

January 28, 2025

5860-2600-32640-02

Kiel Crowe, P.Eng,
Sr. Development Engineer
Vermilion Energy Inc.
Suite 3500, 520 - 3rd Ave SW
Calgary, AB T2P 0R3

Dear Mr. Crowe:

**RE: PRODUCED WATER DISPOSAL SPECIAL PROJECT APPROVAL
VERMILION HZ MICA A7-33-81-14 (WA# 49252)
MICA FIELD – BLUESKY FORMATION**

The Regulator has reviewed the application submitted by Vermilion Energy Inc. dated October 17th, 2024, requesting approval for disposal of produced water into the Mica field Bluesky formation via the subject well.

The subject well was drilled horizontally into the Bluesky formation in January of 2024 for disposal. In March, a step rate injection test on the Bluesky was followed by a 19-stage hydraulic fracture treatment.

Attached please find **Order 25-02-002**, designating an area in the Mica field, Bluesky formation, as a Special Project under section 75 of the Energy Resource Activities Act, for the operation and use of a storage reservoir for the injection of produced water. This Order includes a number of detailed operational, measurement and reporting conditions. Disposal wells are subject to regular field inspection and audit. Contravention of a condition of this Order may be subject to enforcement under section 62 of ERAA, or suspension or cancellation of the Order under section 75(2)(b).

Due to the presence of several vintage wells in proximity, the reservoir pressure has been limited to a maximum of 9,600 kPa as per condition 2j) based on the model provided by Vermilion and utilizing a 10% safety factor. Additionally, conditions 2h) and i) provide additional confirmation and limitation on the rate of pressure buildup in the reservoir.

For the inspection requirement of Order condition 2m), please arrange via email to OGCPipelines.Facilities@bcogc.ca.

Disposal of fluid with high total dissolved solids content requires adjustment of the wellhead injection pressure to remain below formation fracture pressure. It is the responsibility of the permit holder make adjustments to wellhead injection pressure.

Should you have any questions, please contact Logan Gray at (250) 419-4465 or the undersigned at (250) 419-4430.

Sincerely,



Ron Stefik, P.L.Eng.
Supervisor, Reservoir Engineering
Energy Regulator
Attachments



IN THE MATTER of the application from Vermilion Energy Inc. dated October 17th, 2024, requesting disposal approval:

ORDER 25-02-002

1. Under Section 75(1)(c.1) of the *Energy Resource Activities Act*, the Regulator designates the operation and use of a storage reservoir for produced water, including flowback from fracturing operations, in the Mica field – Bluesky formation as a special project in the following area:
DLS Twp 81 Rge 14 W6M Section 33 LSDs 9-16
2. Under section 75(2) of the *Energy Resource Activities Act*, the special project designation in this Order is subject to the following conditions. The Permit Holder shall:
 - a) Inject produced water into the well *Vermilion HZ Mica A7-33-81-14*; WA# 49252 Bluesky from 1,321.0 – 2,120.3 mKB MD.
 - b) Not exceed an injection pressure, measured at the wellhead on the subject well, of 7,500 kPag or the pressure required to fracture the formation, whichever is lesser.
 - c) Inject only through tubing with a packer set as near as is practical above the injection interval.
 - d) Continually measure and record the wellhead casing and tubing pressures electronically.
 - e) Alarm the casing-tubing annulus pressure monitoring system to indicate when casing pressure varies outside the normal operating range.
 - f) Cease injection and notify the Regulator at Reservoir@bc-er.ca immediately if there are any indications that hydraulic isolation is lost in the wellbore or formation.
 - g) Conduct and submit an annual Surface Casing Vent Flow test to the Regulator within 30 days of the completion of the test.
 - h) Conduct a reservoir pressure test on the formation in the subject well, with a shut-in period of sufficient length to provide data for calculation of the reservoir pressure
 - i) within 6 months of initial disposal, or 100,000 m³, whichever comes first, and
 - ii) annually, thereafterand submit a report of the test within 60 days of the end of the test.
 - i) Annual disposal volume may not exceed 201,000 m³.
 - j) Cease injection upon reaching a maximum formation pressure of 9,600 kPaa, measured at 1,088.3 mKB TVD.
 - k)
 - i) Perform a casing inspection log on the subject well and submit results to the Regulator within 30 days of the completion of logging, at an interval of not more than every 10 years, commencing from the date of initial disposal.
 - ii) Perform a hydraulic isolation temperature log on the subject well and submit results to the Regulator within 30 days of the completion of logging, at an interval of not more than every 5 years, commencing from the date of initial disposal.
 - l) Not conduct a hydraulic fracture stimulation on any formation in the subject well without prior Regulator approval.

- m) Complete an inspection, satisfactory to the Regulator, within 4 weeks of initial disposal operations.
- n) Implement a groundwater monitoring program as detailed in Appendix A.



Ron Stefik, P.L.Eng.
Supervisor, Reservoir Engineering
Energy Regulator

DATED AT the City of Victoria, in the Province of British Columbia, this 28th day of January 2025.

Advisory Guidance for Order 25-02-002

- I. A production packer must be set above the injection interval and the space between the tubing and casing filled with corrosion and frost inhibiting fluids, as per section 16(2) of the Drilling and Production Regulation.
- II. Annual packer isolation tests are required to be conducted and the associated report must be submitted to the Regulator within 30 days of test completion, as per section 16(3) of the Drilling and Production Regulation.
- III. Injected fluids must be metered and the injection pressure measured at the wellhead, as per section 74 of the Drilling and Production Regulation.
- IV. A monthly disposal statement including the volume of disposal fluid, maximum wellhead injection pressure, and total operating hours must be submitted to the Regulator via Petrinex not later than the 20th day of the month following the reported month, as per section 75 of the Drilling and Production Regulation.
- V. Seismic events must be reported and disposal operations suspended as per section 21.1 of the Drilling and Production Regulation.

ORDER 25-02-002

Appendix A – Groundwater Monitoring Requirements

Vermillion HZ Mica A7-33-081-14W6 (WA 49252) Produced Water Disposal

1. A groundwater monitoring program must be implemented in the area of disposal well WA 49252. The program must be designed and overseen by a professional with competency in hydrogeology who is registered and in good standing with Engineers and Geoscientist of British Columbia (Professional); and must involve the following tasks, as described in this Appendix:
 - a. prior to commencement of disposal: the installation of three monitoring wells at locations approved by the Regulator, baseline (reference) groundwater monitoring and sampling, and the submission of a reference monitoring report.
 - b. on an annual basis, commencing from the date of initial disposal: annual groundwater monitoring and sampling, and submission of annual groundwater monitoring reports.

2. The groundwater monitoring wells must be installed prior to commencement of disposal, at the following locations:

| Monitoring Well | DLS | Approximate Distance & Direction from Wellsite |
|-------------------|--------------|--|
| Monitoring Well A | A7-33-081-14 | On-site, or |
| | 09-33-081-14 | 300m east of the wellsite (across access road) |
| Monitoring Well B | 16-28-081-14 | 775 m south-southeast of wellsite |
| Monitoring Well C | 08-04-082-14 | 1.5 km north-northeast of wellsite |

3. The monitoring wells must be installed to a minimum depth of 70 m below ground surface, or to a depth approved by the Regulator, within the saturated groundwater zone, and below the water table, to enable the collection of representative groundwater samples from the monitoring wells.
4. The monitoring wells must be installed by a registered well driller, in accordance with the BC Groundwater Protection Regulation (GWPR) (B.C. Reg. 39/2016).
5. During drilling of the monitoring wells, geological conditions must be logged.
6. Groundwater monitoring and sampling must be conducted using standard environmental investigation protocols and quality assurance/quality control protocols.
7. A representative reference groundwater sample must be collected from each monitoring well following installation and appropriate development/purging.
8. The reference groundwater samples must be analyzed by an accredited laboratory for the following analytical parameters:
 - a. Routine water quality parameters (major cations and anions, total dissolved solids, alkalinity, pH, electrical conductivity, dissolved oxygen, oxidation-reduction potential, hardness)
 - b. Total and Dissolved metals
9. A disposal fluid sample must be collected and analyzed for the same suite of parameters as the groundwater samples.
10. The static water level at the monitoring wells must be measured following development/purging and prior to sampling.

11. A reference groundwater monitoring report must be prepared by the Professional and submitted to the BC Energy Regulator by email to hydrogeology@bc-er.ca (referencing Order 25-02-002) prior to commencement of disposal. The reference report must include:
 - a. A description of methodologies used for the assessment, including QA/QC protocols
 - b. Graphical well logs with stratigraphic observations and monitoring well construction details
 - c. A site plan showing the locations of the monitoring wells relative to site boundaries, on-site infrastructure, and relevant surrounding features
 - d. Static water level measurements in the monitoring wells
 - e. Analytical results in tabular form with appropriate comparison criteria and standards
 - f. Laboratory analytical reports
 - g. Data analysis (statistics, trends) and interpretation, as applicable.
12. Annual groundwater monitoring and sampling must be conducted once annually, commencing from the date of initial disposal, as per the requirements in 6. through 10. above.
13. The results of the annual groundwater monitoring and sampling must be included in a report, prepared as per the requirements in 11 a., and 11 c., through 11 g., above, and submitted to the BC Energy Regulator by email to hydrogeology@bc-er.ca (referencing Order 25-02-002) by December 31st of each calendar year after the year of the first annual report.
14. Additional documentation and/or further sampling or investigation may be required by the BC Energy Regulator based on a review of submitted documentation and/or other site information.
15. Upon site closure, the monitoring wells must be properly decommissioned in accordance with the BC GWPR.