

Information Services Activities, April 2020 to March 2021

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The Information Services group is responsible for developing and maintaining the Geoscience and Mines Branch (GMB) Geographic Information System and associated databases, the NovaScan publications and maps database, for supplying digital data and services to clients and staff, and for developing and maintaining the GMB Internet website. Permanent Information Services staff consists of Jeff Poole (supervisor), Jeff McKinnon (geologist/GIS specialist), Angie Barras (GIS specialist/ cartographer), Courtney MacMullen (geologist/GIS specialist), Sonya Cowper (GIS and map server specialist), and Eugene MacDonald (geologist/information and collection management specialist). Diane Webber is the manager for the group.

In 2020, the impact of the Covid-19 pandemic affected several business areas, including GIS support staff and project work. With the uncertainty of start dates and changing protocols around fieldwork, for example, time spent capturing and compiling legacy data, or designing new applications for field projects was disrupted. These disruptions trickled down to all our projects this year.

Digital Geoscience Data Products

A collection of digital geology maps, databases, and images of Nova Scotia (in Esri shapefiles, ArcGIS file geodatabase, KML/KMZ, DXF, ARC export, TIFF, JPEG, and MrSID formats in a UTM projection using the NAD83 datum, and in PDF format) has been developed, and is available for viewing or free download from the GMB website (<https://novascotia.ca/natr/meb/download/gis-data.asp>). ArcGIS file geodatabase and Esri shapefiles are now our main data distribution formats. We are no longer producing the ARC E00 export and DXF formats. The branch has now adopted the Nova Scotia Open Government Licence (<https://novascotia.ca/opendata/>

[licence.asp](#)) for all of its digital datasets. All new products will include a link to the Nova Scotia Open Government Licence. Legacy products will be updated to this new licence as time allows. Several of our datasets are also available through the Nova Scotia Government's Open Data Portal (<https://data.novascotia.ca/>).

GIS Development

Information Services GIS staff worked together with other GMB staff on numerous projects in 2020-2021. This included providing advice and assistance as requested, along with developing databases and maps for the projects outlined below.

Cobequid Highlands Project: This year Information Services staff worked with geologist Chris White on the compilation of data in the Cobequid Highlands area from Mount Thom to Cape Chignecto.

Eastern Shore Project: The GIS staff supported Chris White's work along the eastern shore of Halifax and Guysborough counties by assisting with the compilation of legacy geological and geochemical data, and by creating 1:10 000 scale field maps of shaded relief lidar imagery in the area.

Valley Aggregate Project: The Valley Aggregate dataset contains more than 9,000 aggregate site observations that are linked to 9,340 photos, 972 sample analyses, site descriptions, and an additional layer that shows the bedrock aggregate potential for Hants, Kings, Annapolis, and Digby counties. These data, along with the publication of an online interactive map application for stone resource potential in western Nova Scotia, will likely be released in the next fiscal year. The application will provide valuable information to the stone resource industry, public works agencies, and others looking for sources of materials to make stone-based products.

Mine Tailings Project: GIS staff worked with Ernie Hennick to release a Nova Scotia Mine Tailings Database in the summer of 2020 (Digital Product ME 533: <https://novascotia.ca/natr/meb/download/dp533.asp>).

GIS Support to Field Staff: GIS staff continued to provide support for field operations throughout the year. The group worked to compile data and provide general GIS support and advice as required. This support ranged from creating and printing field maps, to acquiring and/or processing digital data for staff. These data generally included vector topographical maps, satellite imagery, digital orthophotos, and lidar.

Many georeferenced PDF's were created for field staff and used in applications like Avenza on mobile phones or tablets. The GIS group has also begun producing mobile map packages (MMPK) used with Esri applications like Field Maps for ArcGIS, or Explorer for ArcGIS. The mobile map packages are more interactive than PDF maps, allowing a user to turn on/off layers, select features on a map to see attributes, and maintain a spatial reference map.

Many staff continue to use spreadsheets and paper maps in the field and we support them to GIS enable their data. The GIS group encourages and helps staff transition to digital field data collection using mobile applications such as Collector and Survey123 for ArcGIS, and a new product called Field Maps for ArcGIS. By building customized field data collection applications for staff and their specific project needs, we can better integrate field data into our corporate GIS. Making a transition from collection techniques and technology poses its own challenges, which often comes down to a common denominator of: "What works best and what is easy to use?".

Provincial Bedrock Geology Map: GIS staff continue to work on creating a new provincial bedrock geology map. This project is intended to update our current provincial bedrock map and corresponding databases, which were published in 2000. The goal is to compile and integrate the best and most up-to-date bedrock geological mapping for Nova Scotia, and thus create a single, seamless digital dataset. This involves compiling recent mapping projects as well as legacy data from a variety of sources. Bedrock units and linework have been merged for a large part of the province. The remaining areas are intended to be fully

integrated within the coming year (Fig. 1). Staff are also working with colleagues in the New Brunswick Geological Survey and the Atlantic Geoscience Society to produce a new geological highway map for the region in 2022.

Process Improvement: Staff continued work on the Workflow Process Improvement Project. The purpose of this project was to review and improve our current process of collecting, creating, and compiling data, which are ultimately published. The goal is to make the current process faster and more efficient, while ensuring the quality and format of published products are current and useful to our clients. GIS staff continued to work on fulfilling the recommendations outlined in the summary report *GIS Products Process Improvement*. Many of the short-term goals, outlined in the report, have been completed. The summary report states that baseline data collection be initiated once all short-term recommendations are implemented. This field season, the new workflow process will be implemented on a select number of field projects. Staff will monitor these projects closely, which will allow them to measure success of the new processes put in place.

Groundwater Projects: Section staff worked with Gavin Kennedy throughout the year with the publication of groundwater chemistry maps, water well risk applications, and updates to layers in the Groundwater Atlas, summarized in subsequent sections of this report.

Geothermal Project: As part of a collaborative project with the Nova Scotia Department of Agriculture (NSDA) and the Nova Scotia Department of Energy and Mines (NSDEM), the Offshore Energy Research Association of Nova Scotia (OERA) selected the team of INRS and Enki GeoSolutions to provide an assessment of the geothermal resources in onshore Nova Scotia. The resulting dataset and online interactive map application will be released in the next fiscal year and will include data for: corrected subsurface temperature gradient, abandoned mines heating and cooling capacity, geothermal potential for electricity generation and direct use of heat, sedimentary basin outlines, and surface temperatures.

Registry of Mineral and Petroleum Titles Database/NovaROC: Staff made updates to several geospatial layers that will be incorporated



Figure 1. This map shows the progress to date of the provincial bedrock geology map project. The white space along the Eastern Shore and the Cobequid Highlands shows areas where the geology has not been integrated into the map, but the work is in progress.

into the next update of the NovaROC application. Staff also worked with registry staff to maintain the GIS digital product (Digital Product ME 493) *Nova Scotia Mineral Rights Database (NovaROC)*. The product is normally updated daily and released at 2:00 AM. (<https://novascotia.ca/natr/meb/download/dp493.asp>).

GeoNova and Government IT Initiatives:

Geoscience and Mines Branch GIS staff were involved in discussions with GeoNova on GIS metadata initiatives and ArcGIS Portal, the latest map server technology for delivering maps, data, and applications to clients and the public on the Internet. GIS staff have also been involved with the Nova Scotia Government's Open Data Portal (<https://data.novascotia.ca/>). GIS staff are also part of the Information and Data Management (IDM) working group of the National Geological Surveys Committee to develop recommendations to facilitate information and data dissemination

between the surveys as part of a Pan-Canadian Geoscience Strategy.

Internet Applications

The section continues to create and maintain several Internet applications including web map applications and Esri Story Maps. Section staff were also busy implementing ArcGIS for Enterprise and Portal for ArcGIS.

The section currently maintains the following web map applications:

Geoscience Atlas (data updated this year) (Fig. 2) -<https://fletcher.novascotia.ca/DNRViewer/?viewer=Geoscience>

Groundwater Atlas (data updated this year) (Fig. 3) -<https://fletcher.novascotia.ca/DNRViewer/?viewer=Groundwater>

- Mineral Resource Land Use Atlas** - <https://fletcher.novascotia.ca/DNRViewer/?viewer=MRLU>)
- 4) **Potential for Radon in Indoor Air** - <https://fletcher.novascotia.ca/DNRViewer/?viewer=Radon>
 - 5) **Bedrock Acid Rock Drainage Potential for Southwestern Nova Scotia** - <https://fletcher.novascotia.ca/DNRViewer/?viewer=ARD>
 - 6) **Southwest Nova Bedrock Map** - <https://fletcher.novascotia.ca/DNRViewer/?viewer=SouthWestNova>
 - 7) **Arsenic Risk in Bedrock Water Wells** - https://fletcher.novascotia.ca/DNRViewer/?viewer=As_Risk_Wells
 - 8) **The Potential Impact of Drought to Private Wells** (data updated this year) (Fig.4) - <https://fletcher.novascotia.ca/DNRViewer/?viewer=DroughtIndex>
 - 9) **Nova Scotia Real-Time Shallow Aquifer Monitoring Network** - https://fletcher.novascotia.ca/DNRViewer/index.html?viewer=Aquifer_Monitoring.Aquifer_Monitoring
 - 10) **Karst Risk Map** - <https://fletcher.novascotia.ca/DNRViewer/?viewer=Karst>
 - 11) **Uranium Risk in Bedrock Water Wells** - https://fletcher.novascotia.ca/DNRViewer/index.html?viewer=Uranium_Risk
 - 12) **Relative Risk of Corrosive Groundwater in Drilled Water Wells** - https://fletcher.novascotia.ca/DNRViewer/index.html?viewer=Drilled_Corrosive_Groundwater_NS.Relative_Corrosivity_of_Groundwater_in_Drilled_Water_Wells

The GIS group also maintains three Esri Story Maps:

- Nova Scotia's Geoheritage: A Billion Years in the Making** (https://fletcher.novascotia.ca/geoheritage_ns_tour/index.html)

- 2) **Cliffs of Fundy Aspiring Geopark** (<https://storymaps.arcgis.com/stories/4fe5ddb9093a46eb920df5234773e8fd>)
- 3) **From Earth and Rock: A Guide to the Stone Resource in the Annapolis Valley - Acadian Shore Region in Nova Scotia** (<http://nsdnr.maps.arcgis.com/apps/MapJournal/index.html?appid=6ef51825248841d682e6842dfc5e13c1>)

GIS staff continued implementing ArcGIS Enterprise and Portal for ArcGIS this year (<https://dawson.novascotia.ca/portal/>). ArcGIS Enterprise is the foundational software system for the GMB GIS, powering mapping and visualization, analytics, and data management. It is also the backbone for all GMB custom applications.

All the applications are built using Geocortex and have a common look and feel. These applications all use HTML5, which makes them compatible with most browsers on many devices such as PCs, laptops, tablets, and handhelds. To keep current and use the latest technology, Geocortex was upgraded to 4.10 and the HTML5 Viewer to 4.12.

Descriptions of Web Map Applications

The *Geoscience Atlas* application (Fig. 2) provides the public with a single geographic compilation of geoscience maps, databases, and images. The application displays a number of different layers from previously released digital products. Mineral occurrences, drillholes, and abandoned mine openings are present, along with the provincial bedrock geology map and shaded relief imagery. Mineral rights information is available in the application through a connection to NovaROC and is up-to-the-minute in its currency. We also added private property and Crown land layers to the application in 2016. Layers were updated as required and included the Abandoned Mine Openings layer in the spring of 2020. The URL link to the *Geoscience Atlas* application is <https://fletcher.novascotia.ca/DNRViewer/?viewer=Geoscience>.

The purpose of the *Groundwater Atlas* application (Fig. 3) is to provide the public with an interactive

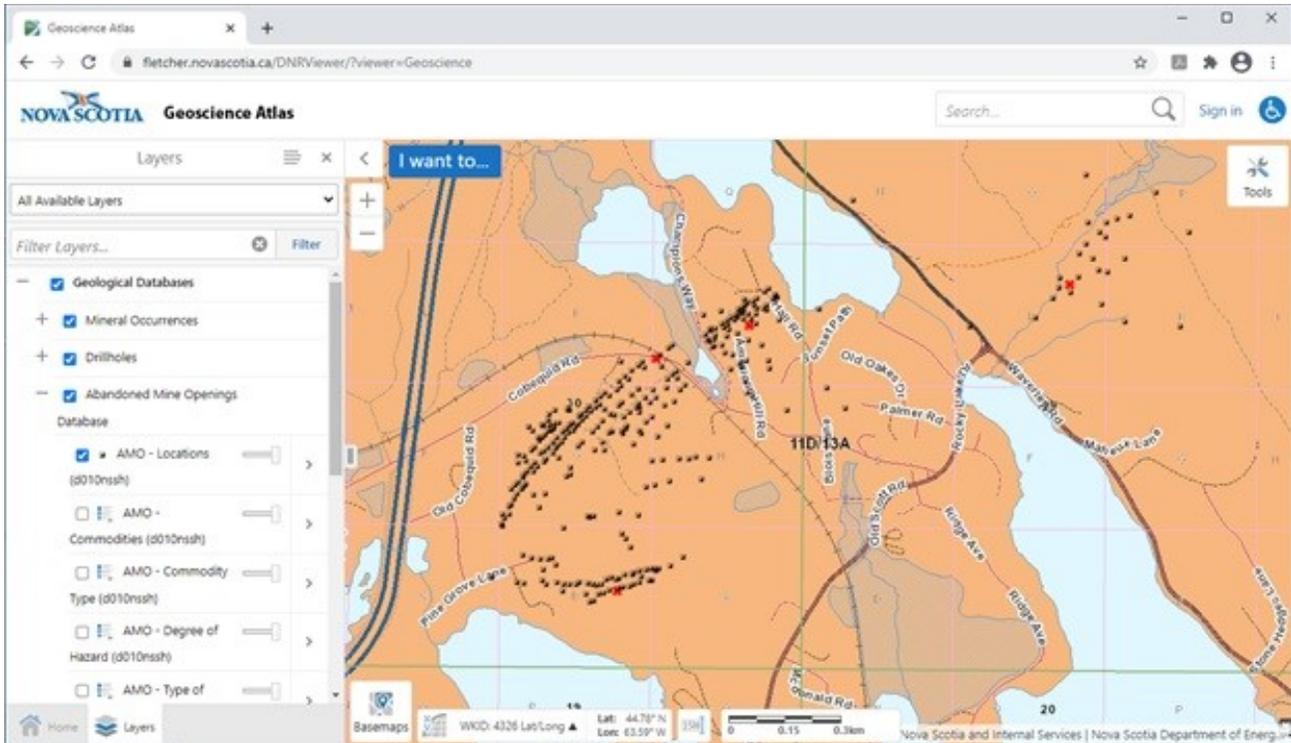


Figure 2. An example of the *Geoscience Atlas* application showing the Abandoned Mine Openings database that was updated this year.

map application containing layers of spatially referenced maps, databases, grids, and images of interest to hydrogeologists, particularly those interested in the hydrogeological properties associated with the identified groundwater regions. Private property and wetlands layers were added to the application in 2016. There were updates to a number of layers in this application in the spring of 2020. The month and year are indicated at the end of many layer names to indicate their currency. The URL link to the Groundwater Atlas application is <https://fletcher.novascotia.ca/DNRViewer/?viewer=Groundwater>.

The main purpose of the *Mineral Resource Land-Use Atlas* (MRLU) interactive map application is to provide the public with a single geographic compilation of mineral resource and related land-use information at a reasonably detailed scale of 1:50 000. A key objective is to create a useful reference for practitioners working in land-use and environmental planning, geotechnical firms, and groups involved in community economic development. The MRLU displays the location and distribution of mineral and energy resources, activities related to these resources, and aspects of environmental geology that relate to land-use and

environmental planning. Special land-use designations on Crown and some privately owned land are shown to indicate how Nova Scotia's land-base varies regarding the ability of mineral resource interests to access land and hold secure tenure. A major update of several protected land layers was made in the fall of 2016. The URL link to the Mineral Resource Land-Use Atlas application is <https://fletcher.novascotia.ca/DNRViewer/?viewer=MRLU>.

The *Potential for Radon in Indoor Air* application was developed to show areas in the province where people are more likely to be exposed to hazardous radon in indoor air. This application has an address and postal code search capability to help users find their home on the map. It provides a simple high-, medium-, and low-risk ranking scheme but emphasizes that the only way to know for sure how much radon is in your home is to test for it no matter where you live. The URL link is <https://fletcher.novascotia.ca/DNRViewer/?viewer=Radon>.

The Acid Rock Drainage Risk for Southwest Nova Scotia application shows the potential of bedrock to

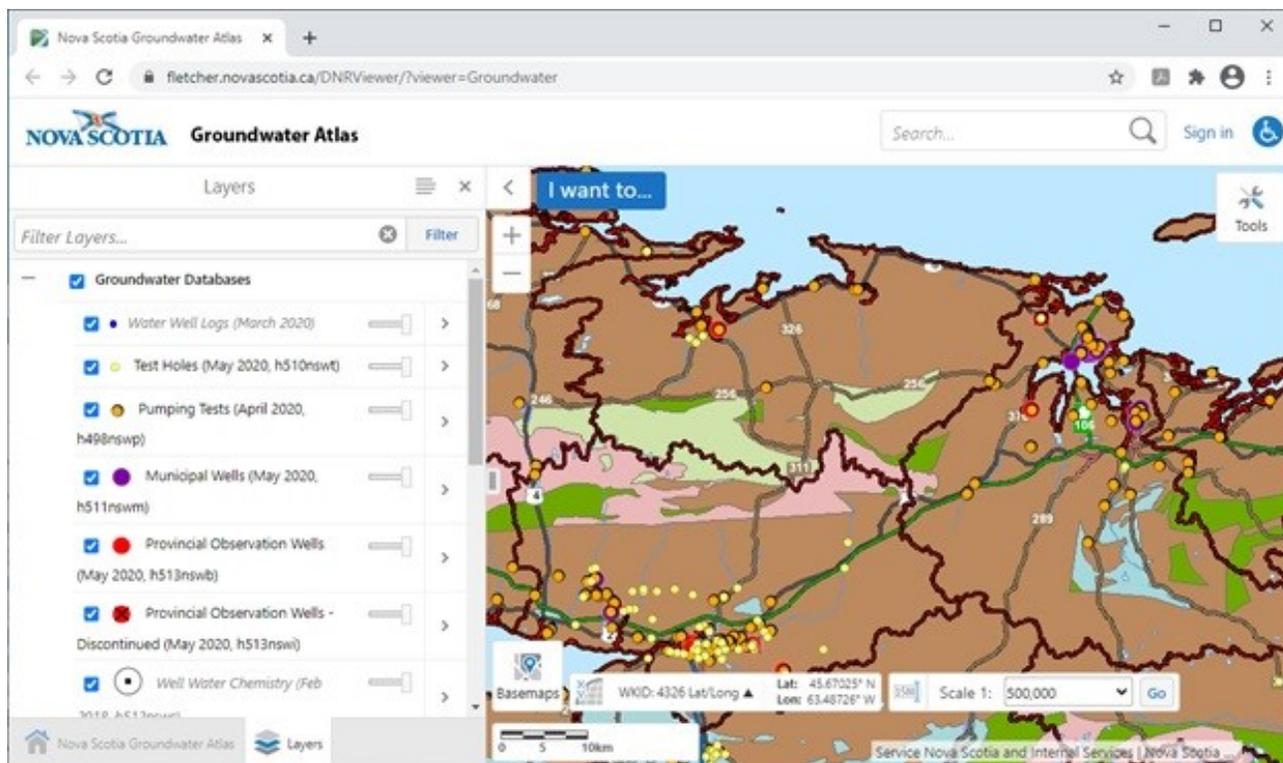


Figure 3. An example of the *Groundwater Atlas* showing a number of layers that were updated this year.

generate acid rock drainage (ARD) if it is physically disturbed or exposed. This map uses a simple high, moderate, and low ranking scheme to inform landowners and planners about the hazards of ARD if they plan to excavate to bedrock in a given area. The URL link is <https://fletcher.novascotia.ca/DNRViewer/?viewer=ARD>

The Southwest Nova Bedrock application is an interactive map showing the compilation of geological data in southwestern Nova Scotia by Chris White. It shows many map layers including bedrock geological units, geological contacts, age dates, anticlines/synclines, drillholes, dykes, faults, fossils, bedrock geological units, geological contacts, gold districts, mines, mineral occurrences, outcrops, quarries, shafts, stockworks, structural data, and shear zones. The URL link is <https://fletcher.novascotia.ca/DNRViewer/?viewer=SouthWestNova>.

The *Arsenic Risk in Bedrock Water Wells* application was developed to show areas of Nova Scotia where there is a relative high, medium, or low risk of arsenic in bedrock water wells. It is emphasized that testing your well is the only way to find out whether arsenic is a concern in your well no matter where you live. The URL link is

https://fletcher.novascotia.ca/DNRViewer/?viewer=As_Risk_Wells.

The *Potential Impact of Drought to Private Wells* application (Fig. 4) was developed to show areas of Nova Scotia where private-well owners are more likely to experience water shortages (especially owners of shallow wells) if drought conditions develop in the summer and fall of a given year. The application presents a new map every month in the summer and early fall of 2020 and currently maintains an archive of past maps for the summer and fall of 2016, 2017, 2018, and 2019. The URL link is <https://fletcher.novascotia.ca/DNRViewer/?viewer=DroughtIndex>

The *Karst Risk Map* application was developed late last year to show areas of Nova Scotia where there is a relative high, medium, or low risk of encountering karst and naturally occurring sinkholes caused by soluble bedrock.

The *Uranium Risk in Bedrock Water Wells* application was developed this year to show areas of Nova Scotia where there is a relative high, medium or low risk of uranium in bedrock water wells. Testing your well is the only way to find out whether uranium is a concern in your well so it is

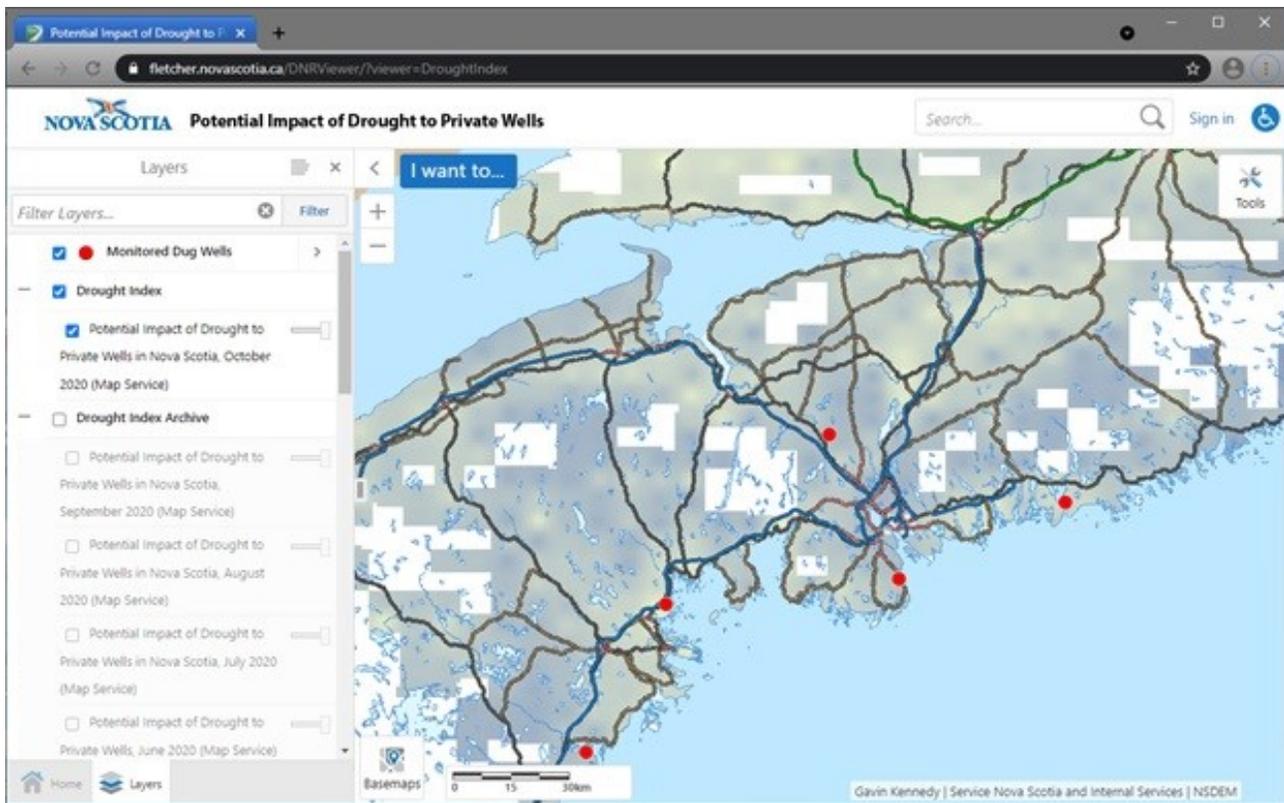


Figure 4. An example of the *Potential Impact of Drought to Private Wells* application showing the map from October 2020.

important to test your water no matter where you live. The URL link is https://fletcher.novascotia.ca/DNRViewer/index.html?viewer=Uranium_Risk

The *Relative Risk of Corrosive Groundwater in Drilled Water Wells* application was developed this year to show areas of Nova Scotia where there is a relative high, medium or low risk of drilled wells. (constructed in either bedrock or surficial aquifers) of having corrosive groundwater. Testing your well is the only way to find out whether lead is a concern in your well so it is important to test your water no matter where you live. The URL link is https://fletcher.novascotia.ca/DNRViewer/index.html?viewer=Drilled_Corrosive_Groundwater_NS.Relative_Corrosivity_of_Groundwater_in_Drilled_Water_Wells.

NovaScan

NovaScan is the geoscience publications and maps database on Nova Scotia and its offshore regions. As of April 1, 2021, the database contained 18,150 records, consisting of 9,035 mineral exploration

assessment and property reports, 4091 publications, 1,471 open file reports, 2,134 maps and illustrations, 867 theses, 283 contribution series, 220 digital products, and 41 outside publications.

In order to provide better service to our staff and clients, the branch maintains a public search application that allows the public to query records in the NovaScan database using an Internet browser. NovaScan can be searched by title, author/organization, subject, area, map sheet (NTS), map type, licence type, licence number, document type, document number, year, and map scale. NovaScan is updated monthly as new mineral exploration assessment reports, geoscience maps, publications, open files and theses become available. The search interface can be accessed at <https://gesner.novascotia.ca/novascan/DocumentQuery.faces>.

Products Released in 2020-2021

The following digital products and maps were released in 2020-2021. All digital products and

maps can be downloaded for free from the URL listed with the product.

Digital Products

Digital Product ME 010, Version 8, 2020. Nova Scotia Abandoned Mine Openings Database. by E.W. Hennick and J.C. Poole. Available in SHP, GDB, KML and XLS formats from the Geoscience and Mines Branch web site: <https://novascotia.ca/natr/meb/download/dp010.asp>.

Digital Product ME 430, Version 4, 2020. Enhanced Georeferenced Version of the Nova Scotia Department of Environment's Nova Scotia Well Logs Database. by G.W. Kennedy and B.E. Fisher. Available in SHP, GDB and KML formats from the Geoscience and Mines Branch web site: <https://novascotia.ca/natr/meb/download/dp430.asp>.

Digital Product ME 443, Digital geological data generated as part of geological mapping of the central Annapolis Valley area, Nova Scotia. by C.E. White, J.C. Poole, A.L. Barras and J.S. McKinnon. Available in SHP and GDB formats from the Geoscience and Mines Branch web site: <https://novascotia.ca/natr/meb/download/dp443.asp>.

Digital Product ME 120, 2020. Nova Scotia Coal Seams and Underground Mine Workings. by

E.W. Hennick and J.C. Poole. Available in SHP and GDB formats from the Geoscience and Mines Branch web site: <https://novascotia.ca/natr/meb/download/dp120.asp>.

Digital Product ME 498, 2020. Nova Scotia Pumping Test Database, by G.W. Kennedy. Available in SHP, GDB and KML formats from the Geoscience and Mines Branch web site: <https://novascotia.ca/natr/meb/download/dp498.asp>.

Digital Product ME 533, 2020. Nova Scotia Mine Tailings Database. by E.W. Hennick and J.C. Poole. Available in SHP, GDB and KML formats from the Geoscience and Mines Branch web site: <https://novascotia.ca/natr/meb/download/dp533.asp>.

Open File Maps

Open File Map ME 2020-001. Uranium in Groundwater from Bedrock Aquifers in Nova Scotia, by G.W. Kennedy, scale 1:500 000. Available as a free PDF download from the Geoscience and Mines Branch website: https://novascotia.ca/natr/meb/download/mg/ofm/html/ofm_2020-001.asp.