



REGION 3

PHILADELPHIA, PA 19103

STATEMENT OF BASIS

U.S. EPA UNDERGROUND INJECTION CONTROL (UIC)
DRAFT CLASS II-D PERMIT VAS2D955BBUC

FOR

ENERVEST OPERATING, LLC
809 HAPPY VALLEY DRIVE
CLINTWOOD, VIRGINIA 24228

FOR

A project consisting of one Class II-D injection well which allows for the disposal of fluids produced solely in association with oil and gas production, located at:

900146 SWD
Nora and Oakwood Fields
Prater District
Buchanan County, Virginia

On January 22, 2025, EnerVest Operating, LLC ("EnerVest" or "the Permittee") submitted a UIC permit renewal application to the U.S. Environmental Protection Agency ("the EPA" or the "Agency"), Region 3, for the renewed issuance of a permit that would allow for the operation of a Class II-D disposal injection well, 900146 SWD, (hereinafter, "Injection Well", "900146 SWD", or the "Facility"), located in the Nora and Oakwood Fields in the Prater District, Buchanan County, Virginia. The coordinates for the Injection Well are Latitude 37° 11' 38", Longitude -82° 12' 15". Though this injection well was originally permitted in 2016, the well has not yet been constructed, and no injection operations have taken place to date. On March, 10, 2025, the EPA sent a Notice of Deficiency to EnerVest, and a response with information was received by the EPA on June 30, 2025. The permit application was deemed complete on June 30, 2025. The Permittee's January 22, 2025 submittal combined with the responses to the Notice of Deficiency is hereinafter referred to in this Statement of Basis as the "Permit Application".

Pursuant to the federal Safe Drinking Water Act, 42 U.S.C. §§ 300f *et. seq.*, and its implementing regulations, 40 C.F.R. Parts 144 -146, and 40 C.F.R. §§ 147.2350 - 2352, the EPA UIC program is responsible for regulating, through the issuance of permits, the construction, operation, monitoring, and closure of injection wells that place fluids underground for disposal or enhanced recovery in oil and gas production. Today's draft permit specifies conditions for injection well construction, operation, monitoring, reporting, and plugging and abandonment which are specified to protect and prevent the

movement of fluids into Underground Source(s) of Drinking Water (USDW). The final Permit will contain the same conditions that are in the draft Permit unless the EPA receives information supporting and warranting alternative final Permit conditions or actions on this Permit Application.

The well, with the issuance of the renewal permit, will be used for the disposal of fluids produced solely in association with oil and gas production. The proposed UIC well 900146 will only accept fluids produced from EnerVest operations located in Virginia. The well will inject the fluids into the Weir Formation, a formation consisting of relatively homogeneous siltstone which is located approximately 4,250 feet to 4,500 feet below ground surface. The Weir Formation, because it is the formation receiving the fluids, is referred to as the “injection zone.” The Permittee’s UIC project and the draft permit conditions specific to the project are described below:

Area of Review: Pursuant to the applicable regulations, 40 C.F.R. §§ 144.3 and 146.6(b), the “Area of Review” is an area surrounding the Injection Well for which the applicant must first research, and then develop, a program for corrective action to address any wells that penetrate the injection zone and which may provide conduits for fluid migration during the injection operation at the Facility. EnerVest proposed a fixed radius Area of Review of one-quarter mile, which the EPA has determined to be acceptable. EnerVest provided a Zone of Endangering Influence (ZEI) calculation that determined the (ZEI) radius to be less than 200 feet, which verifies that a one-quarter mile radius is a more protective Area of Review. This calculation factored in the initial pressure at the top of the injection formation, injection rate, length of injection time, viscosity of fluid, specific gravity of liquid, formation volume factor, permeability, reservoir thickness, compressibility, porosity, surface elevation, depth to injection zone, depth of concern, and critical pressure rise to lift liquid to depth of concern. More details about the ZEI calculation and its components can be found on the 533rd and 534th pages of the publicly available Permit Application. In determining the fixed radius, EPA has considered the following information provided by the Permittee: current information available for all wells obtained from EnerVest, the chemistry of the injection and formation fluids, hydrogeology, population and groundwater use and dependence and historical practices in the area. The Permittee already disposes of fluids from its oil and gas wells into an existing UIC well (EPA Permit #VAS2D950BBUC). The physical and chemical characteristics of the fluid injected into the well permitted by this draft Permit will be similar to what is currently being injected in the existing well. The Permittee will continue to utilize the same treatment facility for the fluids for both wells. The Permittee has reported the presence of one (1) vertical natural gas well that penetrates the Weir formation within the Area of Review. This well (V-900109, API # 45-027-04949), which is active and operated by EnerVest, reaches a total depth of 5,162 feet below ground surface. A cement bond log provided by the Permittee shows that the natural gas well is cemented from approximately 2,275 feet below ground surface to the bottom of the hole. This would indicate that the natural gas well should not serve as a conduit for fluid movement because it is properly cemented through the injection zone. The Permittee has also reported the presence of two (2) coalbed methane (“CBM”) wells within the Area of Review. The deepest CBM well within the ¼-mile radius is 2,610 feet below ground surface, which provides for a minimum separation of approximately 1,700 feet from the top of the Weir Formation to the bottom of the deepest CBM well within the Area of Review. There are no water wells within ¼-mile of the proposed injection well. There is an inactive

surface mine within the Area of Review. There are no identified faults within the Area of Review. If any unplugged/abandoned wells that penetrate the injection zone are found within the Area of Review at a later date, the draft permit requires the Permittee to perform corrective action to address the wells.

Underground Sources of Drinking Water (USDW): An USDW is defined by the UIC regulations as an aquifer or its portion which, among other things, contains a sufficient quantity of groundwater to supply a public water system and which also contains fewer than 10,000 mg/L (milligrams per liter) Total Dissolved Solids, and which is also not an exempted aquifer. The Permittee notes that the groundwater user inventory conducted in the Area of Review found that no one within the Area of Review is currently using the groundwater as a source of drinking water. Underground sources of drinking water would be expected to occur between depths of 200 feet and 760 feet below ground surface. Based on this information and taking the most conservative approach, EPA has determined that the lowermost USDW is located at 760 feet below ground surface. Therefore, relative to the surface elevation of the injection well, the USDW is approximately 3,490 feet above the injection zone.

To protect the USDW, Paragraph III.A.2. of the draft Permit requires the Permittee to ensure that the well has surface casing to a depth of approximately 2,350 feet and that entire length of casing is cemented in place back to the surface. (Casing is steel pipes used in wells to ensure their structural integrity, environmental protection, and operational efficiency.) The Permittee must, among other requirements, also ensure that the well has another run of casing from the ground surface to an approximate depth of at least 100 feet above the injection zone. This is referred to as the long string casing. The long string casing is cemented in place inside the surface casing and runs back to the ground surface. Inside the long string casing, there is a tubing string that is used to inject the fluids. Finally, at the bottom of the long string casing, there is a packer that is placed above the perforated interval of the tubing string. The packer prevents the injected fluid from leaking back up the long string casing.

Injection and Confining Zones: Injection of fluids is limited by the draft permit to the Weir Formation in the subsurface interval between approximately 4,250 feet to 4,500 feet below ground surface.

The lowermost USDW is separated from the upper limit of the injection zone by approximately 3,490 feet. The proposed injection well is in the Appalachian Basin in an area with an extensive, thick sedimentary sequence with an adequate injection interval and numerous confining strata. The target formation for the injection of produced fluid is a zone within the Mississippian Price Formation known as the Weir Formation. The Weir Formation is a hydrocarbon reservoir rock across the Appalachian Basin that has sufficient porosity and permeability to permit the storage and accumulation of hydrocarbons under adequate confining conditions. The Weir Formation has confining strata above and below of sufficient thickness and low enough permeability to confine the injection interval and isolate injected fluids to that zone.

The sedimentary sequence in the southern Appalachian Basin contains several confining zones above and below the Weir Formation. Since the Weir Formation is a hydrocarbon reservoir rock across the

Basin, there are adequate confining zones above the formation that act as barriers to upward movement of fluids. These confining rock layers are stratigraphic traps for the accumulating fluids as a result of lithologic changes in reduced porosity and permeability. The confining zone directly above the Weir Formation is the Mississippian Greenbrier Group locally referred to as the Big Lime, which is a dense carbonate approximately 350 feet thick. The Big Lime is projected to be at a depth of approximately 3,900 feet to 4,250 feet below ground surface. The Big Lime is overlain by several thousand feet of siltstone, tight sands, and coal beds that also inhibit the migration of injected fluid. The confining zones below the Weir Formation include the Weir Shale and Sunbury Shale. The Sunbury Shale is approximately 60 feet to 70 feet thick and acts as a further barrier for downward migration of fluid. The top of the Sunbury Shale is approximately 4,850 feet below ground surface. According to the Permittee, the low permeability of shale will inhibit the downward migration of produced fluids. Below these shales, the Pocono Formation locally known as the Berea Sandstone is approximately 50 feet to 60 feet thick with a porosity of about 4%.

Injection Fluid: The draft Permit limits the injection fluids in this well to produced fluids obtained solely from EnerVest's oil and gas production activity. The draft Permit also establishes a maximum monthly injection volume of 30,000 barrels per month. One barrel of fluid is equal to 42 gallons.

The Permit Application includes analyses of the injection fluid that corresponds to the requirements stated in Paragraph II.C.3. in the draft Permit. The parameters chosen for sampling reflect not only some of the typical constituents found in the injection fluid, but also in shallow groundwater. Should a groundwater contamination event occur during the operation of the Injection Well, the EPA will be able to compare samples collected from groundwater with the injection fluid analysis to help determine whether operation of the Injection Well may be the cause of the contamination.

Maximum Injection Pressure: The current permitted surface maximum allowable injection pressure ("MAIP") is 708 psi (pounds per square inch) with a bottom-hole pressure of 2,686 psi. The maximum surface injection pressure and bottom-hole pressure were developed using the injection pressure limitation calculation; a formula that considers the depth to the Weir Formation injection zone and the highest specific gravity of injection fluid EnerVest's operations expects to encounter (1.075).

Potential for Seismicity: The SDWA UIC regulations for Class II injection wells do not require consideration of the seismicity of the region, unlike the SDWA UIC regulations for Class I injection wells for the injection of hazardous wastes. See regulations for Class I hazardous injection wells at 40 C.F.R. §§ 146.62(b)(1) and 146.68(f). Nonetheless, because of public concerns about injection-induced seismicity, EPA evaluated factors relevant to seismic activity as discussed below and addressed more fully in [*Region 3 framework for evaluating seismic potential associated with UIC Class II permits*](#). The final Permit will provide that the Permittee shall only inject produced fluids through the Injection Well and into a formation which is overlain by a confining zone free of known open faults or fractures within the Area of Review, as required pursuant to 40 C.F.R. § 146.22. No known faults exist in close proximity to the Injection Well that would allow movement of fluids.

Historically, seismic activity in Virginia has been minor. According to the Permittee, the proposed well is in a region that is not susceptible to earthquakes since there are no active forces causing crustal movement. Most of the earthquake hypocenters in Virginia are located miles below the target injection zone at depths around 3-15 miles below ground surface and are not associated with faults mapped at the surface. There are no mapped faults identified within the Area of Review. The Little Pawpaw fault, the only fault within one mile of the well, is inactive. The few faults closest to the proposed well have minimal surficial movement and are not anticipated to have any effect on the well or its operation. There have been no earthquakes recorded in the vicinity of proposed UIC well 900146 or along the Little Pawpaw Fault system. The United States Geologic Survey ("USGS") has not recorded any major seismic activity that originated in Buchanan County, Virginia. from 1900 through the present day (USGS: "[Information by Region - Virginia](#)").

The draft Permit includes an injection pressure limit to prevent the initiation or propagation of fractures that could create conduits for the injected fluid to flow to any existing faults. The surface maximum allowable injection pressure for this draft Permit (708 psi) was calculated using the fracture gradient of the injection zone.

Finally, a number of factors help to prevent injection wells from failing in a seismic event and contributing to the contamination of a USDW. Most Class I or Class II injection wells, including this Injection Well, are constructed to withstand significant amounts of pressure. The Injection Well is constructed with multiple steel rings of casing that are cemented in place. Furthermore, the draft permit requires EnerVest to mechanically test the Injection Well to ensure integrity before operations begin and to continuously monitor the Injection Well during operations in order to identify any potential mechanical integrity concerns. The Injection Well is also designed to automatically cease operation in the event that the mechanical integrity of the well is compromised, including by a seismic event.

Testing, Monitoring and Reporting Requirements: The Permittee is required to conduct a mechanical integrity test ("MIT") every five (5) years and whenever a rework on the Injection Well requires the tubing and packer to be released and reset. The MIT consists of a pressure test and a fluid movement test. The pressure test will be conducted in order to ensure that the casing, tubing, and packer in the Injection Well do not leak. The fluid movement test, which includes casing cement record and cement bond log or temperature log reviews, will be conducted to ensure that fluid movement does not occur outside of the injection zone.

The Permittee will be responsible for continuously monitoring the Injection Well for surface injection pressure, annular pressure, flow rate and cumulative volume from the date on which the Injection Well commences operation and until such date that the Injection Well is plugged and abandoned. The Injection Well must be equipped with automatic shut-off devices which would be activated in the event of a mechanical integrity failure. In addition, Paragraph II.D.3. of the draft Permit requires the Permittee to report to the Director, within twenty-four (24) hours, any permit noncompliance which may endanger, or which has endangered, human health or the environment. The Permittee must

submit an Annual Report to the EPA summarizing the results of the monitoring and testing activities required by the draft Permit, including monthly monitoring records of the injection fluid, the results of any mechanical integrity testing, and information identifying any major changes in the characteristics of the injected fluid. The Annual Report must be submitted to EPA by January 31 of each calendar year.

Plugging and Abandonment: The Permittee has submitted a Plugging and Abandonment Plan that will result in an environmentally protective Injection Well closure at the time of cessation of operations. The Permittee has secured a Performance Surety Bond to ensure proper plugging of the Injection Well. The amount of the Performance Surety Bond shall cover the estimated cost to close, plug, and abandon the Injection Well in the amount of at least \$96,500. The amount of the Performance Surety Bond, which is based on an independent, third-party professional's estimate of the costs associated with the plugging and abandonment of the Injection Well, must also be sufficient to preclude the possibility of abandonment without proper plugging and closure.

Effective and Expiration Date: When issued, the final Permit will become effective as of the date of signature except if the EPA receives a comment requesting a change in the draft Permit. If the EPA receives a comment requesting a change in the draft Permit, the final Permit shall become effective 35 days after the date of signature.

The Permit will be in effect for the operational life of the Facility, which includes the proper plugging and abandonment of the Injection Well when operations cease. The EPA will conduct an annual review of the Permittee's Injection Well operation.

Additional Information: The Administrative Record for the draft Permit is available for public review. All data submitted by the Permittee in support of the draft Permit, unless deemed confidential, is included in the Administrative Record. The Administrative Record can be requested by contacting the EPA staff listed below. Copies of the Permit Application, the draft Permit, the Statement of Basis, and the Administrative Record index are available for review and inspection on EPA's [website](#). Please direct any questions, comments on the draft Permit, and requests for additional information to the EPA staff listed below. **The public may submit comments on the draft Permit until December 8, 2025.**

Tentative Public Hearing: The EPA has tentatively scheduled a virtual public hearing on December 8, 2025. An in-person hearing will not take place. The call-in information for the virtual meeting is listed below:

Call-in Number: (484) 352-3221 6:00 PM Eastern Standard Time

Conference ID: 214 718 450#

MS Teams Link: <https://msteams.link/YDRR>

The EPA will hold the virtual public hearing only if the EPA receives requests from the public to do so. **Requests to hold this public hearing must be received by EPA via email or telephone by December 1, 2025.** When requesting a public hearing, please state the nature of the issues you propose to raise. The EPA expressly reserves the right to cancel this hearing unless a significant degree of public interest is evidenced by December 1, 2025.

There is no need to register in advance for the virtual hearing. Attendees may utilize MS Teams by calling via telephone or entering the URL into a web browser. Participants who want to submit written or printed materials can do so using the information listed below.

General Notice: If you would like to be added to a general mailing list for notice of any UIC permitting actions in EPA Region 3 jurisdictions (Pennsylvania, Virginia, and Washington, D.C.), please notify the EPA by sending an email to R3_UIC_Mailbox@epa.gov. Please specify if you are interested in permitting actions in all three jurisdictions or only in particular jurisdiction(s). If you don't have access to email, you may also send a request to be included on the list at the physical address listed below.

Submit comments or requests for a hearing or for additional information to:

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