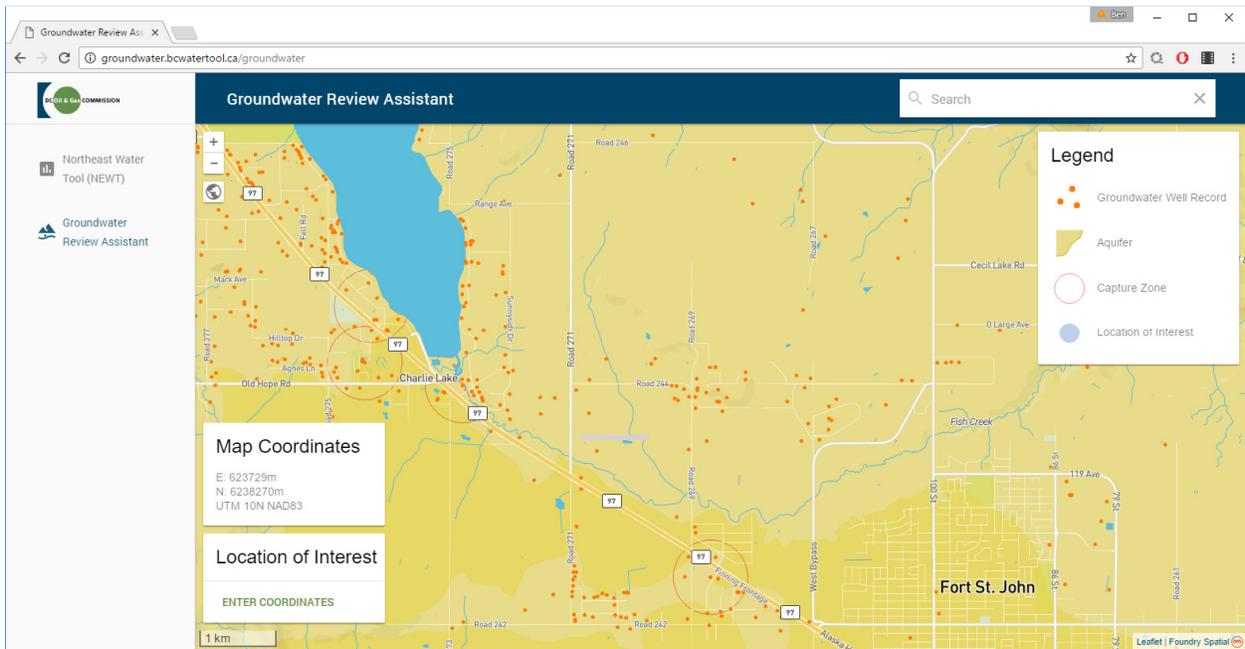


Groundwater Review Assistant (GWRA) User Guide

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1. INTRODUCTION

The Groundwater Review Assistant (GWRA) is a web-based information retrieval tool provided by the BC Oil and Gas Commission (Commission). The GWRA has been developed to assist hydrogeologists and others with the retrieval and compilation of groundwater-related data to support projects or tasks requiring a “desktop” level hydrogeological review or assessment. The GWRA allows a user to specify a location of interest and a search radius to define the area for data retrieval. Based on these specifications, the GWRA retrieves data from public Provincial databases accessed, and presents this information to the user in a comprehensive report.

The contained information retrieved using the GWRA is derived from publicly available data sources. These sources are identified within the generated reports. Questions regarding the content of these data sources should be directed to the original data custodians. Questions regarding the manner in which the information is retrieved and presented by the GWRA, and comments or questions regarding the operation of the GWRA, may be directed to the Commission by email to hydrogeology@bcogc.ca.

2. DISCLAIMER AND LIMITATIONS

The GWRA and Groundwater Data Reports generated by the GWRA access or include specific information retrieved from third party databases. Information other than that provided in the generated reports may be available and/or relevant to the subject location. The generated reports do not provide interpretation of the raw data retrieved, and it is advised that a hydrogeologist or qualified professional be consulted for interpretation of the data. The Commission accepts no responsibility for the accuracy of any information presented in reports or represented on the GWRA interface. All liability for any decision made in whole or in part based on the use of the GWRA or information contained within the generated reports lies with the party making said decision.

3. QUICK START GUIDE

1. **Access the Groundwater Review Assistant** at <https://water.bcogc.ca/groundwater>

2. **Navigate to the general area of interest**

Zoom using the mouse or the buttons on the top left of the map, and pan while engaging mouse button. Use the “Search” box to navigate to a waterbody or community of interest. The “Reset View” button (globe) at top left corner of map resets the view to Northeast B.C.

3. **Specify Location of Interest and search radius**

A Location of Interest (Coordinates: UTM Z10N NAD83) and search radius (km) can be entered as follows:

- Click on the map – a transparent grey Location of Interest marker appears at the centre of a black circle defining a search radius of 2 km.

OR

- Manually enter coordinates and search radius – click on “ENTER COORDINATES” at the bottom left and enter specific UTM Easting and Northing coordinates (UTM 10N NAD83) for a Location of Interest. Enter desired search radius between 0.5 km and 25 km. A transparent grey Location of Interest marker appears at the centre of a black circle that defines the entered search radius.

Note: Once your location of interest is selected, you may modify the search radius by changing that value in the “ENTER COORDINATES” box.

4. **Review available “on the fly” information**

Click on a highlighted aquifer or water well record map marker to view information.

Note: The “CLEAR SELECTION” button must be used to unselect the Location of Interest and any associated selected features.

5. **Generate a Report**

Click on the “Report” button in the Query Results box to generate a PDF report.

Note: For a search in an area of particularly dense data with a large search radius, the total length of the report may reach several hundred pages.

6. **Review Generated Report**

Please confirm your Location of Interest and search radius are in the correct location. Links are embedded throughout the report to provide access to potentially useful additional information and to provide access to database sources.

4. GROUNDWATER REVIEW ASSISTANT USER INFORMATION

4.1 User Interface Overview

The GWRA is available at <https://water.bcogc.ca/groundwater>. When the GWRA is launched, the interface presents a map view of northeastern British Columbia. The mouse wheel and the +/- buttons in the top left of the map can be used to zoom in and out. To pan, engage the mouse and drag the map. A search box in the upper right corner of the map window allows for selecting and zooming to the area of a named waterbody, or community. Map feature layers are visible at pre-set map scales and include: Provincial mapped aquifers, Provincial water well records, mapped capture zones for community water supply wells, surface water bodies (streams, rivers, and lakes), communities, roads, and topographic contours.

To the left of the map interface, links allow the user to toggle between the GWRA and the Northeast Water Tool (NEWT). NEWT allows for the review of surface water hydrology data and water authorization/licence information.

4.2 Specifying a Location of Interest and Search Radius

A Location of Interest can be specified by clicking the mouse directly on the map, or by clicking “**ENTER COORDINATES**” at the bottom left of the interface and manually entering UTM coordinates (UTM Z10N NAD83). The default search radius for data retrieval is 2 km. The default search radius can be modified within the range of 0.5 km to 25 km (to the nearest 0.5 km) by manual entry in the Location of Interest coordinate entry box. Click the “**GO**” button at the bottom of the Location of Interest coordinate entry box after manual entry of coordinates or a search radius.

When a Location of Interest is selected, a transparent grey dot and a larger black circle will appear, identifying the Location of Interest and search radius, respectively. In addition, a grey box will show at the bottom of the map screen displaying the Query Results. The coordinates of the location of interest, the search radius, the resultant area, and the number of Provincial aquifers and water well records within the search radius will be shown.

The “**CLEAR SELECTION**” button within the Query Results box should be used to clear the entered Location of Interest, prior to specifying a new Location of Interest.

4.3 Reviewing “On the fly” information

When a Location of Interest is specified, Provincial mapped aquifers and Provincial water well records located within the search radius will be added to the map as clickable features. Selected mapped aquifers will be displayed in a deeper yellow colour. Selected water well records will be highlighted by blue map markers for individual wells, and blue target circles for ‘clusters’ of wells. Clicking on a water well record cluster symbol produces blue map markers for each well in that cluster.

Aquifers: When a selected aquifer is clicked (by clicking anywhere within the yellow mapped aquifer boundary - inside or outside the search radius), a pop-up window will appear that indicates the aquifer tag number, aquifer classification information, and total number of water well records within the mapped aquifer area.

Note: Water well records which overlap mapped aquifers are not necessarily associated with these aquifers, as they may be separated vertically by various geologic units.

Water well records: Clicking on a blue map marker for a water well record within the search radius provides a pop up window indicating Well Tag Number, ground elevation at the well record location, and reported depth to water, well depth, estimated yield, and bedrock depth. “-” indicates data not available.

Note: Closing of the pop-up windows does not unselect the aquifer or water well records. The “CLEAR SELECTION” button must be used to unselect the Location of Interest and any associated selected features.

4.4 Generating a Report

Click the blue “PDF” action button, within the grey Query Results box, to initiate the generation of a “Groundwater Data Report” for data retrieved within the specified search radius of the Location of Interest. When the “PDF” action button is clicked, a dialog will appear to allow you to customize the report title, and to add up to 500 characters of comments of your choosing regarding the report. Once you have customized your report, click ‘Generate PDF’ to begin processing the report. The report will be downloaded to your computer in approximately 10 seconds.

Note: it is strongly recommended that the user confirm the Location of Interest coordinates and search radius prior to generating a report, which could be inadvertently modified by clicking on the map interface.

4.5 Report contents

Each Groundwater Data Report produced by the GWRA is comprised of a title page, and nine subsequent sections (contents described below). The date, time and page number is displayed at the bottom of each page. All sections are included in each report, even if no features exist within a section – to demonstrate that a search was completed for these features and none were found.

Note: For a search in an area of particularly dense data with a large search radius, the total length of the report may reach several hundred pages.

Title page:

The title page includes the Report Title specified in the generation of the report, information on the Location of Interest, the search radius, and the elevation at your Location of Interest.

The Table of Contents is hot linked to sections within the report, allowing you to click on a heading to quickly skip to the section of interest.

User Notes, if you included them in the dialog within the application, will be displayed beneath the Table of Contents.

Important Report Notes, Disclaimers and Limitations are included at the bottom of the title page.

Location Map:

The location map shows your location of interest, search radius, nearby surface water features, water well records, aquifers, roads and other features.

Aquifers:

The Provincial mapped aquifers are aquifer polygons defined by the Ministry of Environment (MoE). Provincial mapped aquifers which are contained, in part or completely, within the search radius are listed in table format. Aquifers are tabulated in order of increasing aquifer number. Each aquifer number printed in blue text is hot linked to the appropriate MoE Aquifer Report or Aquifer Classification Worksheet for more information.

Attributes from the accessed database(s) included in the Groundwater Data Report table are:

Attribute	Description (Detailed metadata for attributes should be referenced in the noted databases accessed)
Aquifer Number	Unique ID code for the aquifer.
Proximity	Closest point distance from Location of Interest and direction in degrees clockwise from North. Arrow visually represents the direction from the Location of Interest.
Material	Indicates bedrock or unconsolidated sand and gravel for aquifer material.
Productivity	Aquifer productivity determined by the MoE based on the Aquifer Classification System. Represents ability to transmit and yield groundwater and is inferred from any combination of: aquifer transmissivity values, specific capacity of wells, well yields, description of aquifer materials, and sources of recharge (such as rivers or lakes), or a combination. Acceptable values are "Low", "Moderate", "High". Note that aquifer classifications may not have been updated since originally assigned. http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/aquifers/Aq_Classification/Aq_Class.html
Vulnerability	Aquifer productivity determined by the MoE based on the Aquifer Classification System. Vulnerability of an aquifer to contamination indicates the relative intrinsic vulnerability to impacts from human activities at the land surface. Vulnerability is based on: the type, thickness, and extent of geologic materials above the aquifer, depth to water table (or to top of confined aquifer), and type of aquifer materials. Acceptable values are "Low", "Moderate", and "High". Note that aquifer classifications may not have been updated since originally assigned. http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/aquifers/Aq_Classification/Aq_Class.html
Demand	Aquifer productivity determined by the MoE based on the Aquifer Classification System. Describes the level of groundwater use and represents the level of reliance on the resource for supply at the time of mapping. Demand may be "Low", "Moderate", or "High". Note that aquifer classifications may not have been updated since originally assigned. http://www.env.gov.bc.ca/wsd/plan_protect_sustain/groundwater/aquifers/Aq_Classification/Aq_Class.html
Registered Water Wells in Aquifer	Indicates the total number of Provincial water well records within the aquifer area. Note while these wells overlap the mapped extent of the aquifer at the ground surface, this number may not accurately represent the number of wells completed within the aquifer as some wells may not intersect the aquifer vertically.

B.C. Water Well Records:

Water well records located within the search radius of the Location of Interest are retrieved from the B.C. WELLS database. Water well records are tabulated in order of increasing Well Tag Number. Well Tag numbers printed in blue text are hot linked directly to the detailed well record in the Provincial WELLS database. Additional links provided with this report section include: a link to the B.C. WELLS Database, a link to the Commission Water Portal which may be used to search for groundwater chemistry data, and a link to the Provincial Observation Well Network. Water well records for Water Supply System Wells and Provincial Observation Wells are identified by “*” and “**” respectively.

Attributes from the accessed database(s) included in the groundwater data report table are:

Attribute	Description (Detailed metadata for attributes should be referenced in the noted databases accessed)
Well Tag	Unique number of the groundwater well as assigned by the Province of B.C.
Location and Elevation	Surface coordinates (Easting and Northing, UTM Z10N NAD83), and estimated ground surface elevation (metres above sea level) extracted from SRTM Digital Elevation model.
Proximity	Distance from Location of Interest and direction in degrees clockwise from North. Arrow visually represents the direction from the Location of Interest.
Depth (m bgs)	Provides Well Depth (finished well depth), Bedrock Depth (the depth at which bedrock starts), and Water Depth (how far down the well before water reached) in metres below ground surface as indicated on the water well record. “-” = no data available.
Yield (L/min)	Driller estimated yield reported on water well record. “-” = no data available.
Lithology	Provides available descriptions of materials (unconsolidated and bedrock) encountered with depth intervals as entered on water well records. This data is supplied voluntarily by the public and no formal standard for completeness or accuracy is in place.

Water Well Capture Zones:

Capture zones have been delineated as polygons for some drinking water supply system wells in Northeast B.C. Capture zones delineated within the search radius are listed in table format by order of Well Tag number and time of travel. The Well Tag number for the water well record associated with the capture zone, if printed in blue text is linked to the Water well record in the WELLS database. If the capture zone has a capture zone worksheet, a blue text link (‘Capture Zone worksheet’) is provided in the ‘Report’ column of the table and the capture zone worksheet can be accessed directly via this link.

Attributes from the accessed database(s) included in the groundwater data report table are:

Attribute	Description (Detailed metadata for attributes should be referenced in the noted databases accessed)
Well Tag	Unique number of the groundwater well as assigned by the Province of B.C., associated with the capture zone.
Proximity	Closest point distance from Location of Interest and direction in degrees clockwise from North. Arrow visually represents the direction from the Location of Interest. "Within" indicates the Location of Interest is within the capture zone polygon.
Time of Travel	Indicated in years if a time of travel is specified for the mapped capture zone. Note that one well tag number may have multiple capture zones mapped with different "time of travel". Capture zones delineated using the "Arbitrary Fixed Radius" method do not have an associated time of travel.
Methodology	Capture zone delineation methodology is noted: Arbitrary Fixed Radius, Calculated Fixed Radius, Analytical Solution, or Numerical Modelling.
Report	Provides a link to the capture zone worksheet if available.

Oil and Gas Activities Act Wells:

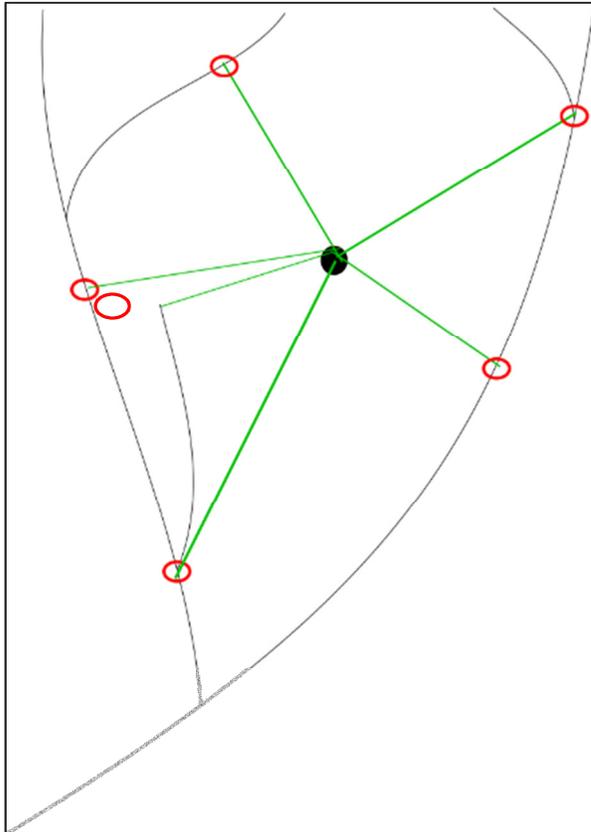
Wells permitted under the [Oil and Gas Activities Act](#) (OGAA) are listed in table format in order of increasing well authorization number. These wells may include OGAA water source wells. A "water source well" is defined in the B.C. [Petroleum and Natural Gas Act](#) as, "a hole in the ground drilled to obtain water for the purpose of injecting water into an underground formation in connection with the production of petroleum and natural gas". Additional information regarding water use from water source wells can be obtained from the Commission Water Reports (<https://www.bcogc.ca/public-zone/water-information>).

Attributes from the accessed database(s) included in the groundwater data report table are:

Attribute	Description (Detailed metadata for attributes should be referenced in the noted databases accessed)
Well Authorization	Commission Well Authorization Number
Location and Elevation	Surface coordinates (Easting and Northing, UTM Z10N NAD83), and estimated ground surface elevation (metres above sea level) extracted from SRTM Digital Elevation model.
Proximity	Distance from Location of Interest and direction in degrees clockwise from North. Arrow visually represents the direction from the Location of Interest.
Well Authorization Grant Date	Date that the well authorization was granted by the Commission.
Status	Current well status = Well Activity, Fluid Type, and Operation Type "Active Water Source" indicates Well Activity = Active, Fluid Type = Water, and Operation Type = Source.
Status Effective Date	The effective date of the current well status.

Surface Water:

The Freshwater Atlas (FWA) is a standardized dataset for mapping B.C.'s hydrologic features. A 'spider' algorithm creates radiuses at each degree bearing around the Location of Interest, to a distance of 10 km. The first stream or lake encountered by each radius is identified, and the bearing and distance is tabulated. Where multiple radiuses encounter the same stream segment or lake, the shortest distance is selected for that stream segment or lake and is shown in the table within the report. In some cases, the same stream may appear multiple times within the table, due to the manner in which streams are segmented within the FWA.



Schematic of spider algorithm

The report table is ordered by increasing distance (proximity). The row containing information for the highest order (largest) stream that is nearest to the location of interest is highlighted in green.

On the first page of the surface water section, clicking on the blue text 'Generate a NEWT report for your Location of Interest', will take you to the Northeast Water Tool application. NEWT can be used to generate a surface water focused supply and demand report at your location of interest. Location of Interest coordinates should be transferred to the NEWT application automatically, or can be entered manually.

Attributes from the accessed database(s) included in table are:

Attribute	Description (Detailed metadata for attributes should be referenced in the noted databases accessed)
Name	Name of surface water body, if named.
Location and Elevation	Closest point surface coordinates (Easting and Northing, UTM Z10N NAD83), and estimated ground surface elevation (metres above sea level) extracted from SRTM Digital Elevation model.
Proximity	Closest point distance from Location of Interest and direction in degrees clockwise from North. Arrow visually represents the direction from the Location of Interest.
Stream Order	Freshwater Atlas assigned, Strahler stream order for the stream segment intersected at the closest point location coordinates indicated.
Water Feature Type	Stream or Lake as indicated in the Freshwater Atlas.

Water Authorizations:

The final three sections of the groundwater report list water authorizations located within the search radius. Water Authorizations are reported on separate pages and tables for Licences, Active Applications, and Short Term Use Approvals. A map showing the search area and locations of water authorizations within is provided on the first page of the Water Authorizations section.

Attributes from the accessed database(s) included in the groundwater data report tables are:

Water Authorizations – Licences and Active Applications

Attribute	Description (Detailed metadata for attributes should be referenced in the noted databases accessed)
Licensee	Name of licensee.
Location	Closest point surface coordinates (Easting and Northing, UTM Z10N NAD83).
Number	Provincial water licence number, and file number.
Proximity	Closest point distance from Location of Interest and direction in degrees clockwise from North. Arrow visually represents the direction from the Location of Interest.
POD	Unique number identifying the point of diversion. Multiple points of diversion may exist with individual licences.
Priority Date	The date of priority for the water right under ‘first in time, first in right’.
Expiry Date	If applicable, the date which the licence rights expire.
Quantity (m ³ /year)	Annual approved volume for the licence.
Flag	Codes identifying unique conditions for the licence. Code acronyms are explained in a table at the bottom of the page, and include D: Multiple PODs for PUC/qty at each are known/PODs on different sources, M: Max licenced demand for purpose/multiple PODs/qty at each POD unknown, P: Multiple PODs for PUC/qty at each are known/PODs on same source, T: Total demand one POD.

Water Authorizations – Short Term Use Approvals

Attribute	Description (Detailed metadata for attributes should be referenced in the noted databases accessed)
Authorization Holder	Name of authorization holder.
Number	Provincial short term use approval number.
Location	Closest point surface coordinates (Easting and Northing, UTM Z10N NAD83).
Proximity	Closest point distance from Location of Interest and direction in degrees clockwise from North. Arrow visually represents the direction from the Location of Interest.
POD	Unique identifier for the point of diversion.
Start Date	Date which the approval became active.
End Date	Date which the approval terminates.
Approved Volume (m ³)	Total volume for the term of the approval.