



July 19, 2017

6600-2600/2800-32640-02

Kyle Dobson, P.Eng.
Senior Operations Production Engineer
ARC Resources Ltd.
1200, 308 4th Ave SW
Calgary, Alberta T2P 0H7

Dear Mr Dobson,

**RE: PRODUCED WATER DISPOSAL SPECIAL PROJECT APPROVAL; AMENDMENT #1
ARCRES PARKLAND 7-16-81-16; WA# 16675
PARKLAND FIELD – BLUESKY AND CADOMIN FORMATIONS**

Approval for disposal of produced water, Order 16-02-004, was issued for the subject well, Bluesky and Cadomin formations, on October 20th, 2016. This amendment corrects an error made in condition 1 of the previous approval. All other conditions remain unchanged.

Attached please find **Order 16-02-004 Amendment #1**, designating an area in the Parkland field – Bluesky and Cadomin formations 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. The error from Order 06-02-004 was corrected, and now the formations approved for disposal uniformly read Bluesky and Cadomin. This Order contains a number of detailed operational conditions, including continuous wellhead measurements, a maximum wellhead injection pressure, and an ultimate reservoir pressure limit. The separate Cadomin and Bluesky zones may remain unsegregated during active disposal and annual pressure testing, but must be segregated if disposal is shut in for a period of greater than three months in order to avoid crossflow between the formations.

Additional general information regarding disposal wells is available on the Commission's website at <http://www.bcogc.ca/industry-zone/documentation/Subsurface-Disposal>.

In certain circumstances, disposal well operation may induce seismicity of values that require modification of operations to mitigate.

Disposal of fluid with high total dissolved solids content requires adjustment of the wellhead injection pressure to remain below formation fracture pressure

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

Sincerely,

A handwritten signature in black ink, appearing to read 'Ron Stefik', written over a horizontal line.

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

Attachment



ORDER 16-02-004 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 Bluesky and Cadomin formations – Parkland field as a special project in the following area:

DLS Twp 81 Rge 16 W6M Section 16 - Lsds 1, 2, 7 and 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. The Permit Holder shall:
- a) Inject produced water only into the well ARCRES Parkland 7-16-81-16; WA# 16675 – Bluesky (1103.0 – 1113.0 mKB) and Cadomin (1249 – 1285 mKB) formations.
 - b) Not exceed an injection pressure, measured at the wellhead on the subject well, of 11,110 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) Report the disposal volumes on the monthly disposal statement 90% to the Bluesky and 10% to the Cadomin.
 - i) Conduct an annual reservoir pressure test on the unsegregated formations 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.
 - j) Cease injection upon reaching a maximum formation pressure of 10,400 kPaa, measured at 1108.0 mKB.
 - k) Isolate the individual formations anytime disposal operations are suspended for 3 months or longer.
 - l) Maintain and manage the well head to prevent surface liquids from entering the well bore through the annulus outside or between casing and conductor strings.
 - 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 19th day of July, 2017.



Advisory Guidance for Order 16-02-004 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 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.