











Environmental Impact Assessment Registration

Groundwater Exploration Program 345 Route 280 Eel River Crossing Dundee, New Brunswick

Boissonnault McGraw



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Appendix A Water Supply Source Assessment – Initial Application, Village of Eel River Crossing

Dundee, NB



1. The Proponent

1.1 Name of the Proponent

Village of Eel River Crossing Dundee

1.2 Address of Proponent

20 Rue Savoie Eel River Crossing Dundee, NB E8E 1T8

1.3 Chief Executive Officer

Kim Bujold General Manager Eel River Crossing Dundee Tel.: 506-826-6080

Tel.: 506-826-6080 kb@ercvillage.com

1.4 Principal Contact Person for Purposes of Environmental Impact Assessment

Erika Graves, P.Eng. GHD Limited 466 Hodgson Road Fredericton, NB E3C 2G5

Tel: 506-458-1248 Fax: 506-462-7646 erika.graves@ghd.com

1.5 Property Ownership

The proposed drilling target area is located on property identification (PID) #50138411, owned by

2. The Undertaking

2.1 Introduction

This document is for work related for the completion of a Water Supply Source Assessment (WSSA) the development of a new groundwater source to supplement/replace the existing surface water supplied infiltration gallery for the Village of Eel River Crossing Dundee, New Brunswick (NB).



A copy of the WSSA application is included as Appendix A and the study area is identified on Figure 1.

2.2 Name of the Undertaking

WSSA for the development of a supplemental/replacement groundwater source for the Village of Eel River Crossing Dundee, NB.

2.3 Project Overview

The Village of Eel River Crossing installed a municipal water supply system in 1976. The water supply consists of an infiltration gallery located on the Eel River near Shannonvale, approximately 1.1 kilometres (km) west of Eel River Crossing (Figure 2). The infiltration gallery includes a fine gelinite pipes installed under the bed of the river to collect filtered river water, which flows into a wet well and then to a pump house adjacent to the river.

The Village's water consumption is metered at the pump house located near the water infiltration gallery along Eel River. A total of 720 properties are supplied by the current water system. The location of the water distribution system is identified on Figure 1 in Appendix A.

The Eel River watershed is a Designated Watershed Protected Area and is located in the Dalhousie and Balmoral Parishes adjacent to the Village of Eel River Crossing Dundee. The predominant land use in the watershed is forest with some agricultural land use along Route 270. Other land users within the watershed include gravel pits and an asphalt plant located in the community of Dundee. According to the Village information and based on the Canadian Drinking Water Quality Guidelines (CDWQG), on occasion, during the spring run-off or heavy rain events, the turbidity and colour levels are excessive in the current water supply. During these events, the Village must increase the chlorine dosage in the water system in order to maintain a chlorine free residual in the distribution system.

Levels of total trihalomethanes (THM) have also been reported throughout the Village's water distribution system during high turbidity events, indicating the relationship between turbidity and organic matter. As indicated by a Boissonnault McGraw representative, the latest upgrades to the existing infiltration gallery included the installation of an ultraviolet (UV) treatment system.

This letter is an application to initiate a water supply source assessment project for Boissonnault McGraw, on behalf of the Village of Eel River Crossing Dundee, as defined in the "Water Supply Source Assessment Guidelines" document dated April 2017.

2.4 Purpose/Rational/Need for the Undertaking

The purpose of the proposed groundwater exploration programs is to locate a municipal groundwater supply to supplement/replace the existing supply for the Village. The proponent would like to undertake the proposed testing as soon as possible following approval of the undertaking, after the spring recharge (June 2019).

The project fieldwork details are presented in Item 5 of the attached WSSA application. In summary, one 150 millimetre (mm) diameter well will be constructed and preliminary testing completed. The



well steel casing will be constructed to a minimum of 6 metres below ground surface (mbgs) (the amount of casing will depend on the stratigraphy intersected). If a promising aquifer is located (based on preliminary yield estimates from airlift during construction and stratigraphy intersected), a 200 mm test well and a second monitoring well will be constructed. The wells will be logged by an experienced GHD professional and the drilling contractor will be a licensed well driller.

Following well construction, a step test will be completed on the 200 mm test well to determine the appropriate pumping rate for the constant rate pump test. Following the step tests, a 72-hour pump test will be completed to evaluate the aquifer parameters and yield. Water levels will be measured in the test well and the two monitoring wells during the pump test. Water samples will be collected at 24-hour interval during the test for chemical analysis.

A detailed report on the hydrogeological investigation will be submitted to the New Brunswick Department of Environment and Local Government (NBDELG) office upon completion of the testing program. The report will meet the requirements outlined in NBDELG's Water Supply Source Assessment Guidelines, and will include well logs, pump test information, chemistry data, grain size analysis and yield estimate.

2.5 Project Location

The potential drill target is located on property PID #50138411, located to the north of the Eel River near Dundee, approximately 2.5 km southwest of the current infiltration gallery (Figure 2). The coordinates for the target area are 47° 59' 45.47" north, 66° 28' 52.18" west.

2.6 Sitting Considerations

This location was identified in a hydrogeological report from TAP (2005) as a potential target area as it is believed to be located on the southern extent of a sand and gravel deposit. The land use in the area is vacant/wooded and there are no other wells within 500 metres (m) of the proposed target area.

2.7 Physical Components of the Project

The drill target is located approximately 40 m to the north of the Eel River, approximately 2.5 km southwest of the current infiltration gallery. The location of the existing infiltration gallery is identified on Figure 2.

The undertaking pertains to the construction and testing of wells in the study area (one test well and two monitoring wells). Once the wells have been developed, additional information pertaining to related infrastructure requirements (pipeline connections, pump house construction, etc.) will be provided to your department prior to undertaking the work. The municipality has only one pressure zone established by the reservoir water elevation, thus any new source could be connected to the existing municipal system without adding a reservoir.

The drill target site will require grading to allow access for a rotary drill rig and service vehicle. Some temporary storage of materials may be required on-site during the construction activities, but minimal storage will be required during the drilling and testing activities.



2.7.1 Construction Details

The construction of the proposed groundwater well and pump test activities, as per the New Brunswick Clean Water Act, will be carried out by a licensed Well Driller under the supervision of GHD personnel.

The following describes the work that is to be completed for the drilling of the additional well:

- Complete underground clearances prior to commencing drilling activities.
- Install and maintain sediment and erosion control structure over the course of well construction, development and pump testing, as required.
- Construction of one 150 mm diameter test well at the target site using standard drilling method
 (air rotary) to bedrock, with a 150 mm steel casing installed to a minimum depth of 6 mbgs (the
 exact amount of casing will depend on the stratigraphy intersected). If a sufficient yield is
 located, a second monitoring well and a 200 mm diameter test well will be constructed for pump
 testing purposes. The wells will be logged by an experienced GHD professional.
- A preliminary yield estimate and groundwater chemistry will be completed based on airlift volumes following construction of the test well.
- If the estimated yield and preliminary chemistry results are acceptable, a step test will be completed on the test well, followed by a 72-hour pump test. Water levels will be measured in the test well and the monitoring wells during the pump test. Water samples will be collected at 24-hour intervals during the test for chemical analysis.
- A detailed report on the hydrogeological investigation will be submitted to the NBDELG office
 upon completion of the testing program. The report will meet the requirements outlined in
 NBDELG's Water Supply Source Assessment Guidelines, and will include well logs, pump test
 information, chemistry data and yield estimate.
- The drilling activities will be completed during daytime hours only to minimize disturbance to local residents.
- Pump testing activities will be completed for a continuous 72-hour period.
- Refueling of the equipment used during the drilling and pump testing activities will either be completed off-site or at a designated on-site location. If an on-site location is necessary, a spill kit will be available to contain any minor release if required.

2.7.2 Operation and Maintenance

Periodic maintenance of the well will be required from time to time, and may include removing/replacing the pump, well re-development activities, etc. Operation and maintenance of the well is not expected to cause significant environmental impacts.

2.7.3 Future Modification, Extensions, or Abandonment

Details on any construction activities necessary to connect the new well to the existing water supply (pipeline installation, pump house construction, etc.) will be provided for approval prior the proceeding with the work. The municipality has only one pressure zone established by the reservoir



water elevation, thus any new source could be connected to the existing municipal system without adding a reservoir.

2.7.4 Project Related Document

The Water Supply Source Assessment – Initial Application document is presented as Appendix A.

3. Description of Existing Environment

3.1 Physical and Natural Features

The target area is located south of a suspected sand and gravel deposit near an inactive gravel pit, with an approximate elevation of 50 m above sea level (masl). Eel River is located approximately 40 m south of the target area. The nearest NBDELG regulated wetland is located approximately 500 m northwest of the target area. Bedrock groundwater flow is expected to be controlled by the fracture systems, with recharge occurring at topographic highs and discharge occurring in low areas. Shallow groundwater flow will be control by the soil stratigraphy and local topography. The regional groundwater flow is expected to be north/east toward Chaleur Bay, located approximately 5 to 7 km from the target area.

3.2 Cultural Features

The target area is located at 345 Route 280, on a property privately owned by

The area is rural in nature. Vacant/wooded areas are located near the target area, with residential properties located along Route 280. There are no significant cultural features identified near the target area.

3.3 Existing and Historic Land Use

The target area is located near an inactive gravel pit. The surrounding land consists mainly of vacant and forested lands.

4. Summary of Environmental Impacts

Environmental impacts related to the construction and testing of the proposed wells are expected to be minimal, as described above.

5. Summary of Proposed Mitigation

- The drill site will be equipped with spill kit;
- Equipment will be inspected daily to ensure it is in good working order and free of leaks;
- Vehicle fueling and maintenance must occur at least 30 m away from any watercourse, either off-site or at a designated on-site location;



- Sediment and erosion controls will be installed and maintained over the course of the well construction, development and pump testing (if required); and,
- All work (except for the pump testing) will be completed during daylight hours, to minimize disturbance to the local area.

6. Public Involvement

Individuals, companies, agencies, organized interest groups, and others that may be affected by the project will be contacted, made aware of the undertaking, explained the details of the project and asked for comments, related to the project.

A report documenting the public involvement process will be submitted to the NBDELG within 60 days of this registration.

7. Approval of the Undertaking

The following permits, licenses, approvals, and permissions are required for this undertaking:

a) Water Supply Source Assessment Initial Application Approval by NBDELG

8. Funding

This project is being funded by the Village of Eel River Crossing Dundee.

9. Signature

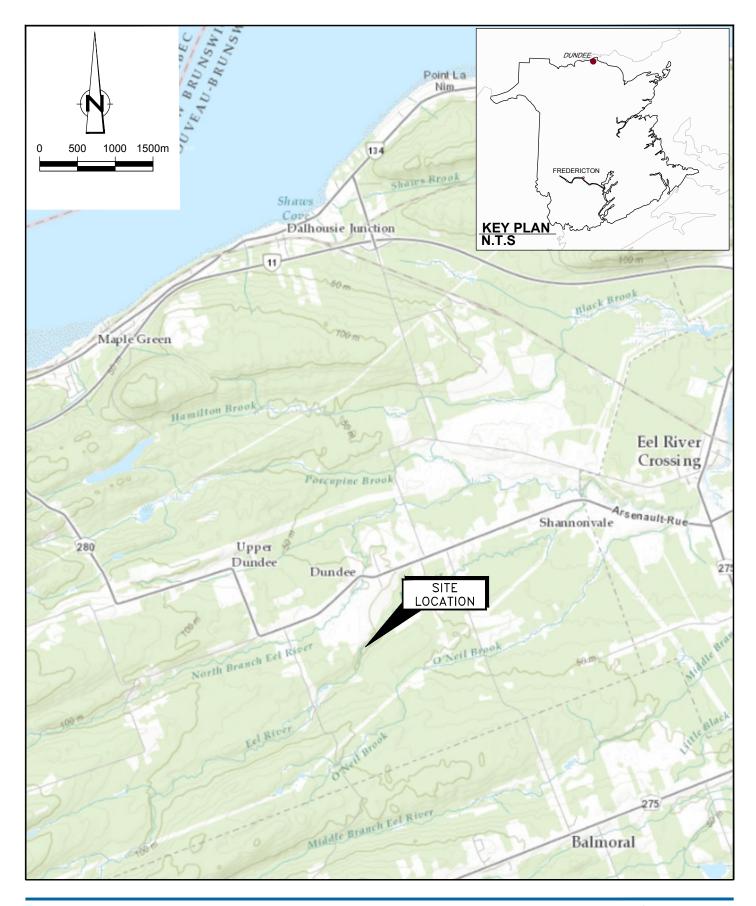
Please accept this EIA Registration for the construction of a well for the Boissonnault McGraw Dundee water system.

Signature of Co-Owner

Kim Bujold – General Manager

Village of Eel River Crossing Dundee

Date

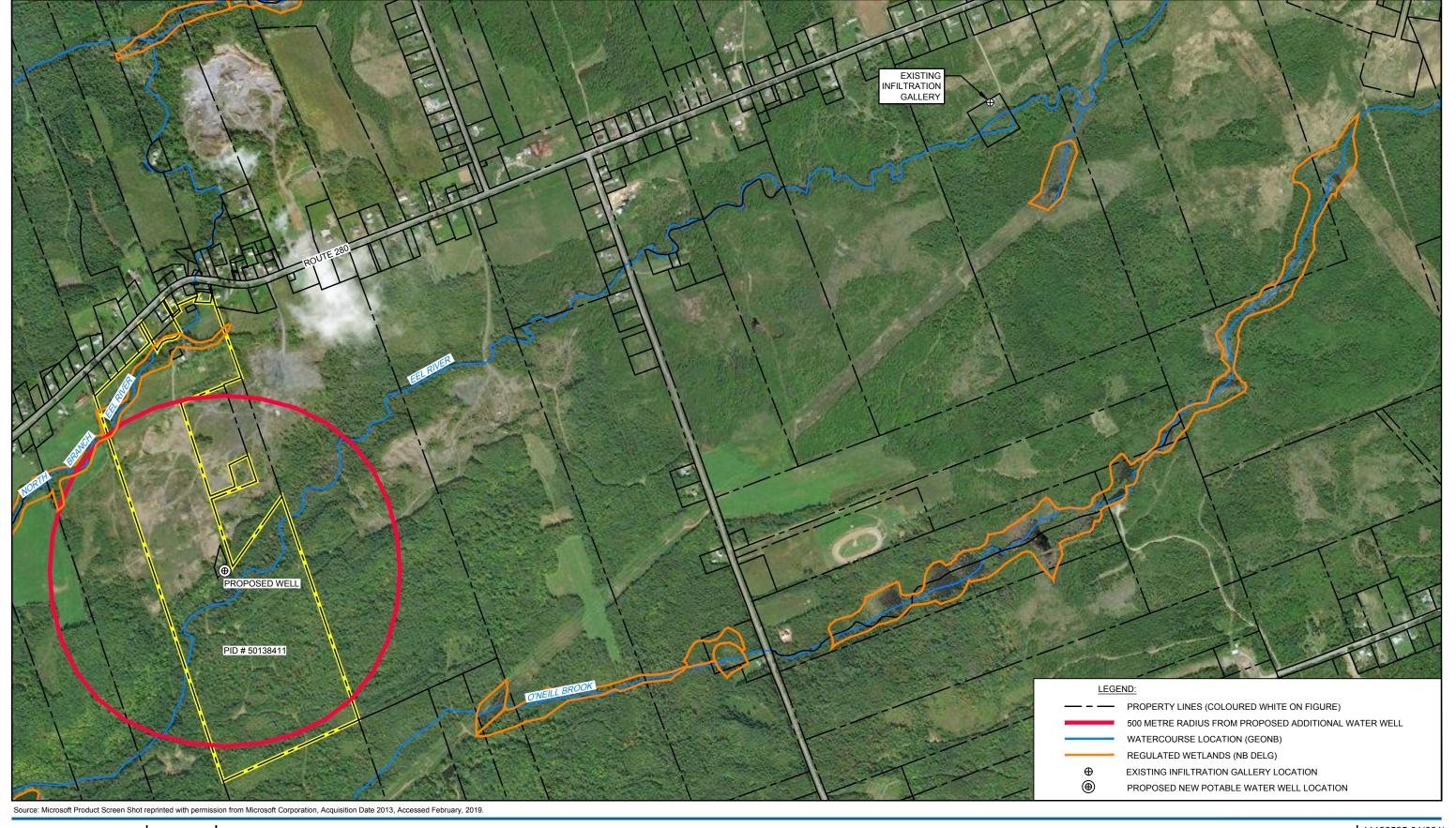




BOISSONNAULT McGRAW 345 ROUTE 280, DUNDEE, NEW BRUNSWICK EIA REGISTRATION WATER SUPPLY SOURCE ASSESSMENT

SITE LOCATION

11190595-01(001) Feb 22, 2019



0 100 200 300m





SITE PLAN

BOISSONNAULT McGRAW 345 ROUTE 280, DUNDEE, NEW BRUNSWICK EIA REGISTRATION WATER SUPPLY SOURCE ASSESSMENT 11190595-01(001) Mar 8, 2019

Appendix A
Water Supply Source Assessment – Initial
Application, Village of Eel River Crossing,
Dundee, NB



March 18, 2019 Reference No. 11190595

New Brunswick Department of Environment and Local Government Marysville Place PO Box 6000 Fredericton, NB E3B 5H1

Re: Water Supply Source Assessment

Initial Application

Village of Eel River Crossing Dundee, New Brunswick

The Village of Eel River Crossing and Local Service District (LSD) of Dundee have recently amalgamated. GHD has been retained by Boissonnault McGraw, on behalf of the Village of Eel River Crossing Dundee, to complete a groundwater exploration study for the development of a new groundwater source for the community. The purpose of the water supply is to supplement/replace the existing water source (infiltration gallery) to meet the current and projected future water demand for the community. The water system will be operated by the Village of Eel River Crossing Dundee, and will supply water to nearby residential and commercial properties.

Background

The Village of Eel River Crossing installed a municipal water supply system in 1976. The water supply consists of an infiltration gallery located on the Eel River near Shannonvale, approximately 1.1 kilometres (km) west of Eel River Crossing (Figure 1). The infiltration gallery includes a fine gelinite pipes installed under the bed of the river to collect filtered river water, which flows into a wet well and then to a pump house adjacent to the river.

The Village's water consumption is metered at the pump house located near the water infiltration gallery along Eel River. A total of 720 properties are supplied by the current water system. The location of the water distribution system is identified in Figure 1.

The Eel River watershed is a Designated Watershed Protected Area and is located in the Dalhousie and Balmoral Parishes adjacent to the Village of Eel River Crossing Dundee. The predominant land use in the watershed is forest with some agricultural land use along Route 270. Other land users within the watershed include gravel pits and an asphalt plant located in the community of Dundee. According to the Village information and based on the Canadian Drinking Water Quality Guidelines (CDWQG), on occasion, during the spring run-off or heavy rain events, the turbidity and colour levels are excessive in the current water supply. During these events, the Village must increase the chlorine dosage in the water system in order to maintain a chlorine free residual in the distribution system.

Levels of total trihalomethanes (THM) have also been reported throughout the Village's water distribution system during high turbidity events, indicating the relationship between turbidity and organic matter.





This letter is an application to initiate a water supply source assessment project for Boissonnault McGraw, on behalf of the Village of Eel River Crossing Dundee, as defined in the "Water Supply Source Assessment Guidelines" document dated April 2017. It is our intention to complete the proposed testing work following the spring recharge (June 2019).

Name of Proponent

Village of Eel River Crossing Dundee

1) Location of drill targets and purpose of the proposed water supply

TAP Environmental Resources Inc. (TAP) conducted an assessment of the hydrogeological conditions of the Eel River Crossing Dundee area in 2005 to identify potential test drill targets. One potential drill target was identified on property identification (PID) #50138411, located to the south of the Eel River near Dundee, approximately 3.5 km southwest of the current infiltration gallery (Figure 2). This location is favourable as it is located on the southern extent of a fairly large sand and gravel deposit; however, the aquifer thickness is this area is unknown.

The proposed target area for this study was selected based on the 2005 TAP report. The test well will establish whether the depth of the sand and gravel aquifer is sufficient and provide the municipal water requirements. The well will be located approximately 40 m north of the river. The site will require grading to allow access for a rotary drill rig and service vehicle.

2) Required water quantity (in m³/day) and/or required pumping rate

The required water quantity estimated at approximately 1,000 m³/day to meet the current requirement and allow a buffer for future expansion.

3) List alternate water supply sources in area (including municipal systems)

There are no other known municipal water supplies in the area, other than the existing infiltration gallery. The nearest municipal water supply is the Town of Dalhousie, located approximately six km north of Eel River Crossing Dundee.

4) Area hydrogeology

As stated in the 2005 TAP report, the study area is underlain by the geological structure known as the Chaleur Bay Sunclinorium, a large northeast-trending structure that extends from the Maine-New Brunswick border in the southwest to the Gaspe Peninsula of Quebec in the northeast. These Silurian-Devonian aged sedimentary and volcanic rocks are mildly deformed and metamorphosed. Late Silurian-Devonian plutonic rocks in the form of dykes, sills, and small stocks intrude the older formations. The youngest rocks in the study area are flat-lying redbeds of the Carboniferous aged Bonaventure Formation. Bedrock in the area generally have low hydraulic conductivities and are considered to have low potential for the development of a water supply.



Unconsolidated surficial (lying above the bedrock) deposits in the area consist of thin glacial tills and sand and gravel deposits of variable thickness. The direction of glacial ice movement, as indicated by glacial striations and grooves in bedrock exposures, was to the northeast and to the east. Deposition by the receding glaciers resulted in a complex system of granular materials in the area, particularly near the present coast of Chaleur Bay. Evidence of glacial flow directions suggests that these sand and gravels were source from two different ice lobes. The Chaleur Bay ice lobe existed to the north, and another lobe was situated inland, on the Chaleur upland. These ice masses coalesced near Charlo.

The surficial deposits within the study area consist of glacial till, glaciofluvial outwash, glaciofluvial deltaic deposition, marine shallow-water sediments, ice-contact stratified drift, and ancient alluvial deposits. From a hydrogeological perspective, all except the glacial till can provide significant groundwater extraction in the right setting. Within the area, the glaciofluvial deltaic and glaciofluvial outwash deposits can provide excellent aquifer characteristics and present the best target options due to their thickness as well as their groundwater storage and transmission properties.

The region ranges in elevation from about 250 m to sea level at Chaleur Bay. The inland plateau is dissected by streams that flow in the Chaleur Coastal Plain that slopes gently to the north to the Bay. The regional stream drainage is to the northeast into Chaleur Bay. The fluvial systems in the area are strongly controlled by the underlying bedrock northeast structure.

5) Proposed hydrogeological testing and work schedule

Following approval of the undertaking from New Brunswick Department of Environment and Local Government (NBDELG), GHD will supervise the drilling of one 150 millimetre (mm) diameter test well at the drill target site (Figure 2). The well will be logged by an experienced GHD professional and the drilling contractor will be a licensed well driller.

Detailed formation samples will be collected during well construction for grain size analysis. A preliminary yield estimate will also be completed based on airlift volumes during construction of the test well. Preliminary groundwater samples will be collected after initial development and analyzed for general chemistry and metals.

If the estimated yield and preliminary chemistry results are acceptable, a 200 mm diameter test well and a second 150 mm diameter observation well will be constructed near the initial test well. Following well construction, a step test will be completed on the 200 mm test well to determine the appropriate pumping rate for the constant rate pump test. Following the step tests, a 72-hour pump test will be completed to evaluate the aquifer parameters and yield. Water levels will be measured in the test well and the two monitoring wells during the pump test. Water samples will be collected at 24-hour intervals during the test for chemical analysis.

A detailed report on the hydrogeological investigation will be submitted to the NBDELG office upon completion of the testing program. The report will meet the requirements outlined in



NBDELG's Water Supply Source Assessment Guidelines, and will include well logs, pump test information, chemistry data, grain size analysis and yield estimate.

The proponent intends to undertake the proposed testing work as soon as approval to proceed is received, shortly after the spring recharge period (June 2019).

6) Existing pollution or contamination hazards within a (minimum) 500 m radius of the proposed drill targets

The land use in the study area includes an abandoned gravel quarry (no longer active). No constraints have been identified within a 500 m radium of the proposed drill target area (Figure 2).

7) Groundwater use problems (quantity or quality) that have occurred in the area

As detailed in the 2005 TAP report, the groundwater quality in the area is fairly good in general, but can be hard. Much of the Silurian aged bedrock is calcareous and secondary calcium carbonate mineralization is also prevalent within the bedrock resulting in moderately hard waters. In the past, the dissolution and reprecipitation of calcium carbonate within the sand and gravel glacial deposits has resulted in the associated aquifers having a moderately high hardness. As stated in the CDWQG, public acceptance of hardness varies considerably. Levels greater than 200 milligrams per liter (mg/L) are considered poor but tolerated; levels greater than 500 mg/L are considered unacceptable.

Though hardness of water samples collected from the municipal water supplies and test wells in the area range from moderately high to high, the infiltration gallery source of the Eel River Crossing distribution system are soft due to the effect of surface water. Water samples from the Eel River Crossing test wells have indicated high conductivity and associated hardness. As previously mentioned, the current water supply is also susceptible to elevated colour and turbidity levels during high recharge periods, bacterial impacts as well as the presence of THM. As indicated by a Boissonnault McGraw representative, the latest upgrades to the existing infiltration gallery including the installation of an ultraviolet (UV) treatment system.

8) Watercourse(s) within 60 m of the proposed drill targets

Eel River is located approximately 40 m of the proposed drill target. No other water courses or regulated wetlands are located within 60 m of the proposed target area.

9) Site supervisory personnel involved in the source development (municipal officials, consultants and drillers)

- Client Contact:
 - Kim Bujold (Village of Eel River Crossing Dundee)
 - Email: kb@ercvillage.com
 - o Phone: (506) 826-6080
- Project Manager/Senior Hydrogeologist: Erika Graves (Project Manager, GHD), Roger Poirier (Senior Hydrogeologist, GHD)
 - Email: Erika.Graves@ghd.com



- o Phone: (506) 458-1248
- Site Supervisors: Mario Theriault / Mike Gaines / Mike Graves (Senior Technicians, GHD)
- Licensed Well Driller: A qualified licensed well driller will be identified to complete the drilling and pump test activities.

10) 1:10,000 map and/or recent air photo identifying:

- Proposed location of drill targets and property PID
- Domestic or production wells within a 500 m radius from the drill target
- Any potential hazards identified in Question 6

A recent aerial photograph (1:10,000 scale) identifying the potential drill target is attached as Figure 2. There are no other known municipal or residential water supplies within a 500 m radius of the target area. There are no water wells listed in the NBDELG Online Well Log System database within 500 m of the drill target site. The location of the proposed drill target site, nearby watercourses and regulated wetlands are identified on Figure 2 for reference purposes.

11) Land use/zoning map of the area. Superimpose drill targets on this map

The Village of Eel River Crossing Dundee and the Regional Service Commission (RSC) #2, Planning Division was contacted for information on land use and/or zoning map for the area. The RSC indicated zoning does not apply in Dundee and therefore land use and/or zoning map is not available for the study area. The aerial photograph shows the land use within 500 m of the target area to be vacant/woodlot with an abandoned gravel pit to the north of the target area (Figure 2).

12) Contingency plan for open loop earth energy systems

Not applicable to this project.

We trust this information is sufficient for your evaluation at this time. Please contact our office should there be questions.

Sincerely,

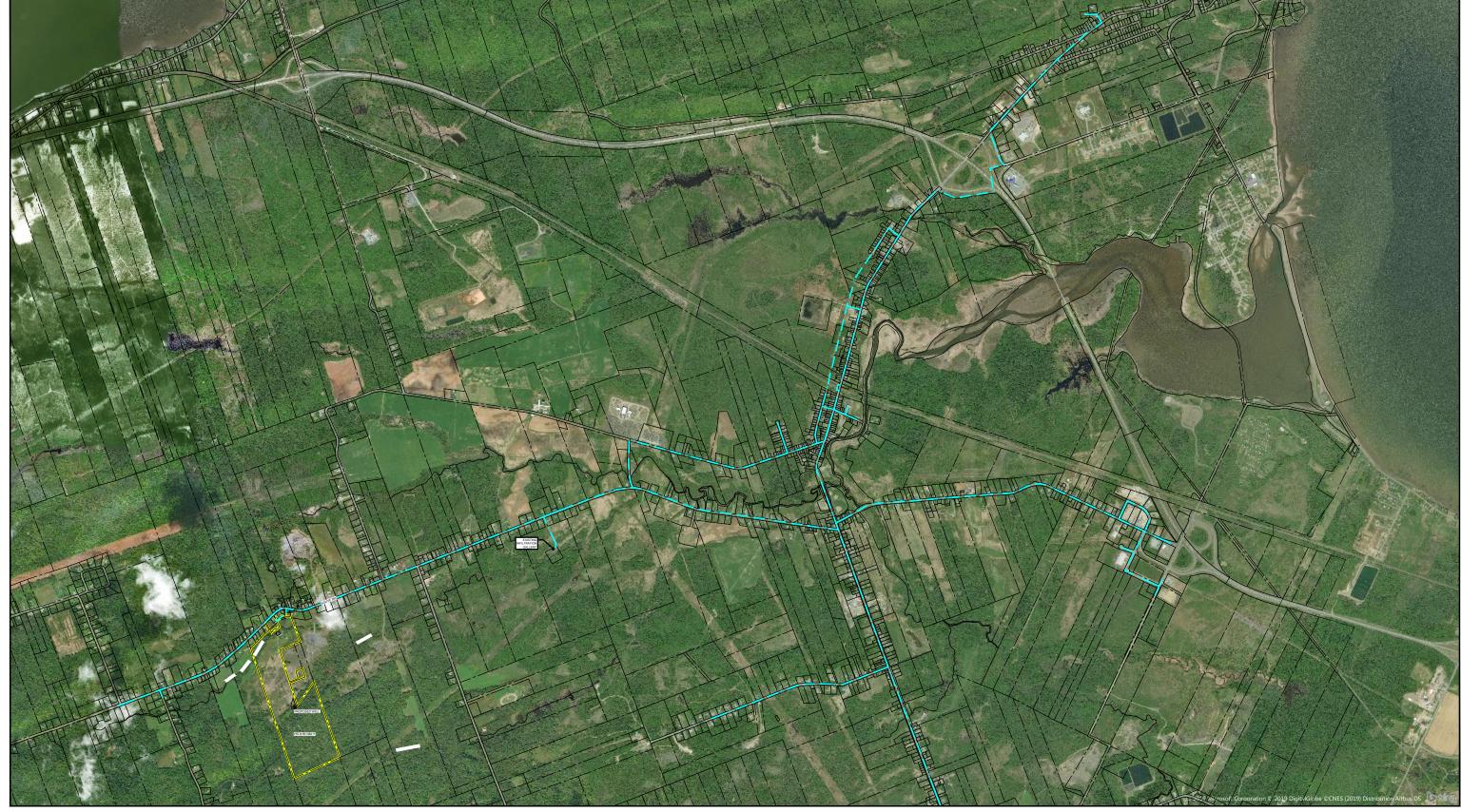
GHD

Erika Graves, P.Eng.

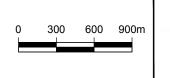
Roger Poirier, M.A.Sc., P.Eng.

EG/ad/1

Encl.



Source: Microsoft Product Screen Shot reprinted with permission from Microsoft Corporation, Acquisition Date 2013, Accessed February, 201





LEGEND:

PROPERTY LINES

— — WATER DISTRIBUTION SYSTEM

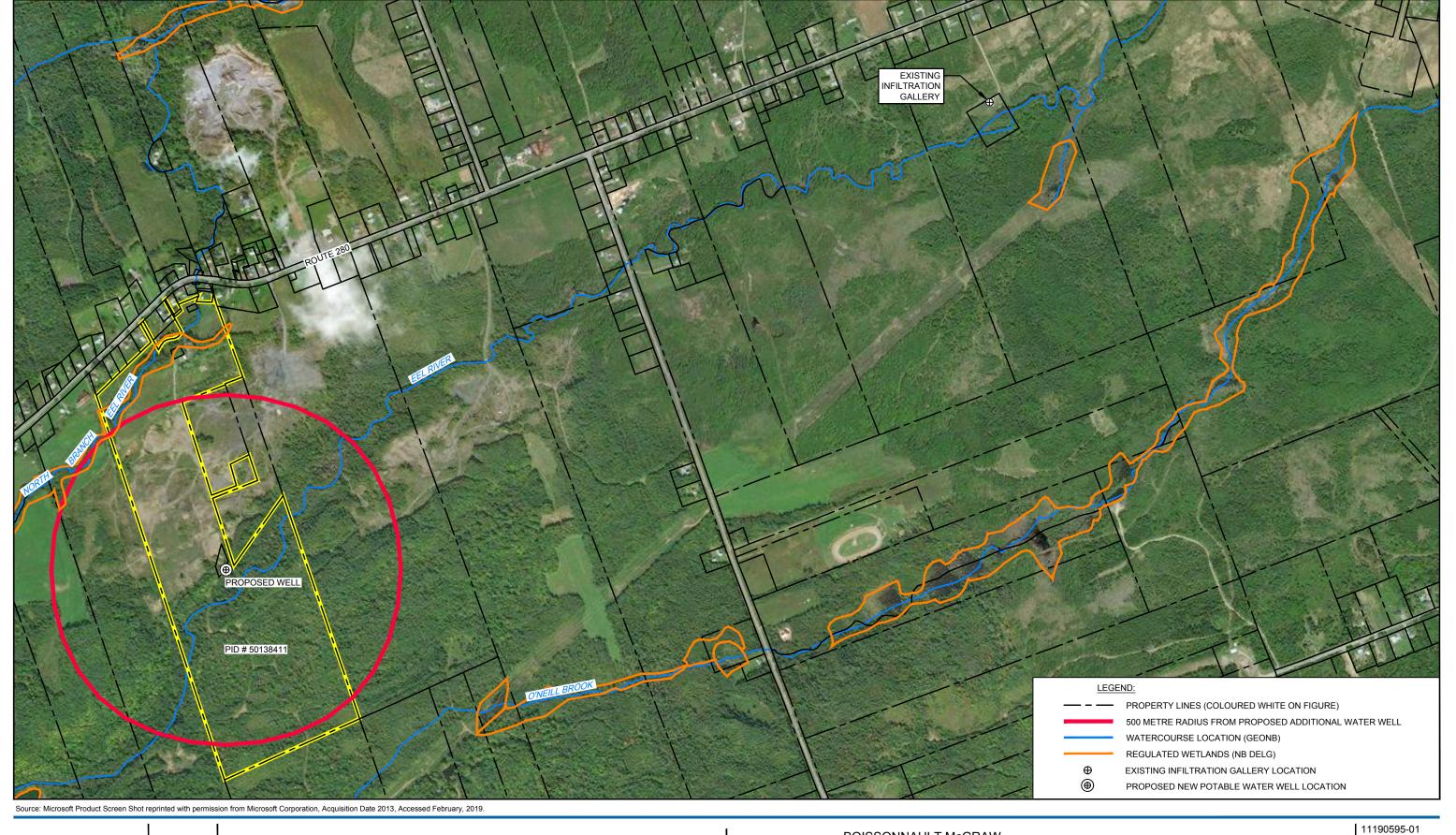
EXISTING INFILTRATION GALLERY LOCATION

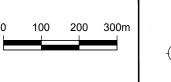
PROPOSED NEW POTABLE WATER WELL LOCATION



BOISSONNAULT McGRAW 345 ROUTE 280, DUNDEE, NEW BRUNSWICK WATER SUPPLY SOURCE ASSESSMENT - INITIAL APPLICATION WATER SUPPLY SOURCE ASSESSMENT 11190595-01 Mar 8, 2019

SITE LOCATION









BOISSONNAULT McGRAW 345 ROUTE 280, DUNDEE, NEW BRUNSWICK WATER SUPPLY SOURCE ASSESSMENT - INITIAL APPLICATION WATER SUPPLY SOURCE ASSESSMENT

Mar 8, 2019

SITE PLAN

www.ghd.com

