

December 14, 2018

0320-4100-32640-02

Dave Kelly, P.Geo
Senior Geologist
Canbriam Energy Inc.
2100, 215 – 2nd Street S.W.
Calgary, Alberta T2P 1M4

Dear Mr Kelly,

**RE: PRODUCED WATER DISPOSAL SPECIAL PROJECT AMENDMENT #1
CANBRIAM ALTAIRES d-76-H/94-B-08; WA# 31916
ALTARES FIELD – BALDONNEL FORMATION**

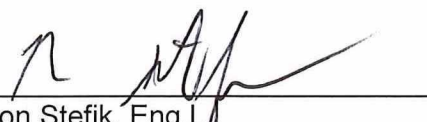
Approval for disposal of produced water, Order 17-02-15, was issued for the subject well, Baldonnel formation, on November 29, 2017. The Commission is amended this order to recognize the NTS location of the completed portion of the deviated subject well.

Attached please find **Order 17-02-015 Amendment #1**, designating an area in the Altares 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 Order contains a number of detailed operational conditions, including a maximum wellhead injection pressure, a requirement for continuous tubing and casing pressure monitoring, and an ultimate reservoir pressure limit. The pressure testing frequency is set to every 6 months, based on the performance of the nearby Baldonnel water disposal well Canbriam Altares B15-1-85-26 WA# 27473, which reached maximum pressure in less than one year. Continuous seismic monitoring is required; to monitor for potential reservoir pressure response, and provide information should seismic events occur. Seismic events of concern attributed to this well may result in an amendment to this Order to alter disposal operations, or termination of this Order.

Please note that disposal of fluid with high total dissolved solids content requires adjustment of the wellhead injection pressure to remain below formation fracture pressure, as per condition 2(b).

Should you have any questions, please contact Kathryn Archibald at (250) 419-4406 or Ron Stefik at (250) 419-4430.

Sincerely,



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

Attachment

ORDER 17-02-015 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 Baldonnel formation – Altares field as a special project in the following area:
NTS 94-B-08 Block H Unit 85
- 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 Canbriam Altares d-76-H/94-B-08; WA# 31916 – Baldonnel formation (disposal perforations 1600.0 – 1653.0 mKB MD).
 - b) Not exceed an injection pressure, measured at the wellhead on the subject well, of 12,020 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) Continually observe and record seismic events within a 5 km radius of the well Canbriam Hz Altares d-76-H/94-B-8; WA #31916, using a monitoring program that;
 - i) is capable of real-time monitoring;
 - ii) has a magnitude detection of 1.5Mw and greater;
 - iii) has hypocenter accuracy to within ± 500 metres;
 - f) Before commencing disposal operations, install and fully activate an accelerometer within 1 km of the wellsite able to record three components of ground acceleration with a minimum detectability of 0.005g and a dynamic range of $\pm 2g$.
 - g) Report the results of seismicity monitoring in Item e) and f), including date, time, location, magnitude, ground acceleration and depth of seismic events, to the Oil and Gas Commission (Commission) via email to Reservoir@bcogc.ca, at 1 month intervals, commencing one month from the date that disposal begins, or upon request.
 - h) Cease injection and notify the Commission immediately if hydraulic isolation is lost in the wellbore or formation.
 - i) Submit the annual packer isolation test report to the Commission within 30 days of the completion of the test.
 - j) Include the disposal operating hours and the maximum injection pressure value on the monthly BC-S18 disposal statement.
 - k) Conduct a reservoir pressure test on the formation in the subject well once every 6 months commencing from the date of initial disposal, 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.
 - l) Cease injection upon reaching a maximum formation pressure of 18,840 kPaa, measured at 1570.1 mKB TVD.

- m) 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.
- n) Not conduct a hydraulic fracture stimulation on any formation in the subject well without prior Commission approval.



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

DATED AT the City of Victoria, in the Province of British Columbia, this 14th day of December, 2018.

Advisory Guidance for Order 17-02-015

- 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 via Petrinex 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 disposal operations suspended as per section 21.1 of the Drilling and Production Regulation.