BC Oil & Gas COMMISSION

May 27, 2019 3600-2885-32640-02

Nicholas Haddow, Regulatory Specialist
AQT Water Management Inc.
700 – 1816 Crowchild Trail NW
Calgary, AB T2M 3Y7

Dear Mr. Haddow:

RE: PRODUCED WATER AND NON-HAZARDOUS WASTE DISPOSAL
SPECIAL PROJECT APPROVAL; AMENDMENT #3
AQT FT ST JOHN 6-24-084-19 W6M; WA# 3060
FORT ST JOHN FIELD – CADOMIN-NIKANASSIN FORMATION

Approval for disposal of non-hazardous waste and produced water was issued for the subject well, Cadomin formation, on February 3, 2010. Order 10-02-001 Amendment #1 was issued on December 5, 2014, updating approval conditions to conform to current requirements. Order 10-02-001 Amendment #2 was issued on June 10, 2016, revising the completed disposal zone into two formations; Cadomin and Nikanassin. The Commission has reviewed AQT Water Management Inc.'s request, dated April 15, 2019, to alter the groundwater monitoring program requirements of Appendix A of Order 10-02-001 Amendment #2. The Commission has also reviewed the well data for the subject well and made adjustments to existing approval conditions.

Attached please find **Order 10-02-001 Amendment #3**, designating an area in the Fort St John field – Cadomin-Niakanassin 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 and non-hazardous fluid. This amendment revises the disposal zones into a single 'Cadomin-Nikanassin' formation, updates existing conditions to refer to Petrinex where applicable, reduces the maximum wellhead pressure, and clarifies the depth for calculation of the maximum formation pressure. The maximum wellhead injection pressure has been re-calculated using a salt water gradient of 11.51 kPa/m, measured in the subject well via static gradient test on December 7, 2018.

The groundwater monitoring and sample reports submitted for the wellsite (WA #3060) show consistency in groundwater chemistry over the sampling period, and there are no apparent trends in groundwater levels except for seasonal fluctuations. Appendix A provides revised groundwater monitoring requirements based on the previously submitted data.

Please note that the casing inspection log required under condition 2l)i) is due in 2019 and must be conducted no later than October 18. Additional general information regarding disposal wells is available on the Commission's website at https://bcogc.ca/industry-zone/documentation/Subsurface-Disposal. The Ministry of Environment identifies the type of effluent approved for injection in the separate Waste Discharge Permit, granted under the Environmental Management Act.

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

Sincerely,

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

Attachments

BC Oil & Gas COMMISSION

ORDER 10-02-001 Amendment #3

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 non-hazardous waste as well as produced water, including flowback from fracturing operations, into the Cadomin and Nikanassin formations – Fort St John field as a special project in the following area:

DLS Twp 84 Rge 19 W6M Section 24 - Lsds 3, 4, 5, and 6

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 non-hazardous waste and produced water only into the well AQT Ft St John 06-24-84-19; WA# 3060 Cadomin-Nikanassin (1066.0 – 1120.0 mKB) formation.

b) Hold a valid Permit under the Environmental Management Act for the disposal of non-hazardous waste.

c) Not exceed an injection pressure, measured at the wellhead on the subject well, of 9,780 kPag or the pressure required to fracture the formation, whichever is lesser.

d) Inject only through tubing with a packer set as near as is practical above the injection interval.

e) Continually measure and record the wellhead casing and tubing pressures electronically.

f) Cease injection and notify the Commission immediately if hydraulic isolation is lost in the wellbore or formation.

g) Submit the annual packer isolation test report to the Commission within 30 days of the completion of the test.

h) Include the disposal operating hours and the maximum injection pressure value in Petrinex.

i) Cease injection upon reaching a maximum formation pressure of 11,670 kPaa at 1093 mKB.

j) 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.

k) 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.

l) 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 operation into the Cadomin and Nikanassin zones.

ii) Perform an annual hydraulic isolation log on the subject well and submit results to the Commission within 30 days of the completion of logging.

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

n) Implement a groundwater monitoring program as detailed in Appendix A.

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

DATED AT the City of Victoria, in the Province of British Columbia, this 27th day of May 2019.

ORDER 10-02-001 Amendment #3

Advisory Guidance for Order 10-02-001 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 disposal statement must be submitted to the Commission via 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 disposal operations suspended as per section 21.1 of the Drilling and Production Regulation.

Appendix A – Groundwater Monitoring Requirements

AQT Ft St John 6-24-84-19 (WA# 3060) Non-Hazardous Waste and Produced Water Disposal

1. The collection of groundwater samples from the three monitoring wells at the site on an annual basis, starting summer or fall field season 2019, and analysis for general water chemistry parameters including Total Dissolved Solids (TDS), cations and anions. Groundwater samples shall be collected using standard environmental sampling and handling protocols consistent with previous sampling.
2. Continued monitoring of groundwater levels in the monitoring wells using a pressure transducer, with the installation of equipment to enable correction of readings for barometric pressure.
3. Groundwater monitoring reports shall be prepared by a qualified professional and submitted to the Commission on an annual basis. Reports shall document the field methods undertaken, document the groundwater monitoring results (corrected for barometric pressure) and analytical results, and include tabular comparison to previous sampling and monitoring results.
4. Additional documentation and/or further sampling or investigation may be required by the Commission based on the review of submitted documentation.

Submission of Documentation

Groundwater Monitoring Reports for the long term groundwater monitoring/sampling program (3, above) shall be submitted to the Commission annually. For each annual report;

- Sampling procedures and date shall be documented and any relevant site observation should be noted.
- Monitoring and sampling results shall be presented in tabular form with appropriate BC comparison criteria.
- Tables shall be presented to allow for comparison of groundwater sampling results collected on different dates from the same well.
- Laboratory analytical reports for the sampling shall be appended to the report.
- Laboratory analytical reports may be requested by the Commission at any time prior to the submission of the annual report.