associated with the production of methane from EnerVest's CBM wells

UIC Well P-143 is operated as a Class II-D production fluid disposal well. The primary formation of injection for the production fluid is the Weir formation.

EnerVest operates six (6) existing Class II-D production fluid disposal wells in the Nora Field and have two (2) permitted undrilled UIC wells. All of these wells utilize the Weir Formation for disposal zone. Based on EnerVest's extensive knowledge of the various oil and gas formations underlying the Nora Field and previous experience with the existing wells, the Weir will continue to be utilized for the renewal term.

The well is located in Dickenson County, Ervinton District, and in the Lick Creek Watershed.

2.0 GEOLOGIC DATA

The following table identifies the formations from surface to TD from the original well driller's report.

Table B-1. Geological Data

Well No. P-143 File No. DI-203 Permit No. VAS2D907BDIC

Drill Log 11/2/1982

Geologic Age	Formation	General Lithology	Top (feet)	Bottom (feet)	Thickness	Notes
-		Fill	0	20	20	
Pennsylvanian	Lee	Sand & Shale	20	31	11	
Pennsylvanian	Lee	Sand	31	421	390	
Pennsylvanian	Lee	Coal	421	424	3	
Pennsylvanian	Lee	Sand & Shale	424	528	104	
Pennsylvanian	Lee	Coal	528	534	6	
Pennsylvanian	Lee	Sand & Shale	534	643	109	
Pennsylvanian	Lee	Sand	643	753	110	
Pennsylvanian	Lee	Sand & Shale	753	788	35	
Pennsylvanian	Lee	Sand	788	1068	280	
Pennsylvanian	Lee	Sand & Shale	1068	1110	42	
Pennsylvanian	Lee	Sand	1110	1410	300	
Pennsylvanian	Lee	Sand & Shale	1410	1454	44	
Pennsylvanian	Lee	Sand	1454	2260	806	
Pennsylvanian	Lee	Red Rock	2260	2263	3	
Pennsylvanian	Lee	Sand & Shale	2263	2638	375	
Mississippian	Ravencliff	Sandstone	2638	2865	227	
Mississippian	Sand & Shale	Sand & Shale	2865	3153	288	
Mississippian	Maxon	Sandstone	3153	3413	260	
Mississippian	Sand	Sand	3413	3905	492	
Mississippian	Little Lime	Limestone	3905	4000	95	
Mississippian	Sand & Shale	Sand & Shale	4000	4118	118	
Mississippian	Big Lime	Limestone	4118	4636	518	
Mississippian	Keener	Sandstone	4636	4690	54	
Mississippian	Weir	Sandy Shale	4690	5184	494	Injection Zone
Devonian	Coffee Shale	Shale	5184	5260	76	
Devonian	Berea	Sandstone	5260	5334	74	
Devonian	Brown Shale	Shale	5334	5358	24	
	Total Depth		5338	TD		

- **Confining Zones.** The sedimentary sequence in the southern Appalachian Basin contains several confining zones above and below the injection zone. Since the Weir is a hydrocarbon reservoir across the Basin, there are adequate confining strata above the injection zone that act as barriers to the upward movement of hydrocarbons and fluids. These confining rock layers are stratigraphic traps as a result of lithogic changes in reduced porosity and permeability.
- Figure G-1 is a geologic column indicating the formations above and below the permitted injection zone. The following is a brief description of these formations.

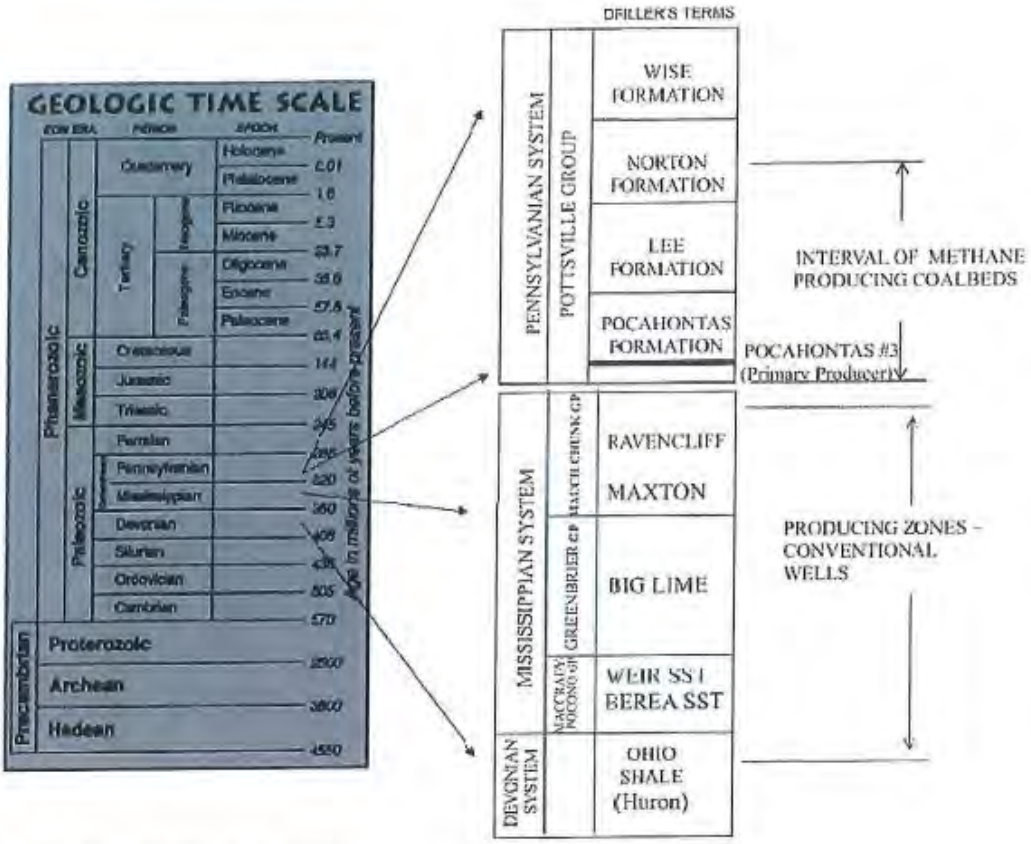


Figure G-1. Virginia Geologic Column

The confining zone directly above the injection zone is the upper Mississippian Greenbrier Group, locally referred to as the Big Lime. This is a dense, thick carbonate. The porosity zones in the Big Lime consist of thin oolitic channel deposits. Overall porosity in the upper Big Lime,

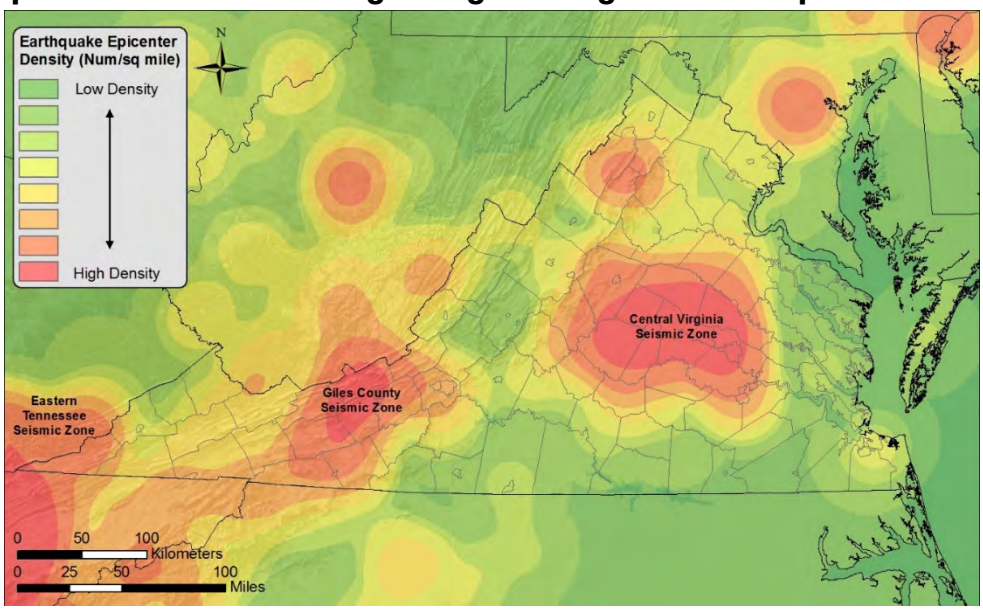
based on offset data, is around two percent. Water saturation for the Big Lime is typically near zero.

Above the Big Lime is the Mauch Chunk Group consisting of over 1,000 feet of tight sands, siltstones, and limestones that act as further barriers to the upward migration of fluids. Above the Mauch Chunk are several thousand feet of siltstone, tight sands and coal beds that also inhibit the migration of injected fluids.

There are also several confining zones below the Weir, such as the Weir shale and below that the Sunbury shale. The very low permeability of shale inhibits the downward migration of produced fluids.

Additionally the Pocono Formation, locally known as the Berea Sandstone, consists of a fine-grained, dirty siltstone. Offset data indicate the Berea has an average porosity of about four percent. In this area, the Berea is approximately 75 feet thick. As mentioned, directly above the Berea is the Sunbury (of Coffee) Shale. This shale is also about 75 feet thick and acts as a further barrier for downward migration of fluid. The top of the Coffee Shale is 5184 feet and the top of the Berea is 5260.

Seismic Zones in Virginia
(http://www.dmme.virginia.gove/dgmr/earthquakes.shtml)



- **Local Seismic Activity**. Historically, seismic activity in Virginia has been minor. The faults that exist in the region were active during the Acadian and Alleghanian Orogenies approximately 375 million to 260 million years ago. The P-143 well is in a region that is not susceptible to earthquakes since there are no active forces causing crustal movement.

3.0 Water Sources

During the surficial survey of the area within ¼-mile radius of the original permit and recent reviews near P-143, no drinking water users or supplies were found. Further, a search of state records indicated no drinking water sources within the ¼-mile radius. Current Virginia Division of Gas and Oil regulations requires an additional survey prior to commencing new drilling, wells VCI-530479 and VCI-530453 have been drilled in the Area of Review since 2017 and no drinking water sources were found in their reviews also.

Underground sources of drinking water within the Area of Review are generally located within the unconsolidated alluvium/colluvium deposits and the associated Norton Formation along local stream elevation. Groundwater is typically found at depths within 300 feet of the topographic expression of the local stream grade. Underground sources of drinking water would be expected to occur between depths of 0 feet and 500 feet related to the surface elevation of the SWD well, or approximately 4100 feet vertically above the target disposal zone.

4.0 MINING ACTIVITY

The area within ¼-mile radius of P-143 is a formerly surface mined area. This extensive surface mining was evident during field reconnaissance and documented by Virginia Division of Mine Land Reclamation (DMLR) files and mapping.

One-mile radius includes Paramont Contura, LLC's Long Branch Auger Mine (DMLR Permit 1102186) and their proposed, not started Long Branch Lower Banner Deep Mine (DMLR Permit 1202282).

As reported by Virginia DMLR, there exists area underlying the ¼-mile radius around the UIC well has been deep mined. The deep mining is completed and deep mine properly closed and sealed. The limits of these deep mine activities is noted on the map included.

Virginia Division of Mined Land Reclamation – Surface/Underground Extents

The deep mining occurred in the Jawbone Seam and Upper Banner at a depth of approximately 775' feet below ground surface. The area was deep mined by Clinchfield/Black Dog Coal Corp (Federal Mine ID 44-04946) and the mine was room and pillar mining, thus solid blocks of

coal (the pillar) are spaced on an approximate 80 by 80-foot grid. The mine is considered Abandoned/Sealed by MSHA. The mine entrance was some 4,800 feet away in Fryingpan Creek.

EnerVest works closely with the mining company to ensure seamless operations.

5.0 REGIONAL STRUCTURE AND FAULTS

Site / Regional Structure – No faults are known to exist within a one-mile radius of P-143 well. In addition, the rocks of the Nora and Duty quadrangles have an average dip of 0.6 degrees toward the northwest, which is indicative of the presence of a subtle structural high with approximately 50 feet of closure that generally corresponds to a northeast trending anticlinal feature recognized in the underlying Mississippian age rocks crossing the northwest part of the Nora quadrangle (Diffenbach, 1989).

Nora quadrangle is located in the southwestern part of Virginia in Dickenson and Russell counties. It lies entirely within the Appalachian Plateaus physiographic province. The bedrock in this quadrangle ranges in age from Lower to Middle Pennsylvanian. The rocks are primarily interbedded siltstones, sandstones, and shales. Generally, the strata in the Nora quadrangle have a dip of approximately 0.6 degrees to the northwest. Coal is the primary mineral/energy resource in the map area. Fourteen coal beds have been mapped in the quadrangle (Diffenbach, 1989).

Faulting –UIC Well P-143 is located nearly 4.7 miles to the southwest of the Russell Fork Fault, a steeply dipping, right lateral (primarily) transcurrent fault believed to have a lateral displacement of up to six (6) miles. Based on review of published cross sections (Meissner, 1978), the Pine Mountain Overthrust underlies the region at an approximate depth of 6,200 feet below drainage. Additional faulting in the area of the Nora quadrangle appears to be limited to indications of thrust faulting within several of the Pennsylvanian coal seams of this area, in response to the Pine Mountain Overthrust (Diffenbach, 1989).

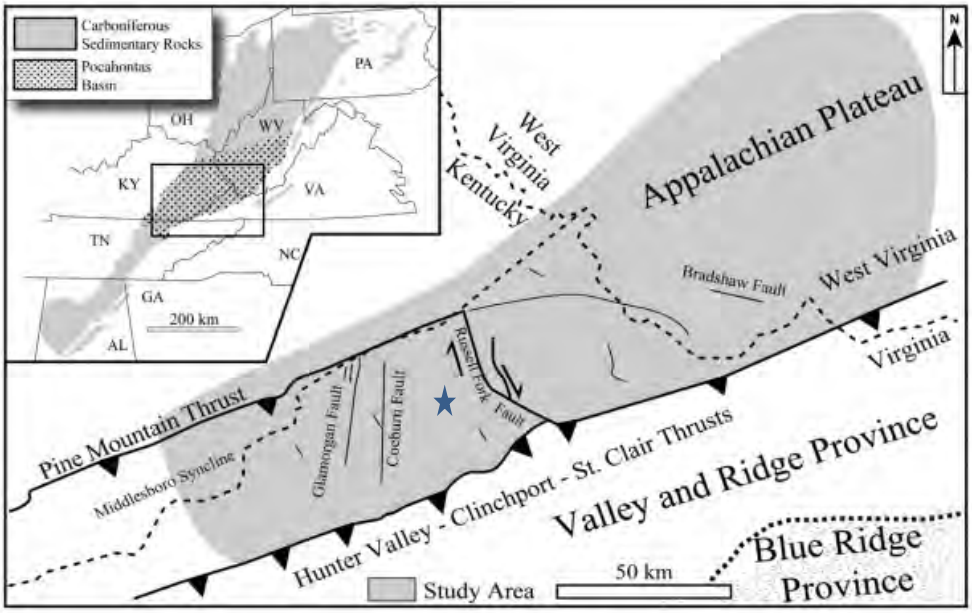


Fig. 1. Regional map illustrating the distribution of Carboniferous sedimentary rocks in the Appalachian Basin (shaded region); hatched area denotes the Pocahontas Basin. Detailed map shows major structures within the Pocahontas Basin, including the Middlesboro Syncline structure of the principal study area, bounded by the Hunter Valley–Clinchport–St. Clair and Pine Mountain thrust faults. The Russell Fork Fault (bold) as well as minor Bradshaw, Coeburn and Glamorgan faults have measurable lateral and vertical displacement features (Adapted from Cecil et al., 1985; Henika, 1994; Mitra, 1988.

Drinking Water Information

No drinking water wells were located within the ½-mile radius of the proposed wellbore. The area was surveyed again in 2019 and found no wells within the area of review.

Springs and surface water bodies

The well is located in the Lick Creek watershed and across the ridge there is Rush Branch of Lick Creek.

HUC12	VAHU6	Watershed
050702020405	BS20	Lick Creek of Russell Fork

No springs were encountered within ½-mile radius during initial permitting or in 2019 field reconnaissance. The area has been extensively mined historically, room and pillar underground mining and surface mines.

6.0 Formation Testing

- The mechanical integrity testing will involve the following:

  The maximum surface injection pressure was originally calculated 990 psig. With the maximum surface injection pressure of 990 psig plus 10% as a safety factor, the minimum mechanical integrity testing pressure will be 1,558 psig (surface pressure)

  Fill the production casing to surface with fresh water and gradually pressure the casing to a minimum pressure of max plus 10% (surface pressure). Once the pressure has stabilized, it will be recorded for 30 minutes (minimum).

  The pressuring of the production casing and the test duration will be recorded by pressure chart, with pressure verified by a calibrated liquid-filled pressure gauge.

  The pressure will be monitored for 30 minutes, with no more than a 10% pressure loss over that period.

  Should a loss of pressure or the inability to establish the desired minimum test pressure occur, all testing will cease. The problem will be corrected and testing resumed based upon the concurrence of the Virginia Gas and Oil representative and U.S. EPA Region III representative present during the testing.

  The mechanical integrity testing will be witnessed if possible by the Virginia Division of Gas and Oil, U.S. EPA Region III, and EnerVest. With the successful completion of the mechanical integrity test, the pressure chart will be signed and dated by those witnessing the test.

The test pressure will be relieved (vented).

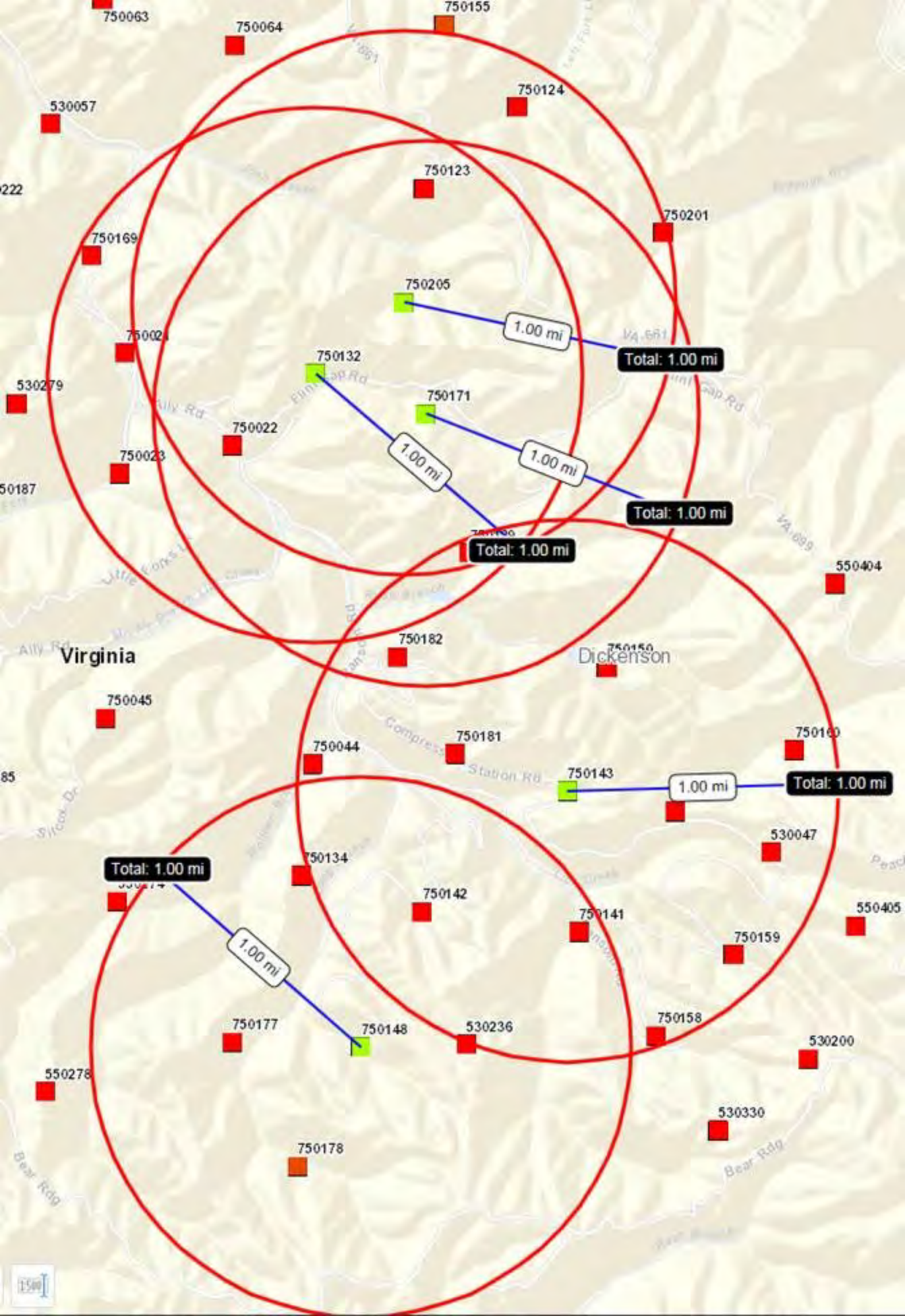
7.0 NOTIFICATIONS

EnerVest will request the presence of representatives from the Virginia Division of Gas and Oil and U.S. EPA Region III to observe and witness the mechanical integrity testing. EnerVest will notify the respective state and federal agencies ten (10) working days prior to commencing the testing programs.

REFERENCES

Diffenbach, Robert N., 1989, Geology of the Nora Quadrangle, Virginia, Virginia Division of Mineral Resources Publication 92.

Grimm, Ryan P., et al, 2012. Seal evaluation and confinement screening criteria for beneficial carbon dioxide storage with enhanced coal bed methane recovery in the Pocahontas Basin, Virginia, *International Journal of Coal Geology*, V. 90-91, p. 110-125.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1.00 mi
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750158
530200
550278
530330
750178

Big Lime

Well ID	Little Lime Top	Little Lime Base	Interval Little Lime Base to Btm Perf	Big Lime Top	Big Lime Base	Big Lime Thickness	Interval Big Lime Base to Btm Perf	Perf Breakdown	Perf Top	Perf Btm	Perf Mid	ISIP (psi)	Frac Fluid	Foam Density (ppg)	Frac Pressure (psi)	Frac Gradient (psi/ft)	Comments
530047	3937	3995	686	4282	4681	399	0	4397-4407, 4671-4681	4397	4681	4539	2709	50Q acid	2.25	3240	0.71	Frac Fluid from DGO site only
530051	3464	3532	693	3709	4268	559	43	3730-3733, 3742-3748, 3964-3974, 4210-4215, 4220-4225	3730	4225	3977.5	920	50Q	4.5	1850	0.47	
530236	4324	4384	663	4545	5072	527	25	5383-4587, 4875-4879, 4934-4940, 4979-4984, 5041-5047	4583	5047	4815	2108	60Q	4.15	3146	0.65	
536397	3407	3473	440	3652	4212	560	299	Single Group	3894	3913	3903.5	3140	65Q acid	3.1	3769	0.97	
750021	3368	3430	376	3519	4011	492	205		3796	3806	3801	3000	Water	8.3	4639	1.22	
750044	3558	3612	640	3738	4263	525	11		4242	4252	4247	-	28% HCL	9.521	-	-	No ISIP Given
750123	4082	4152	187	4288	4756	468	417		4329	4339	4334	0	Water	8.3	1877	0.43	
750124	3664	3724	376	3863	4327	464	227		4086	4100	4093	2500	28% HCL	9.521	4524	1.11	ISIP and Frac Fluid from DGO site only
750141	3660	3728	182	3882	4403	521	493		3902	3910	3906	850	28% HCL	9.521	2782	0.71	ISIP from DGO site only
750159	3939	4021	682	4160	4710	550	7	4697-4703, 4407-4415	4407	4703	4555	1500	15% HCL	8.961	3620	0.79	ISIP and Frac Fluid from DGO site only
750160	3832	3925	579	4066	4585	519	81	4089-4094, 4499-4504	4089	4504	4296.5	1250	28% HCL	9.521	3375	0.79	"Nitrogen Assist" assumed full bore acid at ISIP
750171	3777	3835	183	3980	4465	485	447		4013	4018	4015.5	1400	15% HCL	8.961	3269	0.81	"Nitrogen Assist" assumed full bore acid at ISIP
750181	3843	3910	648	4056	4565	509	7		4552	4558	4555	1300	15% HCL	8.961	3420	0.75	"Nitrogen Assist" assumed full bore acid at ISIP. ISIP from DGO site only
750182	3782	3861	605	3985	4483	498	17		4460	4466	4463	450	15% HCL	8.961	2528	0.57	
750201	3761	3833	547	3949	4390	441	10		4376	4380	4378	1400	28% HCL	9.521	3565	0.81	"Nitrogen Assist" assumed full bore acid at ISIP
809587	3214	3258		3289	3724	435											Berea completion only.
821617	3707	3761	474	3803	4253	450	18		4227	4235	4231	-	-	-	-	-	Screened out
821788	3622	3704	272	3792	4124	332	148		3828	3976	3902	2324	-	-	-	-	N2 assist Acid foam frac quality uncertain
823605	3780	3843	315	3896	4297	401	139		4042	4158	4100	2717	60Q		3634	0.89	Recomplete
823606	3711	3773		3873	4232	359											Not Completed
824073	3582	3645	439	3760	4102	342	18	3903-3909, 3960-3967, 4079-4084	3903	4084	3993.5	-	-	-	-	-	Matrix acid job - Did not fracture
826109	3372	3435	309	3540	3887	347	143		3738	3744	3741	2456	50Q acid		3468	0.93	
826204	3813	3872	318	3992	4348	356	158		4182	4190	4186	3411	Nitrogen		3846	0.92	
900029	3351	3410	401	3517	3846	329	35		3574	3811	3692.5	2570	60Q		3434	0.93	
900109	3754	3811	462	3916	4287	371	14		4260	4273	4266.5	470	Water		2318	0.54	(2-stage Big Lime completion)
900109	3754	3811	306	3916	4287	371	170		3943	4117	4030	1217	Water		2963	0.74	(2-stage Big Lime completion)
Minimum			182			329	0									0.43	
Maximum			693			560	493									1.22	
Average			449			447	131									0.79	

Well ID	State File #	API	Formations Completed
530047			RVCF.MAXTON.BGLM.BEREA
530051			RVCF.MAXTON.BGLM.WEIR
530236			RVCF.BGLM.BEREA.
536397			RVCF BGLM WEIR BEREA LHUR
750021		4505100106	BGLM.BEREA
750044		4505100127	MAXTON.BGLM.BEREA
750123		4505100195	BGLM.BEREA
750124		4505100194	BGLM.BEREA
750141		4505100201	BGLM.BEREA.WEIR
750159		4505100233	BGLM.WEIR.BEREA
750160		450510032	BGLM.BEREA
750171		450510023	BGLM.WEIR.BEREA.CLEV
750181		4505100236	BGLM.WEIR.BEREA
750182		4505100235	BGLM.BEREA.WEIR
750201		4505100266	BGLM.WEIR.BEREA
809587	BU-0092		BEREA
821617	BU-1437		BGLM.WEIR.BEREA.LHUR
821788	BU-1455		BEREA.LHUR
823605	BU-1613		RVCF.MAXTON.BGLM.BEREA.LHUR
823606	BU-1614		
824073	BU-1806		MAXTON.BGLM.BEREA.LHUR
826109	BU-3675		BGLM.WEIR.LHUR.MARC
826204	BU-3391		RVCF.BGLM.WEIR.LHUR.RNST
900029	BU-4785		RVCF.MAXTON.BGLM.WEIR
900109	BU-4949		BEREA.BGLM.MAXTON.RVCF
900109	BU-4949		BEREA.BGLM.MAXTON.RVCF.
Average			

Berea

Well ID	Perf Top	Perf Btm	Perf Mid	ISIP (psi)	Foam	Foam Density (ppg)	Frac Pressure (psi)	Frac Gradient (psi/ft)
530047	5323	5355	5339	639	75Q	2.4	1304.641558	0.24
530051	[redacted]							
530236	5697	5761	5729	389	75Q	2.26	1061.599481	0.19
536397	[redacted]							
750021	4690	4728	4709	?	?		#VALUE!	#VALUE!
750044	4904	4937	4920.5	?	Water	8.3	#VALUE!	#VALUE!
750123	[redacted]							
750124	4980	5029	5004.5	1300	?		1300	0.26
750141	5046	5112	5079	1800	75Q		1800	0.35
750159	5344	5399	5371.5	1700	75Q		1700	0.32
750160	5231	5247	5239	1880	75Q		1880	0.36
750171	5106	5167	5136.5	1900	75Q		1900	0.37
750181	5192	5255	5223.5	1900	75Q		1900	0.36
750182	5113	5173	5143	3000	65Q		3000	0.58
750201	5082	5147	5114.5	2000	75Q		2000	0.39
809587			0				0	#DIV/0!
821617			0				0	#DIV/0!
821788			0				0	#DIV/0!
823605			0				0	#DIV/0!
823606			0				0	#DIV/0!
824073			0				0	#DIV/0!
826109			0				0	#DIV/0!
826204			0				0	#DIV/0!
900029			0				0	#DIV/0!
900109			0				0	#DIV/0!
900109								

Big Lime

Well ID	Perf Top	Perf Btm	Perf Mid	ISIP (psi)	Foam	Foam Density (ppg)	Frac Pressure (psi)	Frac Gradient (psi/ft)
530047	4397	4681	4539	2709	15% HCL foam		2709	0.60
530051	3730	4225	3977.5	1610	50Q		1610	0.40
530236	4583	5047	4815	2108	60Q		2108	0.44
536397	3894	3913	3903.5	3140	Acid with N2		2888.8	0.92
750021			0				0	#DIV/0!
750044	4242	4252	4247	?	28% HCL	9.521	#VALUE!	#VALUE!
750123	[redacted]							
750124	4086	4100	4093	2500	?		2500	0.61
750141	3902	3910	3906	850	28% HCL		850	0.22
750159	4407	4703	4555	1500	15% HCL		1500	0.33
750160	4089	4504	4296.5	1250	?		1250	0.29
750171	4013	4018	4015.5	1400	?		1400	0.35
750181	4552	4558	4555	1300	?		1300	0.29
750182	4460	4466	4463	450	15% HCL		450	0.10
750201	4376	4380	4378	1400	?		1400	0.32
809587			0				0	#DIV/0!
821617			0				0	#DIV/0!
821788			0				0	#DIV/0!
823605			0				0	#DIV/0!
823606			0				0	#DIV/0!
824073			0				0	#DIV/0!
826109			0				0	#DIV/0!
826204			0				0	#DIV/0!
900029			0				0	#DIV/0!
900109			0				0	#DIV/0!
900109								

Weir

Well ID	Perf Top	Perf Btm	Perf Mid	ISIP (psi)	Foam	Foam Density (ppg)	Frac Pressure (psi)	Frac Gradient (psi/ft)
530047	4805	4846	4825.5	464	75Q		464	0.10
530051	4463	4486	4474.5	656	75Q		656	0.15
530236	[redacted]							
536397	4397	4431	4414	1802	75Q		1081.2	0.60
750021	[redacted]							
750044								
750123								
750124								
750141	4503	4590	4546.5	500			500	0.11
750159	4800	4887	4843.5	1700	75Q		1700	0.35
750160	[redacted]							
750171								
750181	4677	4725	4701	1750	75Q		1750	0.37
750182	4601	4635	4618	1800	75Q		1800	0.39
750201	4572	4597	4584.5	1500	75Q		1500	0.33
809587			0				0	#DIV/0!
821617			0				0	#DIV/0!
821788			0				0	#DIV/0!
823605			0				0	#DIV/0!
823606			0				0	#DIV/0!
824073			0				0	#DIV/0!
826109			0				0	#DIV/0!
826204			0				0	#DIV/0!
900029			0				0	#DIV/0!
900109			0				0	#DIV/0!
900109								

Berea

Well ID	Perf Top	Perf Btm	Perf Mid	ISIP (psi)	Foam	Foam Density (ppg)	Frac Pressure (psi)	Frac Gradient (psi/ft)
530047	5323	5355	5339	639	75Q	2.4	1304.641558	0.24
530051	[redacted]							
530236	5697	5761	5729	389	75Q	2.26	1062	0.19
536397	[redacted]							
750021	4690	4728	4709	500	?		500	0.11
750044	[redacted]							
750123								
750124	4980	5029	5004.5	?	?		#VALUE!	#VALUE!
750141	5046	5112	5079	?	?		#VALUE!	#VALUE!
750159	5344	5399	5371.5		75Q		0	0.00
750160	5231	5247	5239	1880	75Q		1880	0.36
750171	5106	5167	5136.5	1900	75Q		1900	0.37
750181	5192	5255	5223.5	?	75Q		#VALUE!	#VALUE!
750182	5113	5173	5143	3000	65Q		3000	0.58
750201	5082	5147	5114.5	2000	75Q		2000	0.39
809587			0				0	#DIV/0!
821617			0				0	#DIV/0!
821788			0				0	#DIV/0!
823605			0				0	#DIV/0!
823606			0				0	#DIV/0!
824073			0				0	#DIV/0!
826109			0				0	#DIV/0!
826204			0				0	#DIV/0!
900029			0				0	#DIV/0!
900109			0				0	#DIV/0!
900109								

Big Lime

Well ID	Perf Top	Perf Btm	Perf Mid	ISIP (psi)	Foam	Foam Density (ppg)	Frac Pressure (psi)	Frac Gradient (psi/ft)
530047	4397	4681	4539	2709	?		2709	0.60
530051	3730	4225	3977.5	920	50Q		920	0.23
530236	4583	5047	4815	2108	60Q		2108	0.44
536397	3894	3913	3903.5	3140	65Q acid		2888.8	0.92
750021	3796	3806	3801	3000	28% acid		3000	0.79
750044	[redacted]							
750123								
750124	4086	4100	4093	?	?		#VALUE!	#VALUE!
750141	3902	3910	3906	?	28% HCL		#VALUE!	#VALUE!
750159	4407	4703	4555	?	?		#VALUE!	#VALUE!
750160	4089	4504	4296.5	1250	?		1250	0.29
750171	4013	4018	4015.5	1400	?		1400	0.35
750181	4552	4558	4555	?	?		#VALUE!	#VALUE!
750182	4460	4466	4463	450	15% HCL		450	0.10
750201	4376	4380	4378	1400	?		1400	0.32
809587			0				0	#DIV/0!
821617			0				0	#DIV/0!
821788			0				0	#DIV/0!
823605			0				0	#DIV/0!
823606			0				0	#DIV/0!
824073			0				0	#DIV/0!
826109			0				0	#DIV/0!
826204			0				0	#DIV/0!
900029			0				0	#DIV/0!
900109			0				0	#DIV/0!
900109								

Weir

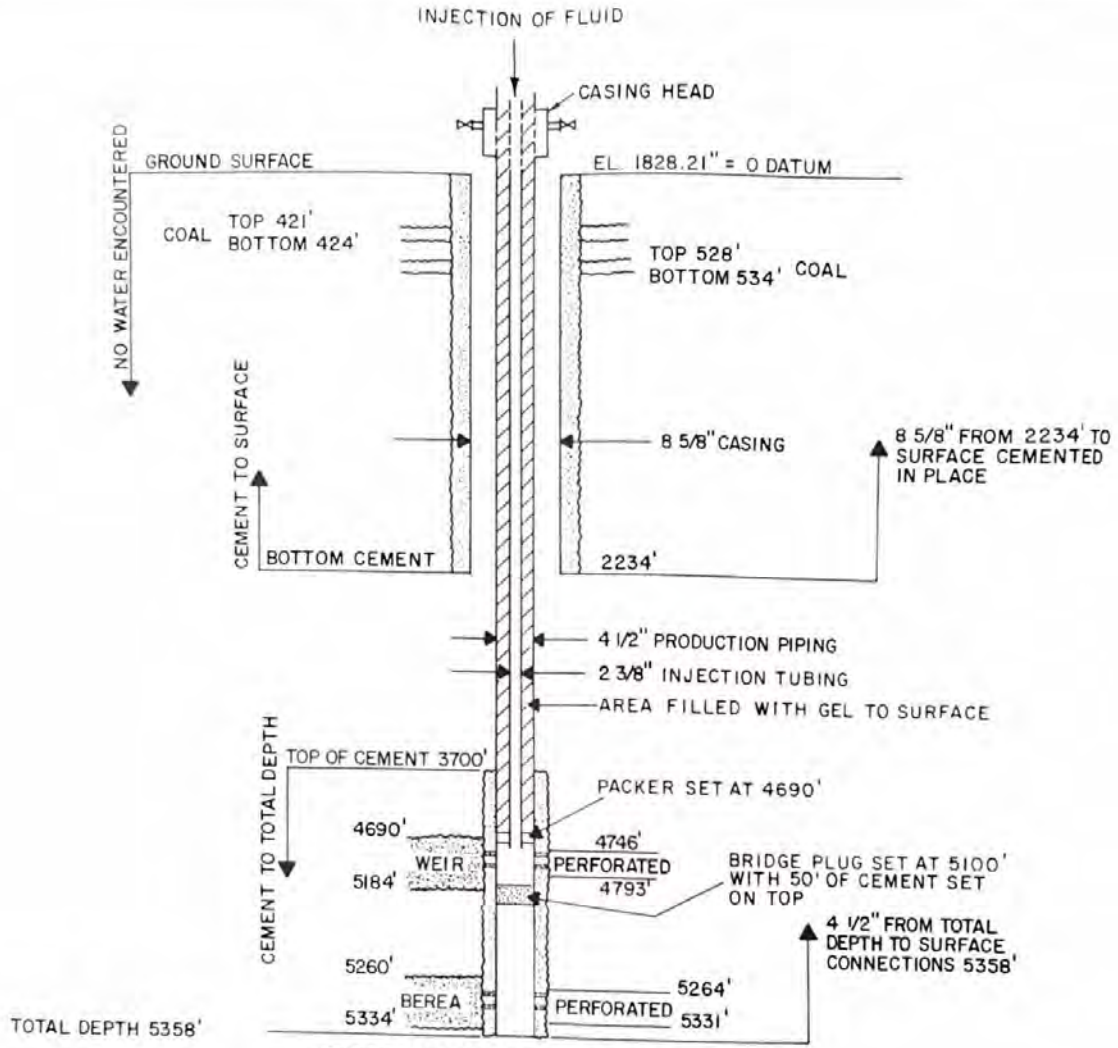
Well ID	Perf Top	Perf Btm	Perf Mid	ISIP (psi)	Foam	Foam Density (ppg)	Frac Pressure (psi)	Frac Gradient (psi/ft)
530047	4805	4846	4825.5	464	75Q		464	0.10
530051	4463	4486	4474.5	656	75Q		656	0.15
530236	[redacted]							
536397	4397	4431	4414	1802	75Q		1081.2	0.60
750021	[redacted]							
750044								
750123								
750124								
750141	4503	4590	4546.5	500	Wtr	8.3	2460.309091	0.54
750159	4800	4887	4843.5	?	75Q		#VALUE!	#VALUE!
750160	[redacted]							
750171	4599	4636	4617.5	1700	75Q		1700	0.37
750181	4677	4725	4701	?	75Q		#VALUE!	#VALUE!
750182	4601	4635	4618	1800	75Q		1800	0.39
750201	4572	4597	4584.5	1500	75Q		1500	0.33
809587			0				0	#DIV/0!
821617			0				0	#DIV/0!
821788			0				0	#DIV/0!
823605			0				0	#DIV/0!
823606			0				0	#DIV/0!
824073			0				0	#DIV/0!
826109			0				0	#DIV/0!
826204			0				0	#DIV/0!
900029			0				0	#DIV/0!
900109			0				0	#DIV/0!
900109								

Berea

Well ID	Perf Breakdown	Perf Top	Perf Btm	Perf Mid	ISIP (psi)	Frac Fluid	Foam Density (ppg)	Frac Pressure (psi)	Frac Gradient (psi/ft)	Comments
530047	5323-5349, 5351-5355	5323	5355	5339	639	75Q	2.4	1305	0.24	
530051		[redacted]								Not Completed
530236	5697-5717, 5743-5749, 5752-5761	5697	5761	5729	389	75Q	2.26	1062	0.19	
536397		[redacted]								Not Completed
750021		4690	4728	4709	600	Water	8.3	2630	0.56	
750044		[redacted]								Not Enough Data
750123										Missing Records
750124										Not Enough Data
750141		5046	5112	5079	1800	75Q	2.9	2565	0.51	ISIP and Frac Fluid from DGO site only
750159	Single Group	5344	5399	5371.5	1700	75Q	2.8	2481	0.46	ISIP from DGO site only
750160	Single Group	5231	5247	5239	1880	75Q	2.9	2669	0.51	
750171		5106	5167	5136.5	1900	75Q	2.95	2687	0.52	
750181		5192	5255	5223.5	1900	75Q	2.95	2700	0.52	ISIP from DGO site only
750182		5113	5173	5143	3000	65Q	4.2	4122	0.80	
750201		5082	5147	5114.5	2000	75Q	3	2797	0.55	
809587		[redacted]								1970 completion, Insufficient Data
821617				4935	1911	80Q		2578	0.52	
821788		4825	4882	4853.5	1807	75Q		2539	0.52	
823605		5026	5134	5080	2150	Nitrogen		2520	0.5	
823606		4934	5235	5084.5	2083	Nitrogen		2453	0.48	Cleveland/Berea
824073		4832	4864	4848	2471	Nitrogen		2874	0.59	2 stg Weir
826109		[redacted]								Not Completed
826204										Not Completed
900029										Not Completed
900109				4969	1880	Nitrogen		2215	0.44	(2-stage Big Lime completion)
900109		[redacted]								(2-stage Big Lime completion)
Average									0.49	

Big Lime

Well ID	Little Lime Top	Little Lime Base	Interval Little Lime Base to Btm Perf	Big Lime Top	Big Lime Base	Big Lime Thickness	Interval Big Lime Base to Btm Perf	Perf Breakdown	Perf Top	Perf Btm	Perf Mid	ISIP (psi)	Frac Fluid	Foam Density (ppg)	Frac Pressure (psi)	Frac Gradient (psi/ft)	Comments
530047	3937	3995	686	4282	4681	399	0	4397-4407, 4671-4681	4397	4681	4539	2709	50Q acid	2.25	3240	0.71	Frac Fluid from DGO site only
530051	3464	3532	693	3709	4268	559	43	3730-3733, 3742-3748, 3964-3974, 4210-4215, 4220-4225	3730	4225	3977.5	920	50Q	4.5	1850	0.47	
530236	4324	4384	663	4545	5072	527	25	5383-4587, 4875-4879, 4934-4940, 4979-4984, 5041-5047	4583	5047	4815	2108	60Q	4.15	3146	0.65	
536397	3407	3473	440	3652	4212	560	299	Single	3894	3913	3903.5	3140	65Q acid	3.1	3769	0.97	
750021	3368	3430	376	3519	4011	492	205		3796	3806	3801	3000	Water	8.3	4639	1.22	
750044	3558	3612		3738	4263	525			[redacted]								Not Enough Data
750123	4082	4152	187	4288	4756	468	417		4329	4339	4334	0	Water	8.3	1877	0.43	
750124	3664	3724	376	3863	4327	464	227		4086	4100	4093	2500	28% HCL	9.521	4524	1.11	ISIP and Frac Fluid from DGO site only
750141	3660	3728	182	3882	4403	521	493		3902	3910	3906	850	28% HCL	9.521	2782	0.71	ISIP from DGO site only
750159	3939	4021	682	4160	4710	550	7	4697-4703, 4407-4415	4407	4703	4555	1500	15% HCL	8.961	3620	0.79	ISIP and Frac Fluid from DGO site only
750160	3832	3925	579	4066	4585	519	81	4089-4094, 4499-4504	4089	4504	4296.5	1250	28% HCL	9.521	3375	0.79	"Nitrogen Assist" assumed full bore acid at ISIP
750171	3777	3835	183	3980	4465	485	447		4013	4018	4015.5	1400	15% HCL	8.961	3269	0.81	"Nitrogen Assist" assumed full bore acid at ISIP
750181	3843	3910	648	4056	4565	509	7		4552	4558	4555	1300	15% HCL	8.961	3420	0.75	"Nitrogen Assist" assumed full bore acid at ISIP, ISIP from DGO site only
750182	3782	3861	605	3985	4483	498	17		4460	4466	4463	450	15% HCL	8.961	2528	0.57	
750201	3761	3833	547	3949	4390	441	10		4376	4380	4378	1400	28% HCL	9.521	3565	0.81	"Nitrogen Assist" assumed full bore acid at ISIP
809587	3214	3258		3289	3724	435			[redacted]								Berea completion only, "Church well"
821617	3707	3761		3803	4253	450											Screened out
821788	3622	3704		3792	4124	332											N2 assist Acid foam frac quality uncertain
823605	3780	3843	315	3896	4297	401	139		4042	4158	4100	2717	60Q		3634	0.89	Recomplete
823606	3711	3773		3873	4232	359			[redacted]								Not Completed
824073	3582	3645	439	3760	4102	342	18	3903-3909, 3960-3967, 4079-4084	3903	4084	3993.5	-	-	-	-	-	Matrix acid job - Did not fracture
826109	3372	3435	309	3540	3887	347	143		3738	3744	3741	2456	50Q acid		3468	0.93	
826204	3813	3872	318	3992	4348	356	158		4182	4190	4186	3411	Nitrogen		3846	0.92	
900029	3351	3410	401	3517	3846	329	35		3574	3811	3692.5	2570	60Q		3434	0.93	
900109	3754	3811	462	3916	4287	371	14		4260	4273	4266.5	470	Water		2318	0.54	(2-stage Big Lime completion)
900109	3754	3811	306	3916	4287	371	170		3943	4117	4030	1217	Water		2963	0.74	(2-stage Big Lime completion)
Minimum			182			329	0									0.43	
Maximum			693			560	493									1.22	
Average			447			443	141									0.79	



LEGEND

CEMENT

COAL

COMPANY WELL NO. P-143
WELL PERMIT NO. 486
NOT TO SCALE

NOTES

1. ALL MEASUREMENTS FROM 0 DATUM OR GROUND SURFACE.
2. SCHEMATIC DIAGRAM OF WELL SHOWS PROPOSED CONVERSION TO CLASS II-D PRODUCTION FLUID DISPOSAL WELL.

FIGURE 2

SCHEMATIC DIAGRAM
WELL P-143 CONVERSION

EQUITABLE RESOURCES EXPLORATION

January 1990

MSES
Environmental & Engineering Consultants

SARC 1/90 LMR 1/90 89-5

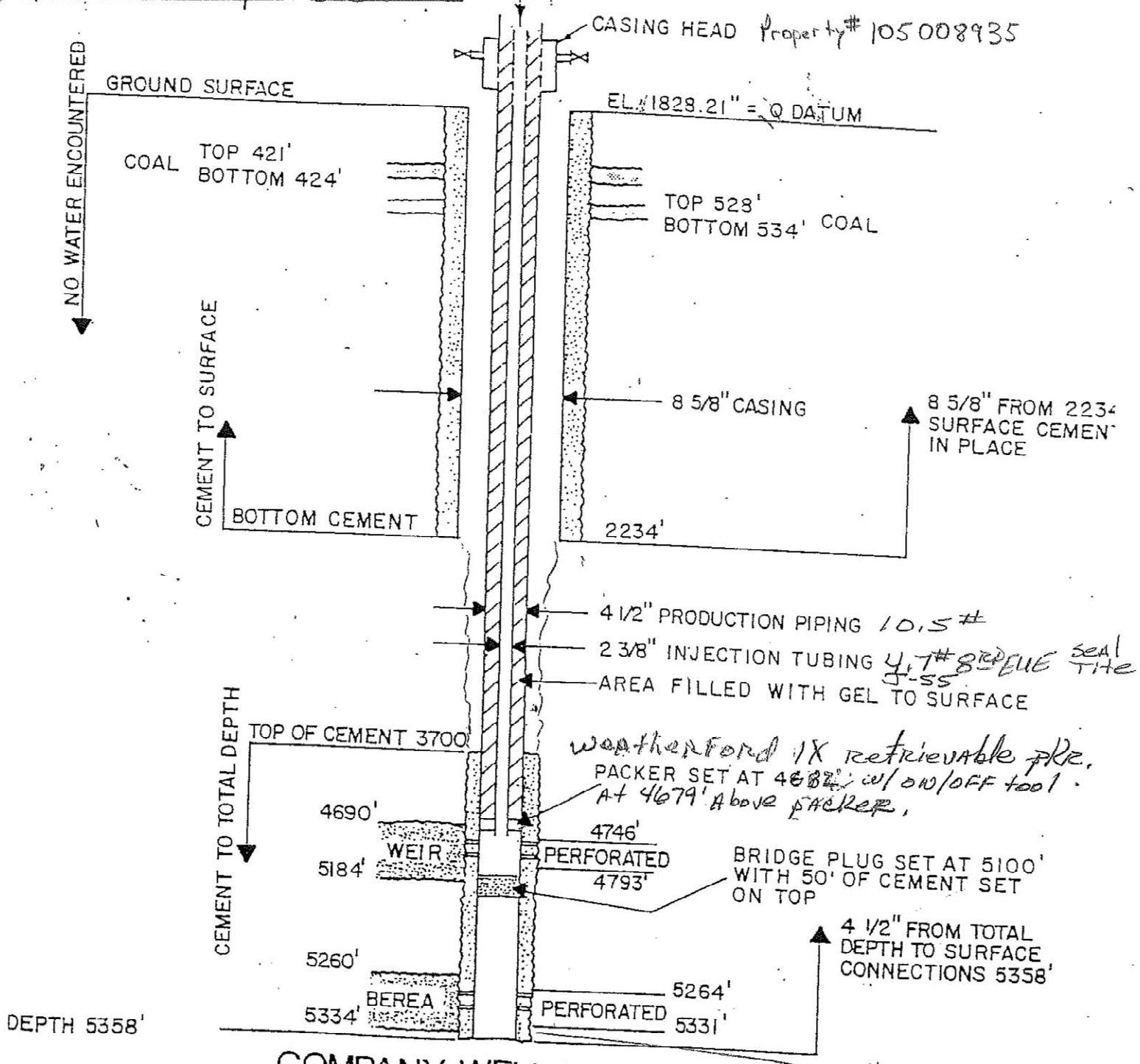
Well # 750143

P-143

P-143

AFE# 1509220064

API# 045-051-20486



COMPANY WELL NO. P-143
WELL PERMIT NO. 486
NOT TO SCALE

4½, 10,5

Dickenson Co., VA.

1 OR GROUND SURFACE.
)WS PROPOSED CONVERSION
DISPOSAL WELL.

(814) 827-3482
Fn
814 671-7609 cell

1.0 OPERATION DATA

The injection fluid to be injected into Well P-143 (VAS2D907BDIC) will be treated produced fluids from EnerVest's Virginia Nora Field Operations. No other fluids for disposal will be injected in this well. The contract water haulers unload at the Virginia Permitted and Inspected P-143 Transfer Station and the fluids are settled and pumped up to the P-143 complex by a buried water line that was replaced with a new coated steel line in 2019. The injection wells are operated, inspected, and maintained by dedicated injection well staff and facility manager that have round-the-clock access to pressures and flow rates with alarms.

2.0 FLOW RATES

The average and maximum daily rates and volume of the treated production fluids to be injected are:

- **Average Daily Flow – 9,772 gallons per 24 hours in 2019**
- **Maximum Daily Flow – 50,000 gallons per 24 hours (not to exceed 35,000 bbls in a month)**

3.0 INJECTION PRESSURES

Using the calculated maximum Weir injection pressure for Well P-143 and applying the safety factor, the following average and maximum injection pressures at the surface are:

- **2019 Average Monthly Maximum Injection Pressure – 727 psig (surface pressure)**
- **Maximum Injection Pressure – 990 psig (surface pressure)**

4.0 INJECTION FLUID

The injection fluid to be injected into Well P-143 (VAS2D907BDIC) will be treated produced fluids from EnerVest's Virginia Nora Field Operations. No other fluids for disposal will be injected in this well.

Annulus fluid is a mixture of water and C&J Energy Service's commercially available Packer Fluid, which contains a biocide, corrosion inhibitor, and oxygen scavenger.

The analysis of injection fluid is taken bi-annually, the 2019 sample results are included in this attachment.

ENVIRONMENTAL MONITORING, INCORPORATED
ENVIRONMENTAL CONSULTANTS ▲ ANALYTICAL LABORATORIES
5730 INDUSTRIAL PARK RD. ▲ NORTON, VIRGINIA 24273 ▲ 276/679-6544

Certificate of Analysis

Client Name: ENERVEST OPERATING, LLC
Address: 408 W MAIN STREET
ABINGDON, VA 24210

Sample Identification: P-143-T

Site Description: INJECTION WELL MONITORING

Report Date: 05/13/19
Lab Sample No.: **1783775**
Client No.: 3096
EMI Project No.: 160

Date Collected: 04/04/19
Time Collected: 1245
Sample Matrix: AQ
Collected By: BAKER, BRANDON

Parameter	Sample Result	Units	MDL	RL	Method	Date Analyzed	Time Analyzed	Analyst
Alkalinity	53.3	mg/l CaCO3	4.00	4.00	SM 2320B-4c-2011	4/5/2019	1100	CNC
Chloride	84974	mg/l	1000	1000	SM 4500 Cl B-2011	4/9/2019	1544	CNC
Conductivity	49200	umhos/cm	1000	1000	SM 2510B-2011	4/7/2019	1415	RSV
Dissolved Oxygen (Not NELAP)	1.14	mg/l			SM 4500-O G-2011	4/4/2019	1245	FLD
Hardness, Total	40000	mg/l CaCO3	1000	1000	SM 2340 C-2011	4/5/2019	1036	CNC
pH (Not NELAP)	4.60	STD			SM 4500-H+B-2011	4/4/2019	1245	FLD
Specific Gravity (Not NELAP)	1.10				SM 2710 F-2011	4/9/2019	1436	CNC
Sulfide	BDL	mg/l	1.00	1.00	SM 4500 S2-F-2011	4/5/2019	1520	THR
Total Dissolved Solids	133735	mg/l	1.00	1.00	SM 2540 C-2011	4/5/2019	1320	THR
Barium, Total	2364	mg/l	0.100	3.00	EPA 200.7	4/9/2019	1225	AWM
Iron, Total	49.3	mg/l	0.080	0.500	EPA 200.7	4/11/2019	2011	AWM
Magnesium, Total	1434	mg/l	2.10	50.0	EPA 200.7	4/8/2019	1233	AWM
Manganese, Total	4.56	mg/l	0.030	0.500	EPA 200.7	4/11/2019	2011	AWM
Sodium, Total	30030	mg/l	7.40	50.0	EPA 200.7	4/8/2019	1233	AWM

To the best of our knowledge and belief, the collection, preservation, and analysis of all parameters represented by this report have been determined to comply the requirements as specified in 40 CFR, Part 136.
This report may not be reproduced except in full, without the written approval of the laboratory.

VA Laboratory ID#: 460038
WV Laboratory ID#: 105
KY Laboratory ID#: 98012
EPA Laboratory ID#: VA00010

The release of this report is authorized by:

R. J. Porter
Technical Director

Flow if Avaliable (GPM):
Temp. if Available (C): 17.0
Depth if Available (Ft):
Analysis Package Code: BF3

PSCN
Rev-06-02-17

Type of Sample: Grab
BDL = Below Detection Limit
FLD = Field Technician
MR = Multiple analytical runs were used for this result
IV = Flag indicates Insufficient Sample Volume
SV = Sample volume indicated by method not used
AB = Analyte found in Method Blank
MSF = Matirx Spike Failure - Method in Control
EV = Estimated Value: Outside of calibration range

J = Flag indicates estimated value below Report Limit
T = Results indicate possible toxicity which is expected to influence reported value.
NA = A result for this analyte is not available.
MI = Matrix Interference - Final result may not be representative.
BQ = Batch QC Outside Acceptable Range
HE = Parameter Hold Time Exceeded
FC = Failure to Comply Current SOP
R = Sample results rejected because of gross deficiencies in QC or method performance .
DC = Duplicate did not meet method criteria, method process in control
P = Sample was not properly preserved for this parameter.

Log Sheet 1 of 1

EMI PROFESSIONAL SERVICES

SAMPLE LOG SHEET & CHAIN OF CUSTODY

C075791

ENVIRONMENTAL MONITORING, INCORPORATED
ENVIRONMENTAL CONSULTANTS ▲ ANALYTICAL LABORATORIES
5730 Industrial Park Rd. ▲ Norton, Virginia 24273 ▲ 276-679-6544

*CLIENT: EnerVest BILLING ADDRESS:

*CONTACT: Jon Lawson CITY:

STATE/ZIP

PHONE ( )

FAX ( )

Purchase Order No.

*COLLECTED BY (print) Brandon Baker

COLLECTOR(S) SIGNATURE(S)

TURN-AROUND (circle): 2 Day (Working Days) 3 Day (Working Days) 5 Day (Working Days) 10 Day (Working Days) **Regular (15 Working Days)**

Additional Cost May Apply – Any TAT Not Specified Will Be Regular

*SITE ID: Injection Well Monitoring

CLIENT PROJ. NO.

*EMI PROJECT NO.: 3096.160

EMI PROJECT MANAGER: DWP

Special Instructions / QC Requirements & Comments

SAMPLES WILL BE DISPOSED OF IN ACCORDANCE WITH EMI's TERMS & CONDITIONS OR RETURNED TO CLIENT OR Archive for ____ months

	EMI No.	EMI SAMPLE #	*CUSTOMER SAMPLE IDENTIFICATION	*DATE COLLECTED	* TIME COLLECTED	*SAMPLE MATRIX	*No. of CNTRS.	Cool <6°C	HNO_3	HCl	H_2SO_4	NaOH w/ ZnAc	Other				REMARKS
1.	51776	1783772	Hays: 23606	4-4-19	9:20	AQ	3	X	X			X			6.5	16	2.36	
2.	51777	773	Cane Creek 535517	4-4-19	10:15	AQ	3	X	X			X			4.5	15	3.03	
3.	51778	774	P-171	4-4-19	11:50	AQ	3	X	X			X			6.4	16	2.22	
4.	51779	775	P-143-T	4-4-19	12:45	AQ	3	X	X			X			4.6	17	1.14	
5.																		
6.																		
7.																		
8.																		
9.																		
10.																		

*PARAMETER (ANALYSIS REQUESTED): BF3, Metals, Sulfide, pH, Temp, D.O.

*PRESERVATIVE USED:

Preservation Checked By Date:

Sample Acceptance / Condition Checklist (SOP61) followed Yes or No If No, Anomaly Report Required.

Hazard Information: (circle) Non Hazard Flammable Skin Irritant Poison B Unknown

*Relinquished by (sign)	*Date/Time	*Received By (sign)	*Relinquished by (sign)	*Date/Time	*Received By (sign)
	4-4-19 14:50	Lab Cooler	Cooler	4/4/19 1532	
*Relinquished by (sign)	*Date/Time	*Received By (sign)	*Relinquished by (sign)	*Date/Time	*Received By (sign)

*METHOD OF SHIPMENT TO LAB (circle): US MAIL UPS FED. EX. **EMI-DIRECT** EMI PICKUP PERSONAL DELIVERY OTHER

Temperature of Cooler upon Receipt by Lab: 3° C BEB

PH Meter # 1277 BIN # 28 No. of Containers 12 100

Additional Remarks:

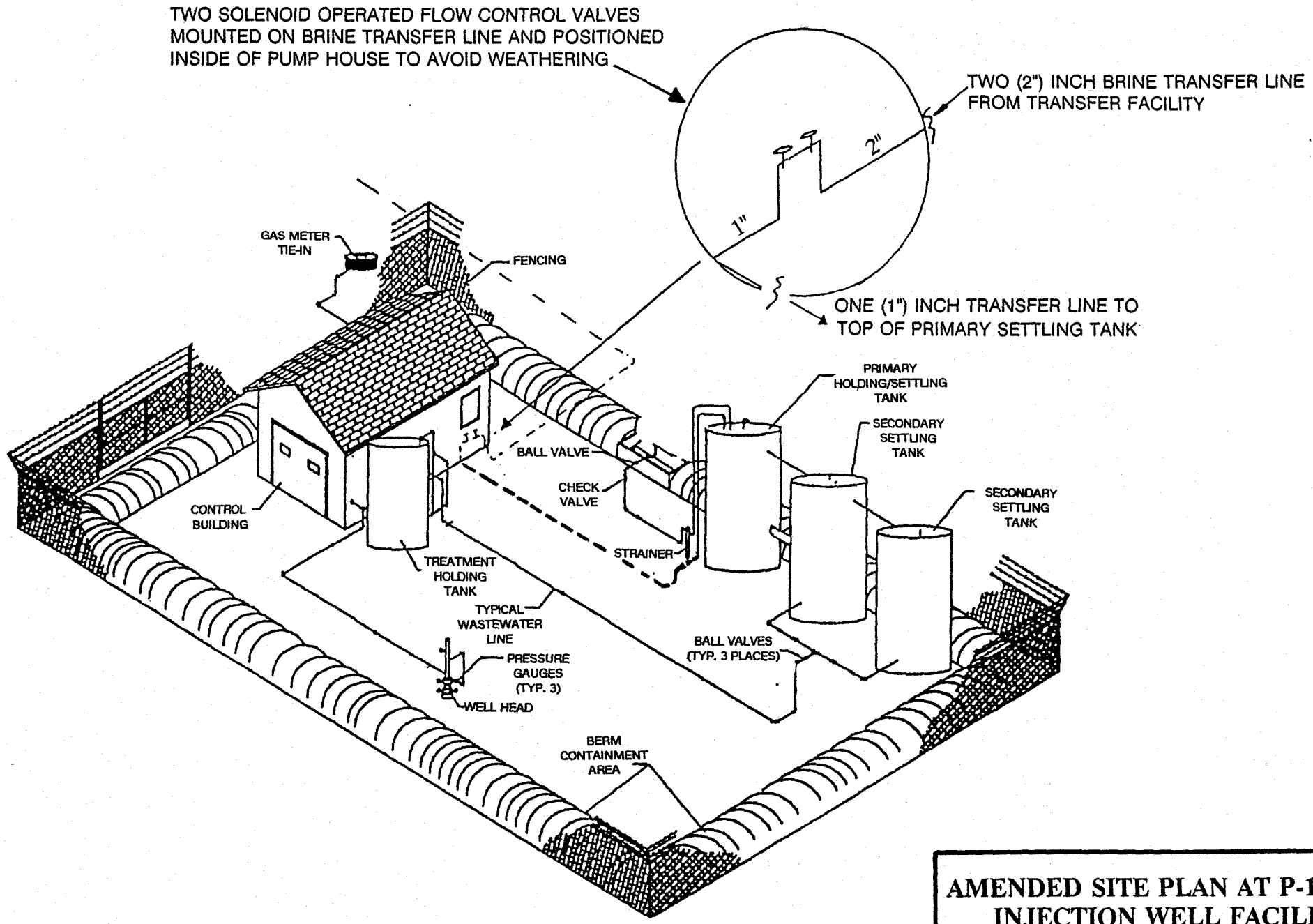
Report to be sent (if different than customer information):

NAME:

ADDRESS:

CITY:

STATE/ZIP FAX ( )



AMENDED SITE PLAN AT P-143-WD
INJECTION WELL FACILITY
(DGO PERMIT NO. 486-M1)

DESCRIPTION: MURPHY FLUID LEVEL SWITCHGAGES MONITOR FLUID LEVEL IN PRIMARY TANK AND SIGNAL BRINE TRANSFER LINE SOLENOID OPERATED CONTROL VALVES TO OPEN OR CLOSE DEPENDING ON FLUID LEVEL IN PRIMARY TANK. NO OTHER FACILITY CHANGES.

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

United States Environmental Protection Agency

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

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

EnerVest Operating, LLC
809 Happy Valley Drive
Clintwood, VA 24228
jlawson@enervest.net

Permit or EPA ID Number	API Number	Full Well Name
VAS2D907BDIC	45-051-0020300	P-143 SWD

State	County
Virginia	Dickenson

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

Latitude: 37.069442

Longitude: -82.264101

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.

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

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

Updated form for 2020 Renewal. In the event of plugging and abandonment of P-143, the balance method will be used to emplace cement plugs.

Certification

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

Name and Official Title *(Please type or print)*	Signature	Date Signed
Kevin Miller, Vice President & General Manager	Kevin L. Miller	03/26/2020

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.

MEADOWS WELL SERVICE, LLC Jason Meadows, VP

45 Meadows Drive, Ravenswood, WV 26164
jasonmeadows1@frontier.com
Cell: (304) 532-8123
Office: (304) 273-8121

EnerVest Operating, LLC
408 West Main Street
Abingdon, Virginia 24210

Mike Randolph
Thank you for the opportunity to bid on the plugging of the 2 wells (750286, 750148) my bid for the 2 wells is 750286 $46,500.00 & 750148 from the 4 ½" cut to surface is $36,500.00

Thank you
Jason Meadows

P-143

FORM 4

ATTACHMENT Q

1.0 PLUGGING AND ABANDONMENT PLAN

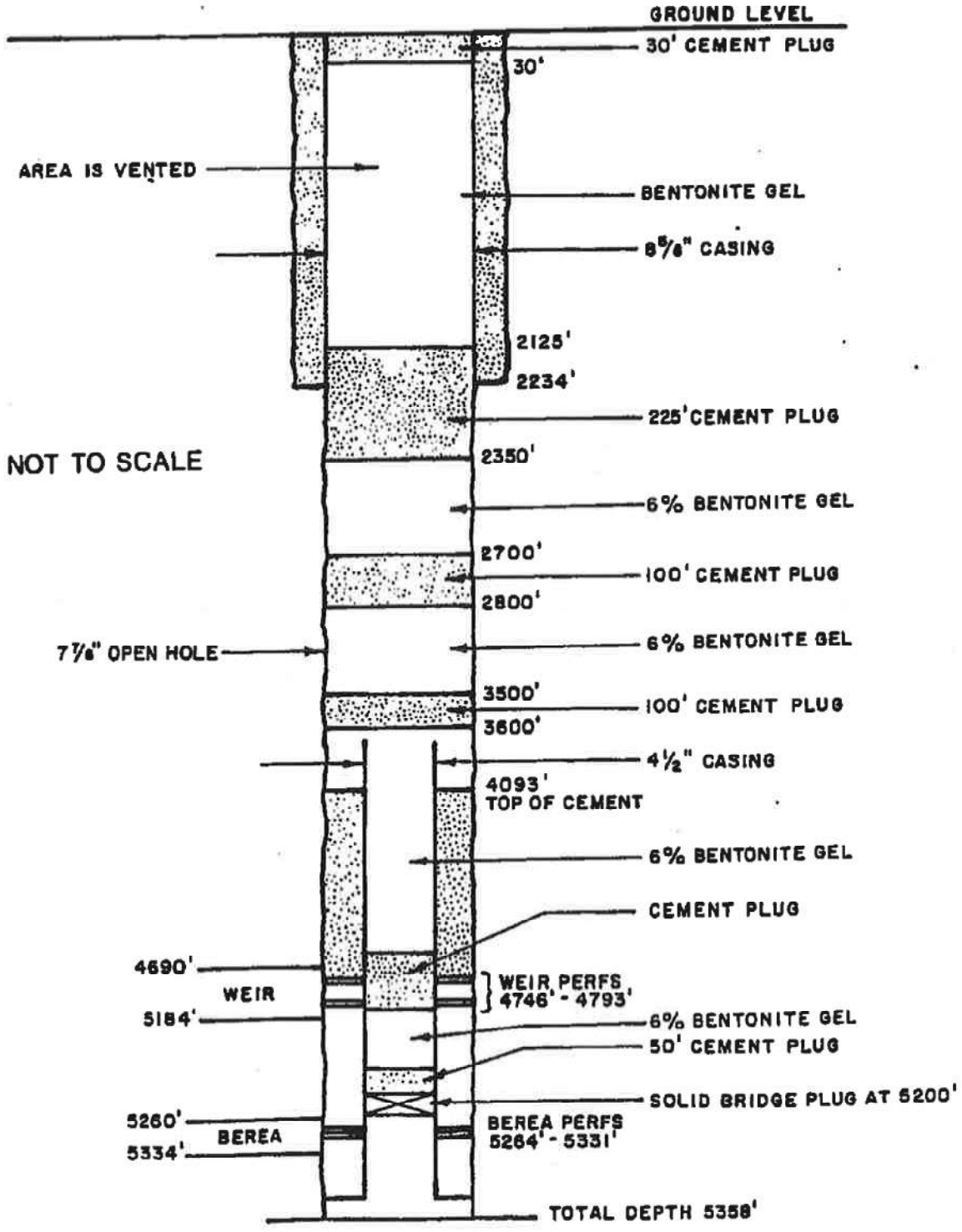
The following plugging and abandonment plan will be employed should Well P-143 need to be plugged:

- Move in service rig.
- Rig up service company and pump cement plug down injection tubing. Run enough cement to cover from injection perforations back to the bottom of tubing plus 100% excess to squeeze off the formation.
- Displace cement to below bottom of injection tubing.
- Let cement set.
- Release the packer and pull tubing. (If tubing cannot be pulled, cut the tubing off just above the packer and pull the tubing.)
- Set a solid bridge plug 20' above the setting depth of the packer.
- Set a 50' cement plug above the solid bridge plug and pull tubing.
- Cut 4-1/2" casing off at 3600'.
- Set a 100' cement plug from 3600' to 3500'.
- Pull 4-1/2" casing to 2800' and set 100' cement plug from 2800' to 2700'.
- Pull 4-1/2" casing to 2350' and set 150' cement plug from 2350' to 2200'.

- Bail out all fluid from surface to top of the cement plug.
- Install vent on the top of the 8-5/8" casing.
- The cement blend to be used will be Class A with 2% gel and 2% calcium chloride. Also, the fluid between the cement plugs will be 6% bentonite gel.
- A schematic of this plugging and abandonment plan follows.

With the plugging and abandonment of Well P-143, all surface equipment and facilities will be removed and the well site reclaimed and vegetated.

PROPOSED WELLBORE SCHEMATIC
COMPANY WELL NO. P-143
WELL PERMIT NO. 486



NOTE

ALL MEASUREMENTS FROM O DATUM OR GROUND SURFACE.

MSES

Environmental & Engineering Consultants

Unlimited Energy Services LLC

PO BOX 474 JANE LEW WV 26378

Job Number ENVTK01

SHIPPED TO ENERVEST OPERATING	CUSTOMER AFE NO.	ORDERED BY MIKE RANDOLPH
ADDRESS	CUSTOMER PO#.	DATE ORDERED
CITY AND STATE ZIP CODE	STATE. VA	DATE FILLED
CARE OF	COUNTY.	AREA / CODE
INVOICE TO	WELL NAME.	WELL # P750148
ADDRESS	WELL LOCATION.	
CITY AND STATE ZIP CODE	RIG / UNIT #	
ATTENTION	NOTES: INJECTION WELL	

Item or Service Number	Item or Service Description	Quantity	Price	Rate	Discount Percent	Retail
RS001	DOUBLE POLE SERVICE RIG (With Crew)	50	150.00	HOUR	10%	6,750.00
PU002	PICKUP	5	100.00	DAY	10%	450.00
PU003	PICKUP	5	100.00	DAY	10%	450.00
	5K PUMP	0	750.00	DAY	10%	0.00
	DOZER JD-700XLT	20	75.00	HOUR	10%	1,350.00
TRFA1	TRUCK - 5 AXLE FLOAT	20	110.00	HOUR	10%	1,980.00
TRWT1	TRUCK - TRI-AXLE WATER W/100BBL TANK	30	105.00	HOUR	10%	2,835.00
	500 BBL LAY DOWN / FRESH WATER	9	50.00	DAY	10%	405.00
PIT01	140 BBL OPEN TOP PIT	5	30.00	DAY	10%	135.00
	3 MAN CREW SUBSISTENCE	5	400.00	DAY	10%	1,800.00
	3 MAN CREW TRAVEL	13	125.00	HOUR	10%	1,462.50
	Class A Cem.-Bulk (25 Sk Min)	900	16.00	EA	10%	12,960.00
	Bentonite - Sacked	1000	0.60	LB	10%	540.00
	Gran. Sugar-Sacked (200lbs Min)	500	2.00	LB	10%	900.00
	Flake - Sacked (2 Sack Min)	0	60.00	EA	10%	0.00
CP01	CEMENT PUMPING CHARGE	5	1,750.00	EA	10%	7,875.00
CT01	Mileage Heavy Vehicle	300	3.50	MI	10%	945.00
PU003	Mileage Pickup or Treating Van	300	2.50	MI	10%	675.00
CT02	Bulk Del Dry Prod. (Ton-Mile)	2500	2.00	MI	10%	4,500.00
	CALCIUM	50	0.95	LB	10%	42.75
	3 MAN CREW SUBSISTENCE	5	400.00	HOUR	10%	1,800.00
	WIRELINE CUT CHARGE	1	4,425.00	EA		4,425.00
	Total					**$52,280.25**

Accepted by: _____ **Date:** _____

1.0 SURETY BOND

EnerVest has provided information to EPA Region 3 on the current surety bond for this injection well P-143. The surety is active and renewed annually with the third party insurer.

1.0 EXISTING U.S. EPA PERMITS

EnerVest operates six existing UIC wells, recently plugging VAS2D927BDIC, and has permits for two undrilled UIC wells (Table I-1) in Dickenson County and Buchanan County, Virginia.

Table I-1. Existing EPA Permits

UIC Wells		
DI-0192	P-750132 WD	
DI-0203	P-143 (750143)	
DI-0220	P-148 (750148)	
DI-0230	P-750171 WD	VAS2D937BDIC
DI-0249	P-750205 WD	VAS2D957BDIC
DI-1144	VWD-535517	VAS2D932BDIC
not drilled	VWD-539572	VAS2D697BDIC
HAYSI		
BU-1614	23606 w/PL	VAS2D950BBUC
not drilled	900146	VAS2D955BBUC

1.0 DESCRIPTION OF BUSINESS

EnerVest (www.EnerVest.net) is a private oil and gas company with 40,000 wells across 15 states, 6.5 million acres under lease and $8 billion in assets under management. Operational Fund XIV owns proved reserves of 6.5 TCF and operations in Appalachia and the Southwestern United States. The December 2015 purchase of Range Resources – Pine Mountain included the operations in the southern Appalachian Basin. EnerVest now owns or has leased the oil, gas and coal bed methane on approximately 350,000 acres in Virginia and produces gas from Pennsylvania age coal seams, as well as deeper formations, including the Devonian Shale, Berea, Weir and Mississippian Big Lime. EnerVest currently operates approximately 3,500 wells in Virginia and plans to drill several hundred additional wells in the next 5 years. Along with coal bed methane and the deeper formation gas production, produced fluid is also extracted. It is because of these produced fluids that EnerVest will dispose of in the renewed Class II-D disposal well.

APPENDIX C

EXISTING WELL RECORDS WITHIN

ONE-MILE RADIUS OF UIC #VAS2D907BDIC (P-143)

1.0 INTRODUCTION

This appendix provides the following information:

- A summary of the known wells contained in the Virginia Division of Gas and Oil (DGO) records is provided by Pages 2, 3, 4 and 5 of this Appendix.

- This well summary is provided by the tables identified as:
  - Proposed Renewal Injection Well VAS2D907BDIC (P-143)
  - Plugged UIC Well within 1-mile, the P-148.
  - Coal Bed Methane Wells of Record within ¼-mile radius of P-143. Two CBM wells exist within ¼-mile, no vertical conventional wells.
  - Well P-143: Twelve conventional wells exist within 1.25-mile.
  - 31 Coal Bed Methane Wells of Record from ¼-mile to 1.25-mile radius of P-143.
  - There are no currently 2020 proposed Wells within 1-mile radius

2.0 WELL RECORDS

Copies of well records are provided following Page 3 of Appendix C.

APPENDIX C

EXISTING WELL RECORDS WITHIN

ONE-MILE RADIUS OF UIC # VAS2D907BDIC (P-143)

UIC# VAS2D907BDIC				
Permit No.	Virginia File No.	Well No.	Total Depth	Formation at TD
486	DI-0203	P-143	5358	Weir

Former UIC within 1-mile of VAS2D907BDIC				
Permit No.	Virginia File No.	Well No.	Total Depth	Formation at TD
-	DI-1144	VS-750148	Plugged	Weir

Coal Bed Methane Wells of Record Within ¼ miles of VAS2D907BDIC				
Permit No.	Virginia File No.	Well No.	Total Depth	Formation at TD
5085-01	DI-1072	VC-502847	2034	Pocahontas #5
11455-02	DI-2405	VCI-537567	2103	Pocahontas #5

Conventional Wells of Record Within 1-mile of VAS2D907BDIC				
Permit No.	Virginia File No.	Well No.	Total Depth	Formation at TD
484-02	DI-0201	V-750141	5278	Berea
488-02	DI-0205	V-750151	5388	Berea
755-02	DI-0233	V-750159	5503	Berea
744-02	DI-0232	V-750158	6345	Cleveland
11431-02	DI-2394	V-530236	5890	Cleveland
944-02	DI-0320	V-750160	5491	Berea
487-02	DI-0204	V-750150	6311	Cleveland
530-02	DI-0219	V-750139	5392	Berea
777-02	DI-0235	V-750182	5284	Berea
210-02	DI-0127	V-750044	5042	Berea

APPENDIX C

EXISTING WELL RECORDS WITHIN

ONE-MILE RADIUS OF UIC # VAS2D907BDIC (P-143)

Additional Conventional Wells of Record Within 1.25-mile of VAS2D907BDIC				
Permit No.	Virginia File No.	Well No.	Total Depth	Formation at TD
461-02	DI-0193	V-750134	5326	Berea
5583-01	DI-1129	V-550405	6188	Cleveland

Coal Bed Methane Wells of Record Within 1-Mile of VAS2D907BDIC				
Permit No.	Virginia File No.	Well No.	Total Depth	Formation at TD
4215-01	DI-0954	VC-704076	1825	Pocahontas
1700-02	DI-0598	VC-751159	2292	Pocahontas
3482-02	DI-0866	VC-703646	2487	Pocahontas
11400-03	DI-2389	VCI-531508	2343	Pocahontas
11446-02	DI-2399	VCI-531506	2320	Pocahontas
1572-02	DI-0544	VC-751151	2185	Pocahontas
4256-01	DI-0968	VC-704162	2240	Pocahontas
4361-01	DI-0984	VC-704269	2162	Pocahontas
11444-02	DI-02398	VC-531510	2354	Pocahontas
1480-02	DI-0515	VC-751154	2588	Pocahontas
1334-02	DI-0467	VC-751113	2289	Pocahontas
3957-01	DI-0922	VC-703890	2235	Pocahontas
11451-02	DI-2403	VC-531512	2126	Pocahontas
1257-02	DI-0446	VC-751103	2255	Pocahontas
3987-02	DI-0925	VC-751109	2200	Pocahontas
1321-02	DI-0461	VC-751114	2170	Pocahontas
4168-01	DI-00943	VC-704099	2100	Pocahontas
1484-02	DI-0519	VC-751150	2209	Pocahontas
3107-02	DI-0808	VC-703564	2195	Pocahontas
1323-02	DI-0463	VC-751126	2212	Pocahontas
1188-02	DI-0435	VC-751101	2134	Pocahontas

APPENDIX C

EXISTING WELL RECORDS WITHIN

ONE-MILE RADIUS OF UIC # VAS2D907BDIC (P-143)

Permit No.	Virginia File No.	Well No.	Total Depth	Formation at TD
1259-02	DI-0448	VC-751105	2310	Pocahontas
2302-01	DI-0682	VC-702559	2240	Pocahontas
1322-02	DI-0462	VC-751124	2216	Pocahontas
4286-01	DI-0977	VC-751110	2297	Pocahontas
-	DI-0455	VC-751108	2117	Pocahontas
10534-02	DI-2212	VCI-537602	2281	Pocahontas
1213-02	DI-0439	VC-751102	2260	Pocahontas
4290-01	DI-0978	VC-751107	2166	Pocahontas
3723-02	DI-0891	VC-751115	2164	Pocahontas
13260	DI-2745	VCI-530479	2149	Pocahontas
13215	DI-2729	VCI-530453	1987	Pocahontas

Additional CBM Wells of Record Within 1.25-mile of VAS2D907BDIC				
Permit No.	Virginia File No.	Well No.	Total Depth	Formation at TD
3424-02	DI-0855	VC-702482	2640	Pocahontas
4675-02	DI-1036	VC-504515	2500	Pocahontas
5026-01	DI-1066	VC-504372	2020	Pocahontas
11350-02	DI-2384	VC-504161	2144	Pocahontas
12911-01	DI-2610	VC-530404	2737	Pocahontas
5417-01	DI-1110	VC-505207	2392	Pocahontas
5674-01	DI-1142	VC-505206	2936	Pocahontas
10644-03	DI-2237	VCI-531396	2879	Pocahontas
1290-02	DI-0457	VC-751112	2789	Pocahontas
1282-02	DI-0454	VC-751106	2400	Pocahontas
4392-02	DI-0990	VC-704268	2371	Pocahontas
5339-01	DI-1097	VC-504517	2754	Pocahontas

APPENDIX C

EXISTING WELL RECORDS WITHIN

ONE-MILE RADIUS OF UIC # VAS2D907BDIC (P-143)

Permit No.	Virginia File No.	Well No.	Total Depth	Formation at TD
1335-02	DI-0468	VC-751116	2445	Pocahontas
3988-02	DI-0926	VC-703973	2240	Lower Horsepen
2108-01	DI-0665	VC-702558	2469	Pocahontas
1517-02	DI-0529	VC-751152	2223	Pocahontas
7956-01	DI-1689	VCI-537611	2177	Pocahontas
2531-02	DI-0711	VC-702563	2241	Pocahontas
3116-01	DI-0810	VC-703562	2065	Pocahontas
10915-02	DI-2311	VC-531424	2202	Pocahontas
3597-01	DI-0871	VC-702484	2258	Pocahontas
1785-01	DI-0618	VC-702145	2589	Pocahontas