



ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Oil and Gas Resource Management
One Natural Resources Way Springfield, Illinois 62702-1271



HIGH VOLUME HORIZONTAL HYDRAULIC FRACTURING PERMIT APPLICATION HVHFF-10

References to "1-xx" or "§1-xx" are to the Hydraulic Fracturing Regulatory Act., 225 ILCS 732/1-1 et seq. References to "240.xxx" and "245.xxx" are to 62 Ill. Admin. Code 240 and 245, respectively.

Attachment: WaterSourceManagementPlan

Please save attachment and use the file name above.

Water Source Management Plan §1-35(b)(10); 245.210(a)(10). Note: If recycled water is anticipated to be used in the HVHFF treatment, describe the source of the recycled water and the anticipated water to be used in (a), but skip subsections (c) through (g) below. If water other than fresh water or recycled water is anticipated to be used in the HVHFF treatment, describe the source and the anticipated volume to be used in (a); and if the water derives from a river, lake, stream, other surface water or groundwater and, but for the total dissolved solids (TDS) levels, would be considered fresh water, provide all the information requested in this section.

- (a) List the source(s) of the water (surface, groundwater, etc.) that will be used in the HVHFF treatment
- (b) Identify precisely the anticipated withdrawal location(s) including county, latitude and longitude
- (c) Identify the anticipated volume and rate of each water withdrawal from each withdrawal location.
- (d) Identify the months when water withdrawals are expected to be made from each location
- (e) Identify the methods to be used to accurately monitor water withdrawals, and how the data will be recorded and maintained.
- (f) Identify the methods to be used to minimize adverse impact to aquatic life.
- (g) Identify the methods to be used to minimize withdrawals as much as feasible.
- (h) Specify how you will transport or deliver water to the well site

Source water is subject to a Source Water Sampling Plan under §1-80 of the Act. Describe the general structure of the sampling program, including but not limited to: who will conduct the sampling, sampling protocols, and provide any relevant certifications. The required tests are marked in **bold** in the table below. You can use the table provided or insert your own table and/or text.

Water Source Management Plan

This Water Source Management Plan is submitted to identify the source of water to be used for High Volume Horizontal Hydraulic Fracturing (HVHHF) operations and the management of the source water. This plan shall be submitted to the White County Soil and Water Conservations District, as well as to Community Water Suppliers in the area.

(a) List the source(s) of water that will be used in the HVHHF Treatment

Groundwater will be used for HVHHF treatment. Three new water supply wells will be drilled in close proximity to the HVHHF well and will supply the full volume of water needed for hydraulic fracturing. Temporary above-ground storage of the extracted groundwater will be provided in an excavated water supply impoundment pit to be constructed at the well site to allow the limited number of wells to make the total required volume of water available prior to the start of hydraulic fracturing operations. Backflow will not commence until injection in all frac stages have been completed, thus there will be no opportunity for use of recycled water in the hydraulic fracture completion.

(b) Identify precisely the anticipated withdrawal location(s) including county, latitude and longitude.

Well No.	County	Latitude	Longitude
WSW 1	White	38.135287	-88.361048
WSW 2	White	38.135171	-88.360673
WSW 3	White	38.134849	-88.360967

(c) Identify the anticipated withdrawal volume and rate of each water withdrawal from each withdrawal location.

Well No.	Rate Gallons/day	Volume Total Gallons
WSW 1	34,000	2.5×10^6

WSW 2	34,000	2.5 x 10 ⁶
WSW 3	34,000	2.5 x 10 ⁶

(d) Identify the months when water withdrawals are expected to be made from each location.

The following schedule assumes that the drilling permit and HVHFF permit will be issued by September 1, 2017. The individual withdrawal rates may vary to achieve the overall 7,500,000 gallons required.

Month	Well No.	Quantity (Gallons)
Sept, 2017	WSW 1	500,000
Nov, 2017	WSW 1,2, & 3	3,000,000
Dec, 2017	WSW 1,2, & 3	3,000,000
Jan, 2017	WSW 1,2,& 3	1,000,000

(e) Identify the methods to be used to accurately monitor water withdrawals, and how the data will be recorded and maintained.

The three wells will be equipped with individual totalizing meters on their output lines. The total output from each well will be recorded daily by the operator in the well log during the operation of the water wells. As required by the Water Use Act of 1983, (525 ILCS 45/5.3) the water withdrawal shall be reported to the Illinois State Water Survey's (ISWS) Illinois Water Inventory Program, In addition, the water use shall be reported to the White County Soil and Water Conservation District, as required by the District.

(f) Identify the methods to be used to minimize impact to aquatic life.

Since no surface water supply will be used other than the fresh water reservoir pit to be constructed prior to HVHFF operations, there will be no impact to aquatic life in surface waters.

(g) Identify the methods to be used to minimize withdrawals as much as feasible.

It is not in the interest of the applicant to overuse water in the HVVHF process. Excessive use of water results in the need for additional storage capacity for both the raw water and the produced water that results from the process. In addition, treatment, transport, and disposal of produced water results in increased well costs. While using recycled water may be feasible and desirable in the future should this exploratory well prove the potential of the target for commercial production, however, there is no compatible source nearby that would be logistically realistic. Wasting water is in no one's best interest.

The design of hydraulic fracturing stages and the chemistry of the fluids used will dictate the quantity of water required. Modern horizontal completion technology has shown that increasing the number of stages and thus overall treatment results in better well performance which in turn drains a larger area and reduces the overall number of wells and resource impact. To put the volumes in perspective, it takes 27,000 gallons of water to irrigate one acre of land with one inch of water. The anticipated usage of 7,500,000 gallons is equivalent to irrigating 278 acres with one inch of water which is a very small percentage as compared to the amount of water used annually for agricultural irrigation in White County, Illinois.

The highest potential for wasting water would be from leakage of water in the pumping, storage, and delivery systems to be used at the site. This potential will be minimized by locating the water wells in close proximity to the HVVHF well, and using piping rather than trucking of the water to and from the impoundment reservoir. Piping the water eliminates the loading and off-loading of water trucks, which would be the process with the highest potential for loss due to overfilling of the transport vehicles.

(h) Specify how you will transport or deliver water to the well site.

As described above, the water will be produced from on-site wells, and transported by pipeline from the water wells to the storage reservoir. No off-site traffic will result from water transport to the site, other than the one-time movement of equipment to and from the well site.

SOURCE WATER SAMPLING

The source water wells will be within 1,500 feet of the proposed HVHHF well. Thus, in addition to the requirements of a Source Water Sampling Plan, they will be included in the required Water Quality Monitoring Work Plan (WQMWP – Section 21 of this application). Under that plan, the wells will each be sampled a minimum of three times between the date of their completion and the start of hydraulic fracturing operations. This will be accomplished by the collection of grab samples from the pump discharges. After HVHHF operations are complete, the wells will continue to be monitored under the WQMWP. Since water quality parameters may change due to exposure at the surface, the on-site reservoir shall also be sampled prior to beginning HVHHF operations. Analytes for each well and the surface impoundment shall include the following:

Analyte	Method Used (EPA Method unless otherwise noted)
Arsenic	6010
Barium	6010
Cadmium	6010
Calcium	6010
Chromium	6010
Iron	6010
Lead	6010
Magnesium	6010
Selenium	6010
Silver	6010
Mercury	7470
Volatile Organic Compounds (VOCs)	8260
BTEX (included in VOCs)	8260
Dissolved Propane	RSK-175
Dissolved Methane	RSK-175
Dissolved Ethane	RSK-175
Chloride	300.0
Sulfide	376x/SM4500 S2-F
Nitrate	300.0
Nitrite	300/SM 4500 NO3 F
Sulfate	300.0
Gross Alpha	900.0
Gross Beta	900.0
pH	Measured in the field
Total Dissolved Solids	160.1 / SM2540C
Alkalinity	310.x / SM2320B
Specific Conductance	120.1 / SM2510B