

Industrial Water Supply and Wastewater Design Guidelines

1.0 Purpose

These guidelines are meant to provide guidance to Industry on the assessment of potential water sources for industrial use. Additional concerns associated with the development of an industrial water supply are also highlighted.

2.0 Legislative Mandate

Various sections of the *Water Resources Act, 2002* allow for assessment, approval, licensing, monitoring, inspection and enforcement related to industrial water supplies including:

- Part 1- water rights
- Section 15- priority of water rights
- Section 31- monitoring
- Section 37- approval of water works
- Section 48- permit to alter a body of water
- Section 58- construction of a non-domestic well
- Section 70- inspections

Any industrial water supply that is proposed as part of a new Environmental Assessment registration under the *Environmental Protection Act, 2002* must demonstrate that they meet these guidelines.

3.0 Type of Source

An industrial water supply may include the following:

- Surface water source
- Groundwater source
- Public drinking water system owned by a City, Municipality or Local Service District (LSD)
- Combined source

In selecting the source of water to be developed, the Design Engineer must prove to the satisfaction of the Water Resources Management Division (WRMD) that an adequate quantity of water will be available. The quality of water should meet any relevant water quality guidelines for the proposed use, and may be achieved with the addition of treatment. The design of any treatment processes shall depend on the nature and quality of the particular water to be treated, seasonal variations, the desired quality of the finished water.

When evaluating multiple sources for an industrial water supply, consideration should be given to other water uses, environmental uses, available yield, water quality, and the cost to develop the source.

4.0 Water Demand

The Proponent shall determine the industry water demand including the following:

- Average daily water use

- Maximum day demand
- Monthly water use

Water demand should be based upon metered flows if possible, otherwise standard flow values can be used for the hydraulic analysis of the industry water use.

An industrial water user connected to a public drinking water system should have a water meter installed to be able to record the amount of water used.

5.0 Surface Water

Surface water includes water bodies (lakes, wetlands and ponds) and water courses (rivers, streams and brooks). The watershed for a surface water source includes all tributary streams and drainage basins upstream from the point of water supply intake.

A surface water quantity assessment should include a review of the available yield of the water supply. The surface water quantity assessment should demonstrate that:

1. Where possible, a minimum drought return period of one in fifty years has been used for calculating the safe yield;
2. A minimum drought duration of 30 days has been used;
3. The yield is adequate to provide ample water for other legal users of the source including any required fish or environmental flows;
4. The yield is adequate to meet the maximum current and future water demand including any required environmental flows without significantly affecting the watercourse habitat downstream of the intake; and
5. Only live storage has been used in the yield calculations.
6. Mean annual discharge at the point of water diversion has been assessed.

Where site-specific stream flow data is available, yield can be estimated by generated mass flow curves. The stream flow data should also be used to estimate the minimum perennial yield on record and to estimate a drought return period for that year. Where site-specific stream flow data is not available but precipitation data is available a stream flow record may be simulated to generate mass flow curves. In doing so the runoff characteristics should adequately reflect the hydrologic and topographic characteristics of the watershed. Where both site-specific stream flow and precipitation data exists both methods should be used and compared. The more conservative yield should be adopted.

For sites where neither site-specific stream flow data nor precipitation data exists, a variety of methods should be used to assess available yield of the water supply, and may include the following:

- The WRMD publication “A Guide to Storage – Yield Analysis at Ungauged River Sites” and its accompanying spreadsheet can be used to provide a preliminary estimate of storage requirements for a desired yield. (<https://www.gov.nl.ca/ecc/waterres/reports/storage-yield/>)
- The WRMD publication “Estimation of Low Flows for the Province of Newfoundland and Labrador” and its accompanying spreadsheet can be used to provide an estimate of low flows. (<https://www.gov.nl.ca/ecc/waterres/reports/estimation-streamflow/>)

- An advanced water balance method that defines boundaries of the area of interest and period, develops a schematic of the water balance model, uses quality-controlled sources of information, and an assessment of uncertainty and sensitivity analysis of the information used.

6.0 Groundwater

A groundwater source includes the water bearing zones and catchment area(s), and all water obtained from dug, drilled, bored or driven wells, and infiltration lines.

A Non-Domestic Well Permit is required for all drilled wells for non-domestic purposes including:

1. New construction;
2. Replacement of an existing non-domestic well;
3. Alterations and repairs to existing non-domestic wells; and
4. Aquifer pumping tests.

An application for a non-domestic well permit can be found here:
https://www.gov.nl.ca/ecc/files/Permit_Non-Domestic_Well_2021.pdf

A groundwater quantity/quality assessment must be made of the potential industrial water supply and shall include:

1. A step drawdown test is to be performed to determine the pumping rate prior to the commencement of the aquifer pumping test.
2. An aquifer pumping test to properly test the capacity of the well is required for all new, modified (i.e. borehole deepening), or reactivated groundwater source wells.
3. The pump is to be set at the predetermined drawdown level as determined by information from the Well Construction Record and adjusted based on the results from yield testing.
4. A report written by a Professional Hydrogeologist licensed in the Province of Newfoundland and Labrador shall be submitted to the Proponent.
5. The total developed groundwater source capacity should equal or exceed the design maximum day demand and equal or exceed the design average day demand with the largest producing well out of service.
6. Every new, replaced, modified or rehabilitated groundwater source shall be examined for applicable physical and chemical characteristics by tests of a representative sample at an accredited laboratory satisfactory to WRMD, with the results reported to WRMD.
7. Two groundwater samples shall be collected during the aquifer pumping test procedures; one during the first two hours and one during the last two hours.
8. Water quality samples must be analyzed by a CALA accredited laboratory.

Please see WRMD's aquifer test guidelines for more information:

<https://www.gov.nl.ca/ecc/files/waterres-regulations-appforms-aquifer-testing-final.pdf>

WRMD should be consulted prior to siting, design and construction regarding a proposed well location as it relates to required separation between existing and potential sources of contamination and

groundwater development. The well location should be selected to minimize the impact on other wells and other water resources.

Yield and drawdown tests shall:

1. Be performed on every production well after construction or subsequent treatment and prior to placement of the permanent pump;
2. Have the test methods clearly indicated in the project specifications;
3. Have a test pump capacity, at maximum anticipated drawdown, at least 1.5 times the quantity anticipated;
4. Provide for continuous pumping for at least 24 hours at the design pumping rate or until stabilized drawdown has continued for at least 6 hours when test pumped at 1.5 times the design pumping rate, and
5. Provide the following data:
 - a. Test pump capacity-head characteristics;
 - b. Static water level;
 - c. Depth of test pump setting;
 - d. Time of starting and ending each test cycle; and
 - e. The zone(s) of influence for the well or wells.

Geological data shall:

1. Be determined from samples collected at 1.5 m intervals and at each pronounced change in formation;
2. Be recorded, and information provided to WRMD; and
3. Be supplemented with information on accurate records of drillhole diameters and depths, assembled order of size and length of casing and liners, grouting depths, formations penetrated, depth to water-bearing fractures, and water levels.

Observation wells shall be:

1. Constructed in accordance with the requirements for permanent wells if they are to remain in service after completion of a water supply well; and
2. Protected at the wellhead to preclude entrance of foreign materials.

7.0 Public Drinking Water System

If the source of water for industry is from an existing public drinking water system, the Proponent must demonstrate that the source has sufficient available yield to meet the additional industrial water demand. The Proponent must also demonstrate that the water treatment plant has sufficient capacity to treat this additional water demand.

Industries with high water demand which may impact the capacity of the public drinking water supply or system will not be allowed to use a public drinking water system. Such industries must develop their own industrial water supply.

8.0 Other Infrastructure

The development of an industrial water supply may entail the construction of associated infrastructure including:

- Intake
- Dam
- Groundwater well
- Pump
- Pipeline
- Water storage tank
- Water treatment plant
- Wastewater treatment and disposal

Guidance on the design of such infrastructure can be found in the *Guidelines for the Design of Drinking Water Systems, 2022*. Approvals for such infrastructure under the *Water Resources Act* or other legislation may be necessary prior to construction.

9.0 Wastewater and Water Treatment Facility Residual Waste

Any discharge of wastewater to a public sewer system or waterbody must meet the requirements of the *Environmental Control Water and Sewage Regulations*. The Proponent must provide information on the expected quality of wastewater discharge in order to demonstrate that it will meet the *Environmental Control Water and Sewage Regulations*.

If industrial wastewater is to be discharged to a public wastewater collection system, the Proponent must demonstrate that there is sufficient capacity in the sewer to meet these additional flows. The Proponent must also demonstrate that the wastewater treatment system has sufficient capacity to treat these additional flows without causing disruption to the existing treatment process.

Provisions must be made for the proper disposal of water treatment plant residual waste, such as neutralization chemicals, treatment sludge, filter backwash water, brines, and any other residual waste streams. The choice of process residual waste handling will depend on the raw water, the treatment plant processes, and the discharge requirements.

Refer to the *Guidelines for the Design of Wastewater Systems, 2022* for detailed design guidance for wastewater treatment systems.

Sludge shall be disposed of at an approved waste disposal site. The regional office of Service NL shall be contacted in this regard.

10.0 Water Use Licenses

As per the Water Resources Act SNL 2002 cW-4.01, a Water Use Licence (WUL) is required for use of water within the jurisdiction of the province of Newfoundland and Labrador. A WUL is required when the proponent proposes using groundwater or surface water source as a water supply. A WUL is not required where the water source is a municipal supply.

The WUL application form and fee schedule can be found here:

https://www.gov.nl.ca/ecc/files/application_for_wul_2021_Jul-19-2021.pdf

https://www.gov.nl.ca/ecc/files/WUL-Fee-Schedule_Revised_Budget-2021_Jul-13-2021.pdf

Background information on the water use or diversion must be provided for the potential industrial water use or diversion and shall include:

1. The annual water use plan (as precisely as possible). Specify the total volume of requested water per year.
2. Basin drainage area above the point of water use or diversion.
3. The estimated 2-year 7-day low flows and 10-year 7-day low flows at the point of water use.
4. List all users of the proposed water source who may be affected by this water use.

As per the Water Use Charges Regulations under the Water Resources Act, an annual Water Use Charge applies for an active WUL. The holder of a WUL must record the volume of water used and report it before January 31st of each year. The Water Use Charges Regulations can be found here:

<https://www.assembly.nl.ca/Legislation/sr/regulations/rc160060.htm>

11.0 References

CCME, 2022, Guidelines, <https://ccme.ca/en/current-activities/canadian-environmental-quality-guidelines>

Water Resources Management Division, 2022, *Guidelines for the Design of Drinking Water Systems*, <https://www.gov.nl.ca/ecc/waterres/waste/groundwater/report/>

Water Resources Management Division, 2022, *Guidelines for the Design of Wastewater Systems*, <https://www.gov.nl.ca/ecc/waterres/waste/groundwater/report/>

Water Resources Management Division, *Aquifer Testing Guidelines*, <https://www.gov.nl.ca/ecc/files/waterres-regulations-appforms-aquifer-testing-final.pdf>