BC Oil & Gas COMMISSION

April 30, 2019 3600-2800-32640-02

Nicholas Haddow, Regulatory Specialist
AQT Water Management (Canada) 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
AQTWM FT ST JOHN 11-12-084-19 W6M; WA# 3010
FORT ST JOHN FIELD – CADOMIN FORMATION

Approval for produced water and non-hazardous waste disposal into the Cadomin formation of the subject well was issued March 11, 2016 under Order 16-02-002 Amendment #1. Amendment #2, issued April 19, 2016, required the implementation of an on-going groundwater monitoring program. The Commission has reviewed AQT Water Management (Canada) Inc.'s request, dated April 15, 2019, to alter the groundwater monitoring program requirements of Appendix A of Order 16-02-002 Amendment #2.

Attached please find Order 16-02-002 Amendment #3, designating an area in the Fort St John field – Cadomin 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 reduces the maximum wellhead pressure, updates existing conditions to refer to Petrinex where applicable, and clarifies the datum depth of the maximum formation pressure. The new maximum wellhead injection pressure has been calculated using a salt water gradient measured in the nearby Cadomin disposal well, AQTWM Ft St John 6-24-84-19 (WA# 3060).

The groundwater monitoring and sample reports submitted for the wellsite (WA# 3010) show consistency in groundwater chemistry over the sampling period, and there are no apparent trends in groundwater levels except for season fluctuations. Appendix A provides revised groundwater monitoring requirements based on the previously submitted data.

Please be reminded that shut-in time for the annual reservoir pressure test required in Condition 2k) must be of sufficient length to measure a stable pressure or to permit the calculation of reservoir pressure. 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

Reservoir Engineering Department
2950 Jutland Road
Victoria, BC V8T 5K2

T 250.419-4400
F 250.419-4402
www.bcogc.ca

BC Oil & Gas COMMISSION

ORDER 16-02-002 Amendment #3

1. Under Section 75(1)(d) of the *Oil and Gas Activities Act*, the Oil and Gas Commission (Commission) designates the operation and use of a storage reservoir for the disposal of produced water, including flowback from fracturing operations, and non-hazardous waste into the Cadomin formation – Fort St John field as a special project in the following area:

   DLS Twp 84 Rge 19 W6M Section 12 - Lsds 11, 12, 13 and 14.

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 and non-hazardous waste only into the well AQTWM Ft St John 11-12-84-19 W6M; WA# 3010 Cadomin formation (perforations from 1030.5 to 1067.0 mKB).

   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 8,450 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 11,485 kPaa measured at 1048.8 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.

      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.

   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 30th day of April 2019.

Advisory Guidance for Order 16-02-002 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 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

AQTWM Ft St John 11-12-84-19 (WA 3010) Non-Hazardous Waste and Produced Water Disposal

1. The collection of groundwater samples from monitoring wells at the site (P14 series and MW16 series) 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. Annual measurement of static water levels in the monitoring wells.
3. Completion of an updated elevation survey in 2019 for the tops of the monitoring wells at the site relative to a common datum.
4. 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, the groundwater monitoring and analytical results, and include tabular comparison to previous sampling and monitoring results.
5. Additional documentation and/or further sampling or investigation may be required by the Commission base on review of submitted documentation.

Submission of Documentation

Groundwater Monitoring Reports for the long term groundwater monitoring/sampling program (4, above) shall be submitted to the Commission annually. For each annual report;

- Sampling procedures and dates shall be documented and any relevant site observations 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.