

December 20, 2019

7600-4520-59240-09

Michael Reinhart, P.Eng.
Production Engineer
Pengrowth Energy Corporation
1600, 222 – 3rd Ave SW
Calgary, AB T2P 0B4

Dear Michael Reinhart:

**RE: PRESSURE MAINTENANCE WATERFLOOD ORDER 99-09-001 AMENDMENT #10
RIGEL FIELD – CECIL 'I' POOL**

The Commission is presently reviewing and amending waterflood approvals to conform to current requirements. The continued operation of a pressure maintenance waterflood in the Rigel field – Cecil 'I' pool by Pengrowth Energy Corporation (Pengrowth) requires this review.

The discovery well, Pengrowth Rigel 4-21-88-18 (WA 10648), was drilled vertically and began production in August of 1997. An additional twenty-one vertical wells were drilled and completed into the pool from 1997 to 2000 and the remaining three were drilled in 2006 and 2008, two of which were horizontal. Approval for waterflood was granted on February 24th of 1999 and injection began in March of 1999. Initial approval allowed for injection into two wells and subsequent amendments were granted to allow conversion of an additional five wells to injection service, three of which are currently active.

The following Orders are attached;

- 1) Order 99-09-001 Amendment #10 designating Pressure Maintenance Waterflood within the Rigel field – Cecil 'I' pool, as a Special Project under section 75 of the *Oil and Gas Activities Act*, and
- 2) Order 99-09-001 Amendment #10 - 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, and a requirement for annual reservoir pressure tests on the injectors. The ultimate reservoir pressure has been limited to the initial pool pressure. Only the three active injectors (WA 11061, WA 11428, and WA 11512) are approved for injection in the Order as all other injectors have not reported injection volumes in over three years. Order condition 2i) requires that a packer isolation test be done on the well Pengrowth et al HZ Rigel 12-16-88-18 (WA 11428) before February 1st, 2020.

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 Logan Gray at (250) 419-4465 or the undersigned at (250) 419-4430.

Sincerely,



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

Attachments

ORDER 99-09-001 – Amendment #10

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 enhanced recovery scheme within the Rigel field – Cecil 'I' pool following area;

DLS Twp 88 Rge 18 W6M: NE/4 sec 6, E/2 sec 7, W/2 & NE/4 sec 8, W/2 sec 16, E/2 & SW/4 sec 17, sec 21, sec 27, E/2 & SW/4 sec 28, E/2 frac sec 33, frac sec 34

NTS 94-A-10 Block K - frac unit 12, frac unit 13, unit 22 and unit 23.

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 450.0 m³.

b) All associated produced gas must be conserved.

c) Water may be injected into the wells:

Pengrowth Rigel 13-27-88-18	(WA 11061),	interval 1,167.0-1,168.7 mKB
Pengrowth et al HZ Rigel 12-16-88-18	(WA 11428),	interval 1,302.0-1,716.0 mKB
Pengrowth Rigel 7-17-88-18	(WA 11512),	interval 1,195.0-1,197.0 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 14,050 kPa for wells listed in (c), or the pressure required to fracture the formation, whichever is lesser.

d) An annual reservoir pressure must be obtained from at least one of the injectors listed in (c), and submitted to the Commission within 60 days via e-submission.

e) Not exceed an average pool pressure of 10,225 kPa measured at 510.0 meters subsea.

f) Cease injection for a well listed in (c) and notify the Commission immediately if hydraulic isolation is lost in the wellbore or formation

g) Include the monthly injected volume, injection hours and the maximum injection pressure value for the well listed in (c) via Petrinex.

h) Injection must cease upon termination of production from the pool.

i) Complete and submit a packer isolation test on the well Pengrowth et al HZ Rigel 12-16-88-18 (WA 11428) before February 1st, 2020.

Advisory Guidance for 99-09-001 – Amendment #10

- 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 completed and 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.

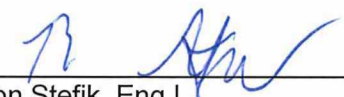


Ron Stefik, Eng.L.
Supervisor, Reservoir Engineering
Oil and Gas Commission

DATED AT the City of Victoria, in the Province of British Columbia, this 20th day of December 2019.

ORDER 99-09-001 – Amendment #10 – OTN

- 1 Under Section 65.1(2) of the *Petroleum and Natural Gas Act*, Other Than Normal Spacing within the Rigel field – Cecil 'I' pool is hereby approved within the following area;
- DLS Twp 88 Rge 18 W6M: NE/4 sec 6, E/2 sec 7, W/2 & NE/4 sec 8, W/2 sec 16, E/2 & SW/4 sec 17, sec 21, sec 27, E/2 & SW/4 sec 28, E/2 frac sec 33, frac sec 34
- NTS 94-A-10 Block K - frac unit 12, frac unit 13, unit 22 and unit 23.
- 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.



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 20th day of December 2019.