

June 4, 2018

3445-6200-59240-09

Brittany Jorgensen, P.Eng.
Exploitation Engineer
Canadian Natural Resources Limited
2500, 855 2nd Street SW
Calgary, AB T2P 4J8

Dear Mrs. Jorgensen:

RE: PRESSURE MAINTENANCE WATERFLOOD ORDER 80-09-002 AMENDMENT #8
EAGLE WEST FIELD – BELLOY “A” POOL

The Commission has reviewed the application dated April 6, 2018 requesting approval of an additional injection well in the Eagle West field Belloy ‘A’ pool, by converting well CNRL et al W Eagle 6-2-85-19 (WA 5062) to water injection services. A review of reservoir performance confirms earlier indications that the Belloy formation is highly compartmentalized, with significant pressure variation between wells. Waterflood operation has shown limited overall oil recovery enhancement for the pool.

Amendment #7 to the subject order requested a reservoir pressure from well CNRL et al W Eagle 16-12-85-19 (WA 4453). This pressure was higher than expected; injection service was suspended in October 2017. Prior to commencing water injection, the Commission requires the confirmation that the reservoir pressure is below the specified limit set in condition 2(d) of the order.

The review of the integrity of well, CNRL et al W Eagle 6-2-85-19 (WA 5062), revealed the presence of casing corrosion and cement squeezed perforation interval 1305.0 – 1310.5 mKB. Condition 2(c)(iii) outlines the measures required prior to commencing injection services. The injector, well 6-2, is adjacent to two producers but it is unclear at this time what the reservoir pressure value is in the area. A stable reservoir pressure must be obtained prior to injection start as per order 2(c)(iv).

The following Orders are attached;

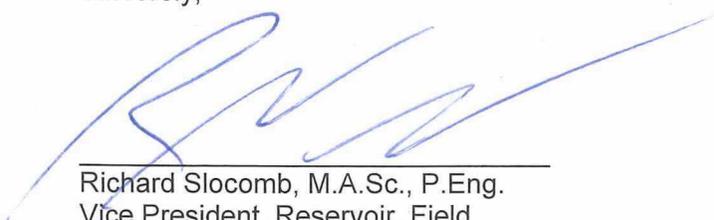
- 1) Order 80-09-002 Amendment #8 designating Pressure Maintenance Waterflood within the Eagle West field – Belloy “A” pool, as a Special Project under section 75 of the *Oil and Gas Activities Act*, and
- 2) Order 80-09-002 Amendment #8 - OTN approving Other Than Normal Spacing under section 65.1 of the *Petroleum and Natural Gas Act* for the subject area and formation.

This amended approval includes a maximum wellhead injection pressure, conditions of operations for the new injector, an ultimate pool pressure limit, restriction of injection for the purpose of oil recovery, and the submission of a packer isolation test. Also included is a requirement for annual reservoir pressure tests on the injectors and the observation wells. This approval will be re-evaluated upon review of the requested pressure tests.

Please note that, as per section 75 of the *Drilling and Production Regulation*, a record of the volume of water injected must be included on a Monthly Injection or Disposal Statement (BC-S18). This statement must be submitted to the Commission no later than the 25th day of the month in which activity occurred.

Should you have any questions, please contact Petra Kriescher-Trudgeon at (250) 419-4415 or the undersigned at (250) 419-4421.

Sincerely,



Richard Slocomb, M.A.Sc., P.Eng.
Vice President, Reservoir, Field
Engineering & Technical Svcs
Oil and Gas Commission
Attachments

ORDER 80-09-002 AMENDMENT #8

- 1 Under section 75(1)(a) of the *Oil and Gas Activities Act*, the Eagle West field – Belloy “A” pool is designated as a Special Project for the recovery of oil utilizing pressure maintenance waterflood within the following area;

DLS Twp 84 Rge 18 - S/2 & NW/4 Sect 19, NE/4 Sect 29, Sect 30, 31, 32, N/2 &
SW /4 Sect 33

Twp 84 Rge 19 - N/2 Sect 24, NE/4 Sect 23, Sect 25, 36, E/2 Sect 26, 35

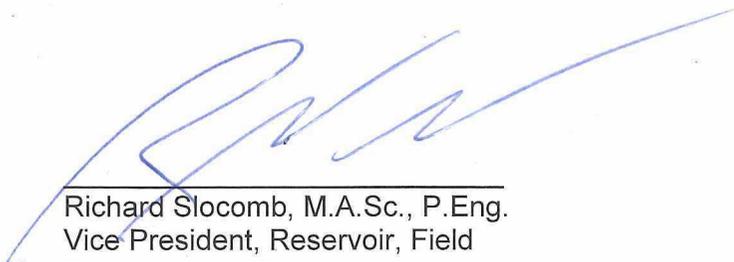
Twp 85 Rge 18 - W/2 Sect 4, Sect 5-7, SW/4 Section 8

Twp 85 Rge 19 - Sect 1, 2, 11, 12, S/2 Sect 14.

- 2 Under section 75(2) of the *Oil and Gas Activities Act*, I specify the following:
 - a) The project unadjusted daily oil allowable (UDOAA) is 1572.3 m³/d.
 - b) All associated produced gas must be conserved.
 - c) Water may be injected into the injection wells CNRL et al W Eagle 16-12-85-19 W6M (WA 4453) and CNRL et al W Eagle 6-2-85-19 (WA 5062).
 - i) For wells injecting other than fresh water, inject only through tubing with a packer set as near as is practical above the injection interval.
 - ii) Not exceed an injection pressure, measured at the wellhead of 21,000 kPa or the pressure required to fracture the formation, whichever is lesser.
 - iii) Prior to commencement of injection, well CNRL et al W Eagle 6-2-85-19 (WA 5062) must have a continuous pressure monitoring system installed on the production casing as well as a Pressure Safety Valve (PSV) located at the surface of the production casing set at 4 MPa or lower.
 - iv) Prior to injection start, obtain a reservoir pressure measurement from both injection wells to confirm that wells listed in (c) are below the specified limit.
 - v) Submit annual reservoir pressure test on the injectors and the observation wells to the Commission within 30 days of the completion of the test.
 - d) Not exceed an average pool pressure of 20,120 kPa measured at 1,168 meters subsea.
 - e) Cease injection immediately for the well listed in (c) and notify the Commission if hydraulic isolation is lost in the wellbore or formation.
 - f) Include the injection hours and the maximum injection pressure value for wells listed in (c) on the monthly BC-S18 form.
 - g) Injection must cease upon termination of production from the pool.

Advisory Guidance for Order 80-09-002 AMENDMENT #8

- 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 injection statement must be submitted to the Commission not later than the 25th 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 injection operations suspended as per section 21.1 of the Drilling and Production Regulation.



Richard Slocomb, M.A.Sc., P.Eng.
Vice President, Reservoir, Field
Engineering & Technical Svcs
Oil and Gas Commission

DATED AT the City of Victoria, in the Province of British Columbia, this 4th day of June 2018.

ORDER 80-09-002 AMENDMENT #8

- 1 Under Section 65.1(2) of the *Petroleum and Natural Gas Act*, Other Than Normal Spacing is approved within the Eagle West field – Belloy “A” pool within the following area;

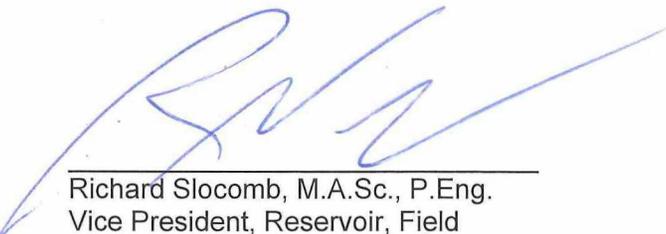
DLS Twp 84 Rge 18 - S/2 & NW/4 Sect 19, NE/4 Sect 29, Sect 30, 31, 32, N/2 &
SW /4 Sect 33

Twp 84 Rge 19 - N/2 Sect 24, NE/4 Sect 23, Sect 25, 36, E/2 Sect 26, 35

Twp 85 Rge 18 - W/2 Sect 4, Sect 5-7, SW/4 Section 8

Twp 85 Rge 19 - Sect 1, 2, 11, 12, S/2 Sect 14.

- 2 Under section 65.1(3) of the *Petroleum and Natural Gas Act*, I specify the following:
- a) the target area for an oil well completed within the project area is not nearer than 100 m to the sides of the Other Than Normal Spacing area,
 - b) an oil well completed outside the target area specified in paragraph (a) may be subject to an off-target production penalty,
 - c) oil wells drilled within the specified project area are not subject to spacing requirements.



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