



November 15, 2016

9000-7450-32640-02

Dave Ketchum  
Senior Operations Manager  
Ramshorn Canada  
8601-99<sup>th</sup> Street  
Clairmont, Alberta, T0H 0W0

Dear Mr. Ketchum:

**RE: PRODUCED WATER DISPOSAL SPECIAL PROJECT APPROVAL, AMENDMENT #1  
RAMSHORN TATTOO c-C68-B/94-O-15; WA# 25340  
ELKTON FORMATION**

Approval for disposal of produced water, Order 09-02-007, was issued for the subject well, Elkton formation, on May 25, 2009. The Commission is presently amending disposal well approvals to conform to current requirements.

The subject well was rig released in March 2009, and has been disposing since July 2009 with a cumulative volume of 515,817 m<sup>3</sup> as of September 30, 2016. A reservoir pressure from October 2015 shows that the pressure has increased to 109% of initial, with remaining capacity for disposal. The temperature log run on October 9, 2015, shows that during injection, water flows up the backside of the production casing between 670 – 697 mKB, where there is no cement behind casing. Highly saline disposal fluids can be corrosive to casing. Ramshorn should closely monitor the casing pressures during operations to ensure that annular integrity is maintained.

Attached please find **Order 09-02-007 Amendment #1**, designating an area near the Tattoo field – Elkton 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 a maximum wellhead injection pressure, reservoir pressure fill-up limit, and continuous tubing and casing pressure monitoring. Additional general information regarding disposal wells is available on the Commission's website at <http://www.bccgc.ca/industry-zone/documentation/Subsurface-Disposal>.

In certain circumstances, disposal well operation may induce seismicity. The Commission advises that disposal well permit holders monitor seismic events in proximity to the well and be prepared to modify operations to mitigate induced seismicity. Permit holders may monitor seismic events through the Natural Resources Canada seismic monitoring network at <http://www.earthquakescanada.nrcan.gc.ca/recent/index-eng.php>

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

Sincerely,

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

Attachment

ORDER 09-02-007 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 Elkton formation – near the Tattoo field, as a special project in the following area:

NTS 94-O-15 Block B Unit 68

- 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 Ramshorn Tattoo c-C68-B/94-O-15; WA# 25340 – Elkton formation (open hole 697.0 – 774.0 mKB).
- b) Not exceed an injection pressure, measured at the wellhead on the subject well, of 5,400 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 7,880 kPaa, measured at 735.5 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, 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.
- 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 15<sup>th</sup> day of November, 2016.



**ORDER 09-02-007 Amendment #1**

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Advisory Guidance for Order 09-02-007 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.