

September 5, 2024

6600-2885-32640-02

Mallary Banister
ARC Resources Ltd.
Suite 1200, 308 - 4th Avenue, SW
Calgary, Alberta T2P 0H7

Dear Mallary Banister:

**RE: PRODUCED WATER DISPOSAL SPECIAL PROJECT APPROVAL
ARCRES ET AL PARKLAND 6-3-81-16 (WA #23065)
PARKLAND FIELD – CADOMIN-NIKANASSIN FORMATION**

The Regulator has reviewed the application submitted by Benoit Regulatory Compliance Inc. on behalf of ARC Resources Ltd. dated May 24th, 2023, requesting approval for disposal of produced water into the Parkland field Cadomin-Nikanassin formation via the subject well.

The subject well was drilled and completed in the Montney formation for the production of gas in 2007 and produced from 2007 to 2012. In March of 2023, the Montney was suspended with a bridge plug and the Cadomin-Nikanassin was completed for disposal.

Attached please find **Order 24-02-002**, designating an area in the Parkland field, Cadomin-Nikanassin, 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. The Regulator recognizes the Cadomin and Nikanassin formations as a compound, unsegregated zone in this area for disposal use. 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 groundwater sensitivity of the area and the surface casing depth not exceeding the base of useable groundwater, a groundwater monitoring program must be implemented, as outlined in Appendix A.

For the inspection requirement of Order condition 2I), 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 Benoit Regulatory Compliance Inc. on behalf of ARC Resources Ltd. to the Energy Regulator dated May 24th, 2023, requesting disposal approval:

ORDER 24-02-002

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 Parkland field – Cadomin-Nikanassin formation as a special project in the following area:

DLS Twp 81 Rge 16 W6M Section 3 – LDSs 3 - 6

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 ARCRes et al Parkland 6-3-81-16; WA# 23065 Cadomin-Nikanassin from 1,233.0 – 1,265.0 mKB.
 - b) Not exceed an injection pressure, measured at the wellhead on the subject well, of 13,825 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 an annual 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, and submit a report of the test within 60 days of the end of the test.
 - i) Cease injection upon reaching a maximum formation pressure of 13,475 kPaa, measured at 1,249.0 mKB TVD.
 - j)
 - 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.
 - k) Not conduct a hydraulic fracture stimulation on any formation in the subject well without prior Regulator approval.
 - l) Complete an inspection, satisfactory to the Regulator, within 4 weeks of initial disposal operations.
 - m) 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 5th day of September 2024.



Advisory Guidance for Order 24-02-002

- 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.

Appendix A – Groundwater Monitoring Requirements**ARCRes et al Parkland 6-3-81-16 (WA 23065) Produced Water Disposal**

1. A groundwater monitoring program must be implemented at the site of disposal well WA 23065. 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 one monitoring well, baseline (reference) groundwater monitoring and sampling, 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. One groundwater monitoring well must be installed prior to commencement of disposal, within a 50 m distance of disposal well WA 23065. The monitoring well must be installed 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 well.
3. The monitoring well must be installed by a registered well driller, in accordance with the BC Groundwater Protection Regulation (GWPR) (B.C. Reg. 39/2016).
4. Groundwater monitoring and sampling must be conducted using standard environmental investigation protocols and quality assurance/quality control protocols.
5. During drilling of the monitoring well, geological conditions must be logged.
6. A representative reference groundwater sample must be collected from the monitoring well following installation and appropriate development/purging.
7. The reference groundwater sample 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. Dissolved metals
8. A disposal fluid sample must be collected and analyzed for the same suite of parameters as the groundwater samples.
9. The static water level at the monitoring well must be measured following development/purging and prior to sampling.

10. 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 24-02-002) 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 log with stratigraphic observations and monitoring well construction details
 - c. A site plan showing the location of the monitoring well relative to site boundaries, on-site infrastructure, and relevant surrounding features
 - d. Static water level measurement in the monitoring well
 - 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.
11. Annual groundwater monitoring and sampling must be conducted once annually, commencing from the date of initial disposal, as per the requirements in 6. through 9. above.
12. The results of the annual groundwater monitoring and sampling must be included in a report, prepared as per the requirements in 10. above, and submitted to the BC Energy Regulator by email to hydrogeology@bc-er.ca (referencing Order 24-02-002) by December 31st of each calendar year after the year of the first annual report.
13. 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.
14. Upon site closure, the monitoring well must be properly decommissioned in accordance with the BC GWPR.