

September 9, 2019

8200-4510-59240-09

Kiel Crowe, P.Eng.
Senior Exploitation Engineer
Leucrotta Exploration Inc.
700, 639 5th Ave SW
Calgary, AB T2P 0M9

Dear Mr. Crowe:

**RE: PRESSURE MAINTENANCE WATERFLOOD ORDER 04-09-002 AMENDMENT #3
OTHER THAN NORMAL SPACING ORDER AMENDMENT #3
TWO RIVERS FIELD – SIPHON “A” POOL**

The Commission is presently reviewing and amending waterflood approvals to conform to current requirements. The upcoming re-activation of the Two Rivers field Siphon ‘A’ pool by Leucrotta Exploration Inc. required this review.

The Two Rivers Siphon “A” oil pool commenced production in March 1967. A pressure maintenance waterflood project was approved in June 2004, with injection starting in January 2005. The pool ceased injection and production in June 2016. A review of reservoir performance indicates that the waterflood was successful in stabilizing the GOR, achieving an average monthly voidage replacement ratio of 0.78 and cumulative oil recovery of approximately 25 %. The Commission is concerned regarding the reduced injectivity and recommends a compatibility test of the water prior to injection start. Good reservoir management requires a limit on the ultimate reservoir pressure at the cessation of pool operation, with consideration of demonstrated potential for pool pressure equalization.

The following Orders are attached;

- 1) Order 04-09-002 Amendment #3 designating Pressure Maintenance Waterflood within the Two Rivers field – Siphon “A” pool, as a Special Project under section 75 of the *Oil and Gas Activities Act*, and
- 2) Order 04-09-002 Amendment #3 - 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 (MWHIP), an ultimate pool pressure limit, restriction of injection for the purpose of oil recovery, the submission of a packer isolation test and a static gradient test pressure. Also included is a requirement for annual reservoir pressure test on the injector.

Please note that, as per section 75 of the *Drilling and Production Regulation*, a record of the volume of water injected and the MWHIP must be included on a Monthly Injection statement to the Commission via Petrinex not later than 20th day of the month following the reported month.

Should you have any questions, please contact Petra Kriescher-Trudgeon at (250) 419-4415 or the undersigned at (250) 419-4430.

Sincerely,



Ron Stefik, EngL
Supervisor, Reservoir Engineering
Oil and Gas Commission

Attachments



ORDER 04-09-002 – Amendment #3

1. Under Section 75 (1) (a) of the *Oil and Gas Activities Act*, the Commission designates by Order the development and production of petroleum and natural gas from a pool using pressure maintenance waterflood enhance recovery scheme within the Two Rivers field – Siphon “A” pool following area;

DLS Twp 83 Rge 16 W6M NW/4 Sect. 4, Sect. 5, NE/4 Sect. 6, S/2 & NE/4 Sect. 7 and Sect. 8.

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:

- a) The project unadjusted daily oil allowable (UDOA) is 210.6 m³/d.
- b) All associated produced gas must be conserved.
- c) Water may be injected into the injection wells Leucrotta Two Rivers 14-5-83-16 W6M (WA 12253), interval 1306.0 – 1308.8 mKB.
 - i) 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 15,760 kPa or the pressure required to fracture the formation, whichever is lesser.
- d) Prior to injection start and then yearly thereafter a reservoir pressure must be obtained from the injector listed in (c), and submitted to the Commission within 60 days via e-submission
- e) Not exceed an average pool pressure of 12,430 kPaa measured at 418.0 meters subsea for the wells listed in (c).
- f) Cease injection for the well listed in (c) and notify the Commission immediately if hydraulic isolation is lost in the wellbore or formation
- g) Submit the annual packer isolation test report for the well listed in (c) to the Commission within 30 days of the completion of the test.
- h) Include the monthly injected volume, injection hours and the maximum injection pressure value for the well listed in (c) via Petrinex.
- i) Injection must cease upon termination of production from the pool.

Advisory Guidance for Order 04-09-002 – Amendment #3

- 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 Petrinex not later than the 20th 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.



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

DATED AT the City of Victoria, in the Province of British Columbia, this 9th day of September 2019.



ORDER 04-09-002 Amendment #3 - OTN

1. Under Section 65.1(2) of the *Petroleum and Natural Gas Act*, Other Than Normal Spacing is approved within the Two Rivers field – Siphon "A" pool within the following area;

DLS Twp 83 Rge 16 W6M NW/4 Sect. 4, Sect. 5, NE/4 Sect. 6, S/2 & NE/4 Sect. 7 and Sect. 8.

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 specified target area may be subject to an off-target production penalty,
 - c) oil wells drilled within the specified project area are not subject to spacing requirements.

A handwritten signature in blue ink, appearing to read "Ron Stefik".

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

DATED AT the City of Victoria, in the Province of British Columbia, this 9th day of September 2019.