

Northeast Water Tool v3

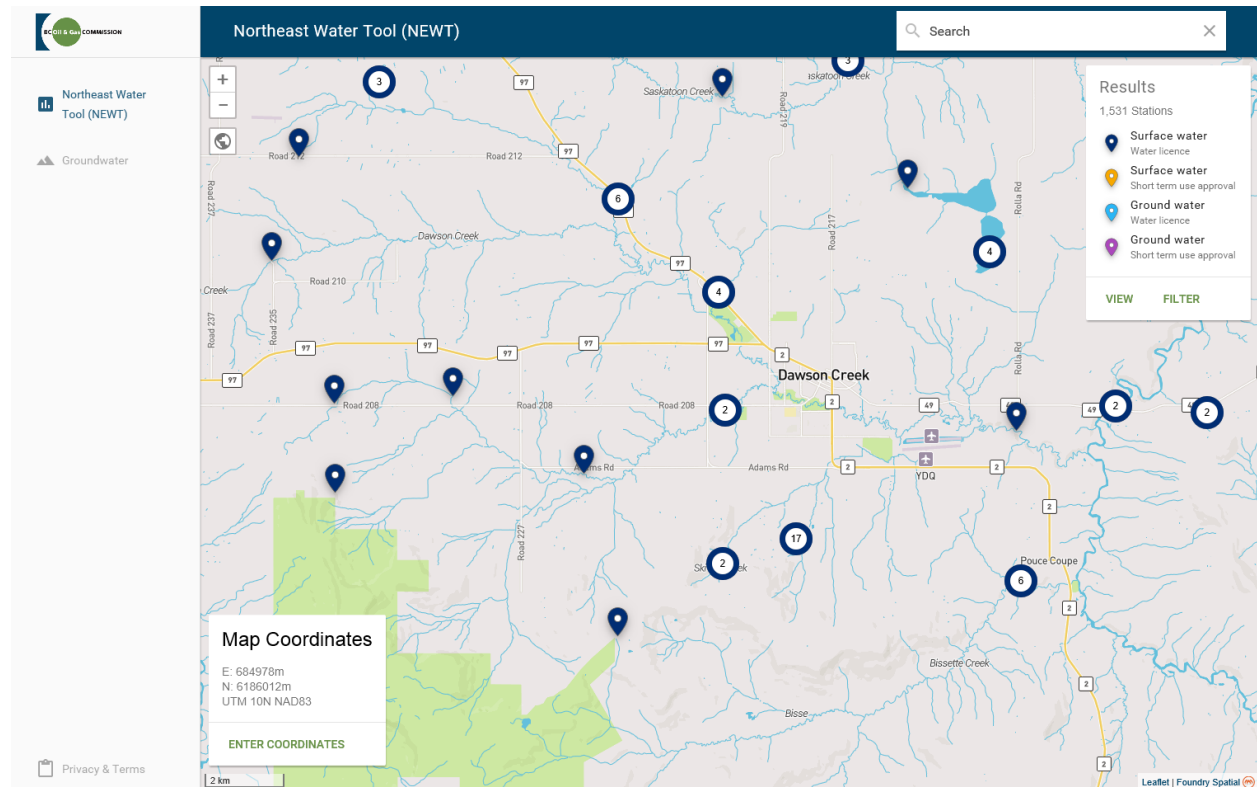
Release date November 1, 2016

The Northeast Water Tool (NEWT) v3, was developed for the BC Oil and Gas Commission (Commission) by Foundry Spatial Ltd. There are a number of significant enhancements to NEWT. NEWT V3 replaces the original version released in 2012 and a 2013 update. It remains intuitive and easy to use, and includes enhancements such as:

- Improved map and query functionality, including search capability on multiple parameters.
- Expanded and improved NEWT Summary Reports, including projections of future climate.
- Enhanced Environmental Flow Needs assessment, including explicit guidance for winter withdrawals from lakes.
- Explicit presentation of “uncertainty”.
- Addition of “downstream water rights holders” as per the Water Sustainability Act, to support stakeholder engagement and notification.

NEWT can be accessed at: <http://water.bcogc.ca/newt>

Main screen



The Main Screen shows the map base with rivers, lakes, highways, roads, communities and other geographic locations and features.



- The “map pin” symbols show locations of water licences or Commission-issued short-term water use approvals (short-term water use approvals issued by the Ministry of Forests, Lands and Natural Resource Operations (FLNRO) are currently not available for inclusion in NEWT, but will be added in the future). Hovering the cursor over the symbol causes the name of the water licence holder or short-term water use approval holder to appear.


- The circles containing a number represent locations where there are multiple water licences or short-term use approvals. The colours around the circle represent the proportion of types of licences or approvals represented by the circle – surface water licence, surface water short-term use approval, groundwater licence, groundwater short-term use approval (i.e., water source dugouts). As you zoom in, the circles will disaggregate and show the individual locations. You can also click on a circle to investigate.
- The “+” and “-” box in the upper left are for zooming in and out. You can also zoom in and out using your mouse or keyboard “+” and “-” keys, or you mouse scroll wheel. Holding the ‘shift’ key will let you click and drag a rectangle on the screen. After letting go the map will zoom in to the area under the rectangle.
- The “**Map Coordinates**” box in the bottom left shows the UTM coordinates for the location of the cursor (UTM Zone 10, NAD 83). By using the “ENTER COORDINATES” feature you can zoom to a specific coordinate of your interest.
- The “**Search**” box in the upper right is a powerful new addition, letting you search for named features (lakes, rivers, water licence and short-term water use approval holders, licence and approval numbers, and many other things).
- The “**Results**” box in the upper right lets the user select and display whatever water licence or short term use information you are interested in:
 - Use the “**FILTER**” option to select the information to be displayed. You can filter on:
 - **Network** - OGC or FLNRO
 - **Status** – active approval or application
 - **Type** (surface water licence, surface water short term use approval, groundwater licence, groundwater short term use approval)
 - **Purpose** (Agriculture, Commercial, Municipal, Power, Oil and Gas, Other)
 - **Quantity** of water approved for use (m³ per year)
 - The results of your filtering will be displayed on the map. You can use the “**VIEW**” feature to view a list of the results on the screen. Clicking on an entry will zoom you in to that result and provide more details.

Generating a NEWT Report

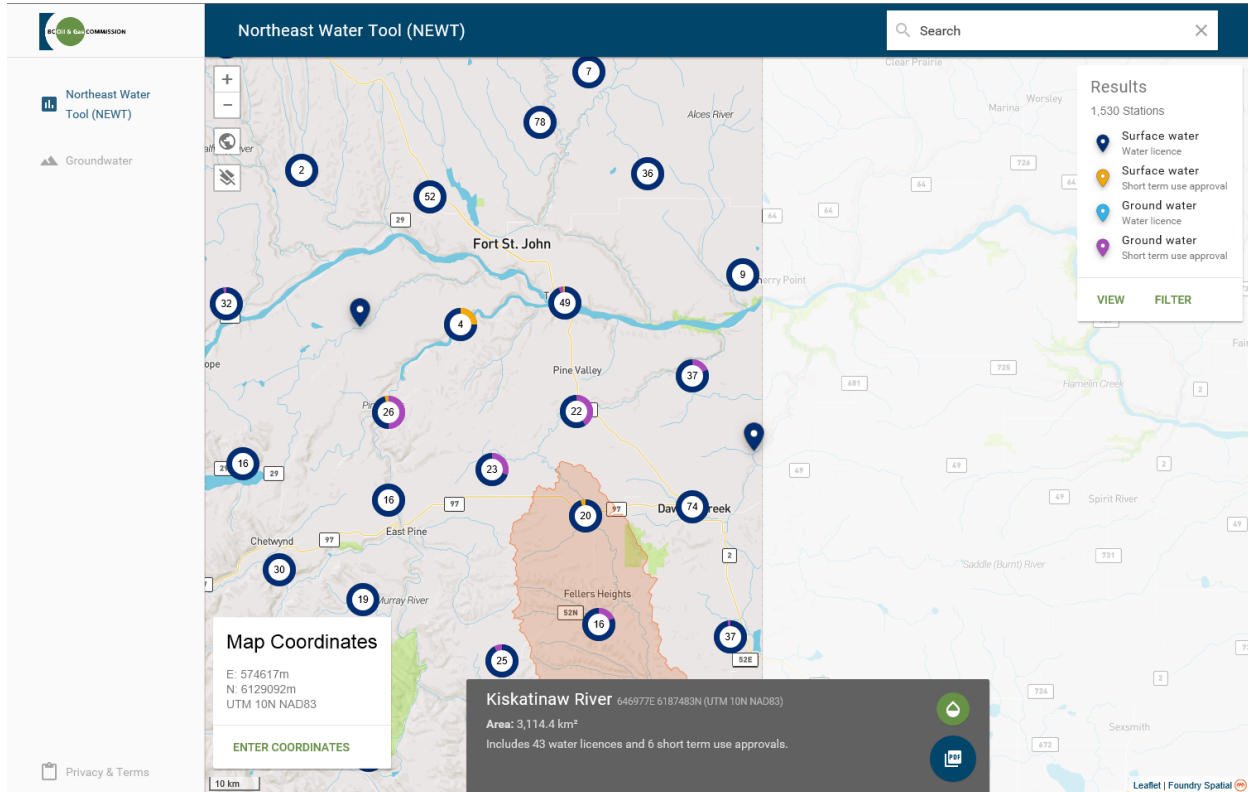
To generate a NEWT report you either zoom into a location using your mouse, the “+” and “-” box, or by entering UTM coordinates into the Map Coordinates box. Once at the location of interest, place the cursor on the river or lake of your interest and select the location with your mouse. The watershed you selected will be highlighted on the map, and a **Results** box will appear:

The **Results** box displays the following (see graphic on next page):

- **Name** of the water body (if it is a named waterbody).
- the **UTM coordinates** of the point you selected.
- the number of water licences and short-term use approvals present in the watershed
- A **water drop** symbol  - this displays the NEWT results on the screen for the user to review, without having to review the entire PDF report. This can be very handy – give it a try.
- A **PDF** symbol  - this produces the entire NEWT report, for reading, saving and printing.
- To zoom to the extent of the watershed you have selected, click on the name of the waterbody.
- To close the results box and make the orange watershed disappear, use the **Clear watershed**

symbol  - located in the upper left of the main map window below the + and – zoom buttons.

Results Screen



The NEWT Report

Page 1. Depicts a map of the watershed area upstream of the point of diversion you selected. The header box displays the following:

- The name of the water body (if it is a named water body)
- The UTM coordinates for the point you selected
- The upstream watershed drainage area (km²)
- The minimum, median and maximum elevations in the watershed (metres above mean sea level)
- The drainage hierarchy for the point you selected
(e.g., Fontas River → Fort Nelson River → Liard River → Mackenzie River → Arctic Ocean)

Page 2. Hydrology – Annual. The map shows the query (orange) and downstream (blue) watersheds. The table below the map provides an overview of the hydrology and existing authorized water allocations under the *Water Sustainability Act* within these watersheds.

Page 3. Hydrology – Monthly – Query Watershed. The chart and table show information on modeled hydrology and existing allocations in the **query watershed**. This location is shown with an orange marker and watershed outline in the map on page 2. The table includes:

- **Mean Annual Discharge (MAD)** and a calculation of 20% of MAD and 10% of MAD. The discharge calculations in NEWT are based on hydrology modelling, and represent 30-year average (or “normal” discharge).
- **Mean Monthly Discharge** (in units of millimetres - mm, cubic metres per second - m³/s and cubic metres - m³).
- **% of MAD** – this is monthly runoff as % of Mean Annual Discharge (MAD).

- **Flow Sensitivity** (based on BC Ministry of Environment “Environmental Flow Needs” policy).
- **Environmental Flow Needs (EFN)** (calculated as 85%, 90% or 95% of monthly runoff, derived from the approach in the BC Ministry of Environment “Environmental Flow Needs” policy).
- **Potential Maximum Allocation** – calculated as the monthly runoff subtracting the EFN.
- **Existing Allocations** – this is the cumulative total of all water licence and short term water use allocations (except FLNRO short term use approvals) in the watershed upstream of the query point.
- **Remaining Potential Allocation** – calculated as the Potential Maximum Allocation subtracting the Existing Allocations
- **Notes** – this will show if a water source is “winter flow limited”, or if it’s a lake source. Where a query point is on a lake or is from a stream that is winter flow limited, the “Remaining Potential Allocation” is depicted as “/”. When a lake source is selected, it is OGC policy that cumulative winter withdrawal for December-March be limited to a maximum of 10 cm water depth related to the surface area of the lake. The detail on the water availability for the winter period is shown below the table.

Model Performance

The hydrology estimates are produced from a hydrology model which included 55 long term hydrometric stations in northeast BC, NWT, and AB. Model uncertainty is calculated using the “leave-one-out cross-validation” approach of Moore *et. al.*¹. Mean error = 5.5%, Median error = 3.7%, Mean absolute error = 16.1%, Modeled annual runoff is with $\pm 20\%$ for 77.8% of the calibration watersheds.

Page 4. Hydrology – Monthly – Downstream Watershed

Same information as Page 3, except for the larger watershed encompassing the area downstream of the query point to the next major confluence.

Page 5+ Existing Allocations – Water Licences (the number of pages vary, depending on the number of water licences or short term use approvals). This table presents all the active water licences in the watershed upstream of the query location.

Followed by: Existing Allocations – Short Term Approvals (S10). This table presents all the active OGC-issued short-term water use (S10) approvals in the watershed upstream of the query location.

Followed by: Downstream Water Rights Interests - Water Licences and Short Term Approvals

This table lists current water licences, active water licence applications and OGC-issued short term water use approvals on or near the main stem of the queried waterbody, downstream of the queried location, to the next major confluence. These are considered to be “water rights holders” under the Water Sustainability Act, whose rights have to be considered in further water allocation decisions.

Followed by: Land Cover and Topography. This page presents characteristics of land cover and topography for the query watershed.

Followed by: Climate. This page presents historic “climate normal” conditions and predicted future change in temperature and precipitation for the query watershed. The climate normal data represent the 1971-2000 period, and is based on modeling by the ClimateWNA project team (UBC, University of

¹ Moore, R.D., J.W.Trubilowicz and J.M.Buttle, 2011. Prediction of Streamflow Regime and Annual Runoff for Ungauged Basins using a Distributed Monthly Water Balance Model. Journal of the American Water Resources Association (JAWRA) 48(1): 32-42. DOI:10.1111/j.1752-1688.2011.00595.x

Alberta, BC MFLNRO). The future climate data represents 2041-2070. Scenario A illustrates the UKMO HadGEM A1B run 1 general circulation model (GCM), Scenario B shows the CGCM3 A2 run 4 GCM and Scenario C shows the UKMO HadCM3 B1 run 1 GCM. The combination of these three climate models and emissions scenarios were chosen because, over most of British Columbia, they provide a range of generally hot/dry, warm/very wet, and moderately warm/wet for Scenario A, B, and C respectively.

For further information about NEWT, contact:

Allan Chapman, MSc, PGeo
Hydrologist, Water Manager
BC Oil and Gas Commission
Email: Allan.Chapman@bcogc.ca
Tel: 250-419-4435

For further information about Foundry Spatial, contact:

Ben Kerr, PAg
CEO & Senior Water Scientist
Email: ben@foundryspatial.com
Tel: 250-85808593