

February 1, 2017

8135-4100-32640-02

Matt Desroches, P.Eng.
Exploitation Engineer
Murphy Oil Canada
4000, 520-3 Avenue SW
Calgary, AB T2P 0R3

Dear Mr Desroches:

**RE: PRODUCED WATER DISPOSAL SPECIAL PROJECT APPROVAL, AMENDMENT #2
MURPHY HZ SWAN c-39-A/93-P-09; WA# 24405
SWAN LAKE FIELD – BALDONNEL FORMATION**

Approval for disposal of produced water, Order 09-02-003, was issued for the subject well, Baldonnel formation, on March 24, 2009. Order 09-02-003 Amendment #1 was issued on May 13, 2016 to bring the approval up to current standards, and to specify a volume limit for continuous disposal.

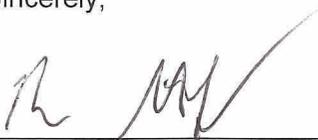
A static gradient test from January 2017 indicates that the reservoir pressure has fallen below the 120% maximum pressure after 2.5 months of shut-in. Therefore, there is room for short-term disposal to continue in 2017 while Murphy prepares an alternative disposal solution. Murphy intends to keep the subject well active as a backup disposal well, to be used for a maximum of 60 days annually in order to incorporate the well testing requirements for the new disposal well. Annual pressure tests will determine if the Baldonnel reservoir pressure is being maintained at a suitable level.

Attached please find **Order 09-02-003 Amendment #2**, designating an area in the Swan Lake 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 may be modified or terminated if conditions change, based on annual performance monitoring data. 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. 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 09-02-003 Amendment #2

- 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 – Swan Lake field as a special project in the following area:
NTS 93-P-09 Block A Unit 39.
- 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 Murphy Hz Swan c-39-A/93-P-09; WA# 24405 – Baldonnel formation (disposal perforations 2250.0 – 2560.0 mKB MD).
 - b) Not exceed an injection pressure, measured at the wellhead on the subject well, of 12,330 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) i) Inject a volume of no more than 12,000 m³ in the calendar year 2017. Thereafter;
ii) A volume of 9,000m³ or less may be injected annually, for a period of no more than 60 days per year. This condition is subject to review, dependent on reservoir pressure response.
 - i) i) Conduct a bottom-hole pressure gauge fall-off test no more than 90 days after ceasing disposal in the year 2017. Thereafter;
ii) 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.
 - 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.



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

DATED AT the City of Victoria, in the Province of British Columbia, this 1st day of February 2017.



ORDER 09-02-003 Amendment #2

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Advisory Guidance for Order 09-02-003 Amendment #2

- 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.