

# Canada

Capital city: Ottawa  
Inhabitants: 37 Million



## INSTITUTIONAL SETTING AND PURPOSE

Under the Canadian constitution, responsibility for natural resources is shared by all levels of government, including federal, provincial, territorial, municipal, and indigenous.

Groundwater monitoring is carried out in a decentralized manner. Most Canadian provinces and territories have an active groundwater monitoring network, or “observation well network”, that integrates local and municipal networks. The objective of these networks is to monitor seasonal and annual long-term fluctuations. Many wells are located in important aquifers

where stresses caused by anthropogenic groundwater extraction and/or climatic variations are monitored. This provides valuable insight on the magnitude of groundwater recharge and aquifer depletion.

The monitoring networks also play an important role in assessing aquifer sustainability, especially when limited data on actual groundwater use are available in parts of Canada.

## CHARACTERISTICS OF THE NETWORK

The number of wells in provincial and territorial monitoring networks ranges widely, from tens to many hundreds.

The Groundwater Information Network (GIN) then integrates much of this data into a single national network.

## PROCESSING AND DISSEMINATION

GIN is a data network and web portal dedicated to the improvement of knowledge about groundwater systems by increasing access to groundwater information. Water well and water monitoring data, to name a few, are collected from provincial and territorial collaborators such as British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Québec, Nova Scotia, Newfoundland and Labrador, and Yukon. The GIN web portal allows users to view, download and query groundwater information online (Figure 1). Several types of groundwater information can be requested in formats such as GWML (Groundwater Markup Language), Excel, Google Earth, ESRI Geodatabase, ESRI shapefile and PDF.

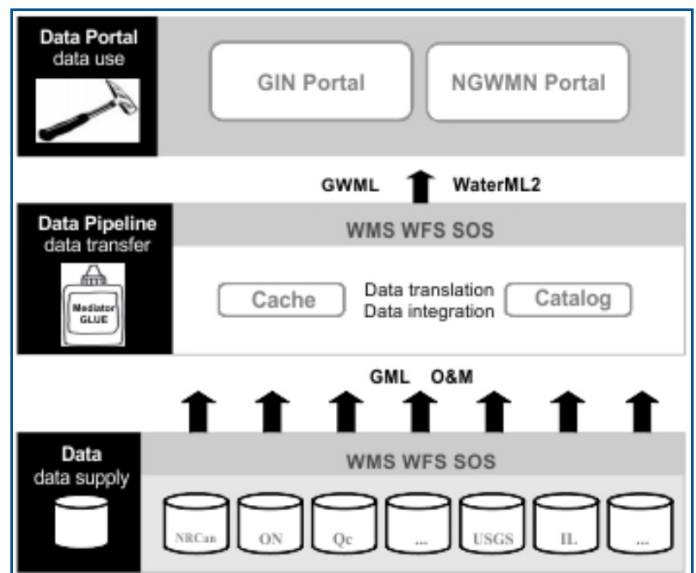


Figure 1 – GIN Portal pre-processing

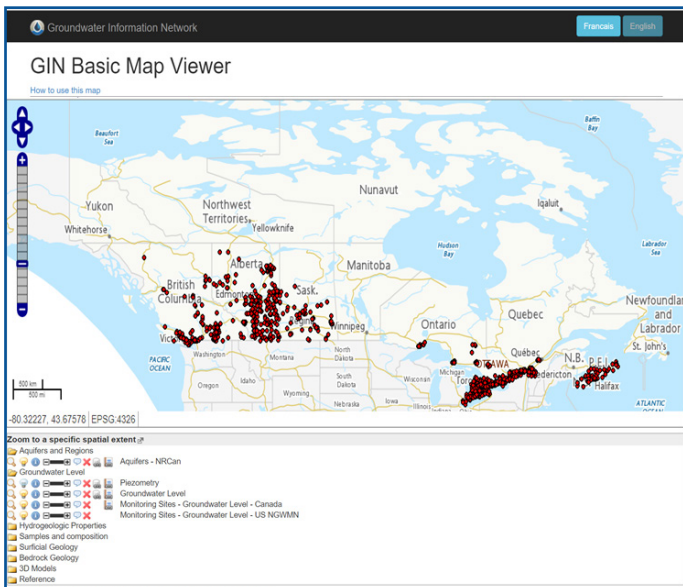


Figure 2 – Groundwater monitoring sites of Canada. Source: GIN

Monthly values of groundwater levels, related statistics, location and borehole characteristics are presented in the portal for each monitoring station (Figure 3), where available.

NRCan (Natural Resources Canada) also worked closely with the U.S. Geological Survey (USGS) and the international community to develop the WaterML2 data standards and best practices, including GroundwaterWML2 (<https://www.ogc.org/standards/waterml>; Brodaric et al. 2018). Combined with the adoption of other data access standards and technologies from the Open Geospatial Consortium, this has resulted in the ability to seamlessly retrieve groundwater level data from either GIN or the National Groundwater Monitoring Network (NGWMN) of the United States (Brodaric et al. 2016).

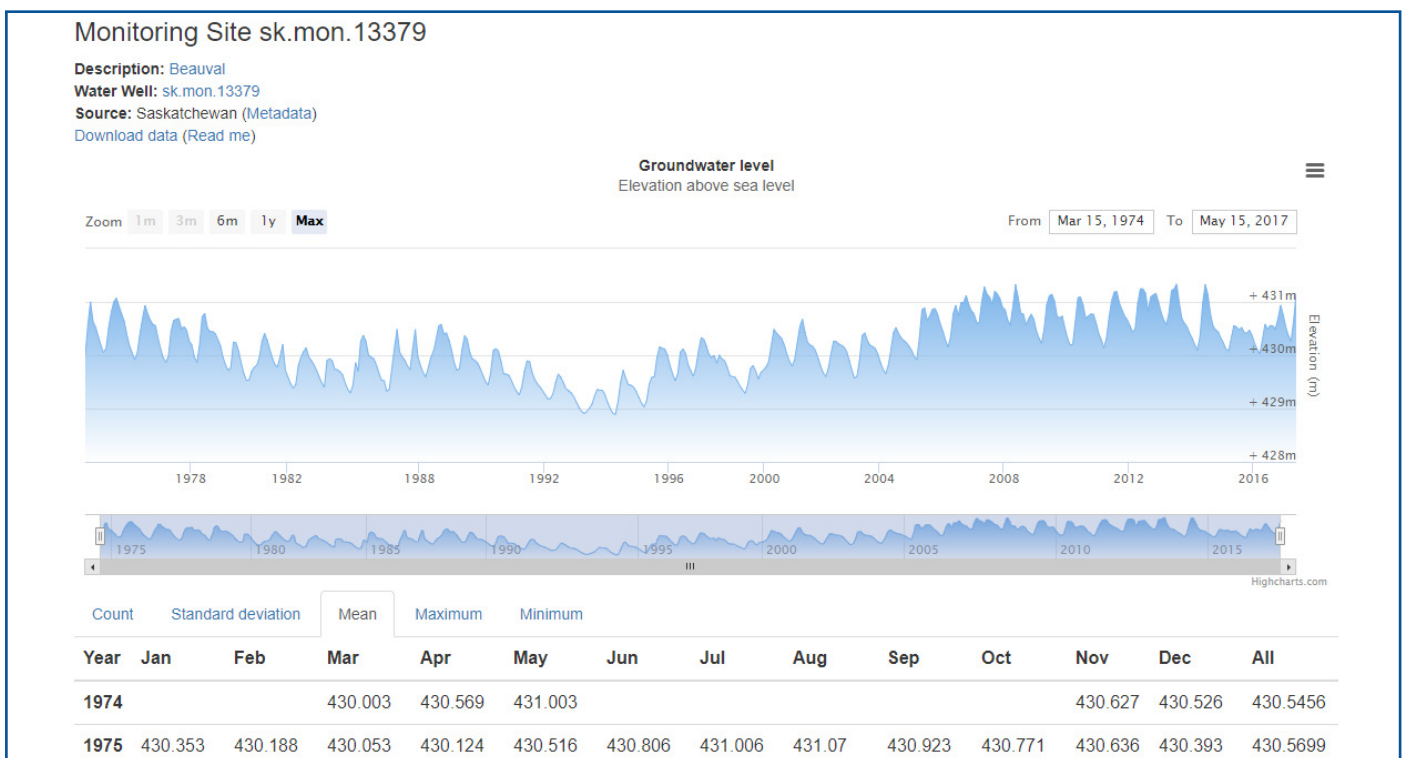


Figure 3 – Example of monitoring well from Monitoring Sites of Canada (GIN)

## Sources

- Brodaric, B., Booth, N.L., Boisvert, E., Lucido, J. Groundwater Data Interoperability. *Journal of Hydroinformatics*, 18(2):198-225 - <https://doi.org/10.2166/hydro.2015.242>;
- Brodaric, B., Boisvert, E., Chery, L., Dahlhaus, P., Grellet, S., Knoch, A., Letourneau, F., Lucido, J., Simons, B., Wagner, B. Enabling Global Exchange of Groundwater Data: GroundWaterML2 (GWML2). *Hydrogeology Journal*, 26(3):733-741 - <https://doi.org/10.1007/s10040-018-1747-9>;
- Feedback from NRCan - received on 06-07-2020;
- GGMN People Network - email exchange;
- Groundwater Information Network (2020) - <http://gw-info.net>. Accessed 28 January 2020; and
- Rivera A (ed) (2014) Canada's groundwater resources. Geological Survey of Canada. Fitzhenry & Whiteside, Markham, ON - ISBN: 978-1-55455-292-4 (HC).