



July 5, 2018

4300-4100-32640-02

Cassandra Lai, P.Eng.  
Exploration Manager, BC North  
Canadian Natural Resources Ltd.  
Suite 2100, 855 2<sup>nd</sup> Street S.W.  
Calgary, Alberta T2P 4J8

Dear Ms. Lai:

**RE: PRODUCED WATER DISPOSAL SPECIAL PROJECT AMENDMENT #2  
CNRL ET AL GRAHAM d-6-C/94-B-9; WA #8093  
GRAHAM FIELD – BALDONNEL “A” POOL**

The subject well produced a cumulative volume of 186.3 e<sup>6</sup>m<sup>3</sup> of natural gas from the Graham field Baldonnel “A” pool, from September 1994 to May 2013. Approval Order 15-02-011 was issued in June 2015 to operate the well for produced water disposal into the Baldonnel. Disposal capacity was required to replace the well CNRL et al Graham d-A6-C/94-B-9 (WA #12191), which terminated operation in June 2015 due to seismic activity at depth associated with disposal into the Debolt formation.

Ongoing seismicity including event greater than magnitude 3.0 resulted in Order Amendment #1 issued February 2017. The amendment included a condition for installation of a dense seismograph array to provide accurate hypocenter determination for all events.

The seismograph array began operation in March 2017. All subsequent seismic events indicate Debolt depth and deeper, with no events greater than magnitude 3.0 since June 2017. Ongoing enhancement of the NRCAN seismic station array in the region will provide the ability to accurately monitor future events in the Graham area.

Attached please find Order 15-02-011 Amendment #2, designating an area in the Graham field, Baldonnel 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 amendment removes the previous requirement to maintain and report on a local seismic monitoring dense array.

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 OGAA, or suspension or cancellation of the Order under section 75(2)(b).

Should you have any questions, please contact the undersigned at (250) 419-4430 or Michelle Gaucher at (250) 419-4482.

Sincerely,

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

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

Attachment

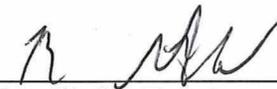
cc: Neil Orr

**ORDER 15-02-011 Amendment #2**

- 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, into the Baldonnel formation – Graham field as a special project in the following area:

NTS                      Map 094 - B - 9    Block C    Unit 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 Graham d-6-C/94-B-9; WA# 8093 – Baldonnel formation (disposal perforation 1441.0 – 1485.0 mKB MD).
  - b) Not exceed an injection pressure, measured at the wellhead on the subject well, of 10,100 kPag or the pressure required to fracture the formation, whichever is lesser.
  - c) Continually measure and record the wellhead casing and tubing pressures electronically.
  - d) Cease injection immediately and notify the Commission if hydraulic isolation is lost in the wellbore or formation.
  - e) 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.
  - f) Cease injection upon reaching a maximum formation pressure of 19,700 kPaa, measured at MPP.
  - g) 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, commencing from the date of initial disposal.  
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, commencing from the date of initial disposal.
  - h) 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 5<sup>th</sup> day of July, 2018.

Advisory Guidance for Order 15-02-011 Amendment #2

- I. A production packer must be set as near as is practical 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, and failures repaired without unreasonable delay, 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, indicating the quantity of fluid injected, the maximum wellhead injection pressure and the total monthly operating hours, 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.