



September 8, 2017

2020-4900-32640-02

Stephen Penner  
Exploitation Engineering Technologist  
Canadian Natural Resources Limited  
2100, 855 – 2<sup>nd</sup> Street SW  
Calgary AB, T2P 4J8

Dear Mr Penner,

**RE: PRODUCED WATER DISPOSAL SPECIAL PROJECT APPROVAL; AMENDMENT #1  
CNRL ET AL N BOUNDARY 6-9-87-14; WA# 10691  
BOUNDARY LAKE NORTH FIELD – DOIG FORMATION**

Approval for disposal of produced water was issued for the subject well, Doig formation, on January 6, 1998. The Commission is presently amending disposal well approvals to conform to current requirements. The subject well was initially completed and hydraulically fractured in the Halfway 'B' gas pool, but the gas flow test showed uneconomic production rates. The Halfway perforations were subsequently suspended with a cement squeeze. The well was then completed in the Doig zone for oil potential, but the well was not productive. Disposal has occurred into the Doig formation since August 1999.

The Halfway zone directly overlies the Debolt in this area. In nearby wellbores, the thin barrier between the zones was breached when hydraulic fracture stimulation was conducted on the Halfway in order to recover marginal remaining gas reserves. Because of this, the Boundary Lake North Doig 'A' and 'D' pools are approved for commingled production with the overlying Halfway 'B' pool. Although the subject well Doig formation is downdip and appears fault isolated from nearby Doig pools, there may be a pressure connection through the previously completed Halfway.

Attached please find **Order 98-02-001 Amendment #1**, designating an area in the Boundary Lake North field – Doig formation as a Special Project under section 75 of the *Oil and Gas Activities Act*, for the operation and use of a storage reservoir for the disposal of produced water. This Order contains a number of detailed operational conditions, including continuous tubing and casing pressure monitoring requirements, and a maximum wellhead injection pressure. Because of the potential pressure connection between the Doig and Halfway zones, and the older vintage of wells in the Halfway 'B' pool, the ultimate reservoir pressure limit has been set to the initial pressure of the Halfway formation. Reservoir pressure testing for the subject well is required on an annual basis. If a few years of annual pressure tests show lack of significant pressure increase, CNRL may apply to modify this testing schedule.

In certain circumstances, disposal well operation may induce seismicity of values that require modification of operations to mitigate.

Disposal of fluid with high total dissolved solids content requires adjustment of the wellhead injection pressure to remain below formation fracture pressure

Should you have any questions, please contact Michelle Harding at (250) 419-4493 or the undersigned at (250) 419-4430.

Sincerely,

A handwritten signature in black ink, appearing to read 'Ron Stefik', written over a horizontal line.

Ron Stefik, Eng.L.  
Supervisor, Reservoir Engineering  
Oil and Gas Commission

Attachment



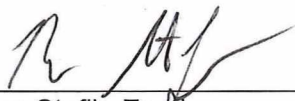
## ORDER 98-02-001 Amendment #1

- 1 Under Section 75(1)(d) of the *Oil and Gas Activities Act*, the Commission designates the operation and use of a storage reservoir for the disposal of produced water, including flowback from fracturing operations, into the Doig formation – Boundary Lake North field as a special project in the following area:

DLS Twp 87 Rge 14 W6M Section 9 - Lsds 3, 4, 5 and 6.

- 2 Under section 75(2) of the *Oil and Gas Activities Act*, the special project designation in this Order is subject to the following conditions. The Permit Holder shall:

- a) Inject produced water only into the well CNRL et al N Boundary 6-9-87-14; WA# 10691 – Doig formation (disposal perforations 1359.0 – 1370.0 mKB).
- b) Not exceed an injection pressure, measured at the wellhead on the subject well, of 6,570 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) Cease injection and notify the Commission immediately if hydraulic isolation is lost in the wellbore or formation.
- f) Submit the annual packer isolation test report to the Commission within 30 days of the completion of the test.
- g) Include the disposal operating hours and the maximum injection pressure value on the monthly BC-S18 disposal statement.
- 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 10,730 kPaa, measured at 1364.5 mKB.
- j)
  - i) Perform a casing inspection log on the subject well and submit results to the Commission within 30 days of the completion of logging, at an interval of not more than every 10 years.
  - ii) Perform a hydraulic isolation temperature log on the subject well and submit results to the Commission within 30 days of the completion of logging, at an interval of not more than every 5 years.
- k) Not conduct a hydraulic fracture stimulation on any formation in the subject well without prior Commission approval.

  
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Ron Stefik, Eng.L.  
Supervisor, Reservoir Engineering  
Oil and Gas Commission

DATED AT the City of Victoria, in the Province of British Columbia, this 6<sup>th</sup> day of September, 2017.



Advisory Guidance for Order 98-02-001 Amendment #1

- 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 submitted, 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 must be submitted to the Commission not later than the 25<sup>th</sup> 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.