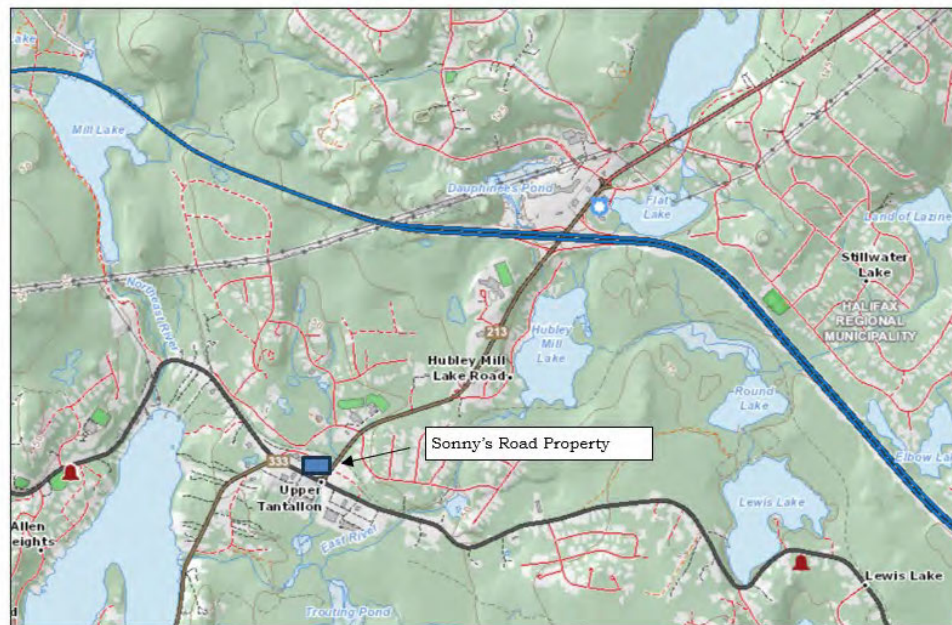


# Sonny's Road Property

Upper Tantallon, Halifax County, Nova Scotia

## Level I Groundwater Resources Assessment



prepared for:

DesignPoint Engineering and Surveying Ltd.

W.G. Shaw & Associates Ltd.  
Consulting Geoscientists  
September 12, 2024

**W.G. Shaw & Associates Ltd.**

*Consulting Geoscientists*

4546 Highway #7  
Antigonish , Nova Scotia  
Canada B2G 2L3  
phone (902) 863 - 1903  
E-mail : wgshaw@eastlink.ca

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Mr. Logan King, P.Eng.  
DesignPoint Engineering and Surveying Ltd.  
222 Waterfront Drive, Suite 104  
Bedford, Nova Scotia  
Canada, B4A 0H3

September 12, 2024

Re : Sonny's Road Property, Upper Tantallon, Nova Scotia  
Level I Groundwater Assessment

Dear Mr. King,

Please find enclosed our technical report on a Level I Groundwater Assessment for the Sonny's Road Property, Upper Tantallon, Nova Scotia.

Sincerely,



William G. Shaw, *Pigeon*.  
President



Sonny's Road Property, HRM, N.S.  
Level 1 Groundwater Assessment  
September 12, 2024

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## **1.0 Introduction**

### **1.1 General Description of the Project**

W.G. Shaw & Associates Ltd. (WGSL) was retained by DesignPoint Engineering and Surveying Ltd. (DesignPoint) to conduct a Level I Groundwater Assessment for a proposed residential and commercial development (the Property) located at Sonny's Road, Upper Tantallon, Halifax County, Nova Scotia (Figures #1, #2 and #3).

The Property is an east-trending, roughly triangular-shaped parcel of land that is 200 metres long by 20 to 60 metres wide with a total area of 1.0 hectare (Figure #7). The Property includes the following PIDs:

4145 4125  
4145 4133

Current plans for the project are to build an 18,000 square feet commercial space on the lower floor of a multi-storey building with 30 residential, apartment style units on the upper floors. (See Chapter 3.0.) Anticipated water use by the project, at full build-out, are estimated by DesignPoint to be 16,000 litres per day.

### **1.2 Scope of Work and Methodology**

In order to fulfill the requirements, we followed the Nova Scotia Environment's Guide to Groundwater Assessments for Subdivisions Serviced by Private Wells, Level I. These included the review, compilation and interpretation of the following sources of information and data:

- Geologic Reports and Maps: surficial sediments and bedrock geology
- Topographic Maps:
- Air Photos
- Water Wells Records: Nova Scotia Well Logs Database and Groundwater Atlas, well construction records, pump tests records and water quality records.
- Historical Pump Tests: wells and aquifers
- Nova Scotia Pump Test Database
- Watershed Maps: primary, secondary, tertiary
- Climate Data: annual precipitation patterns



- Nova Scotia Hydrogeology Toolkit

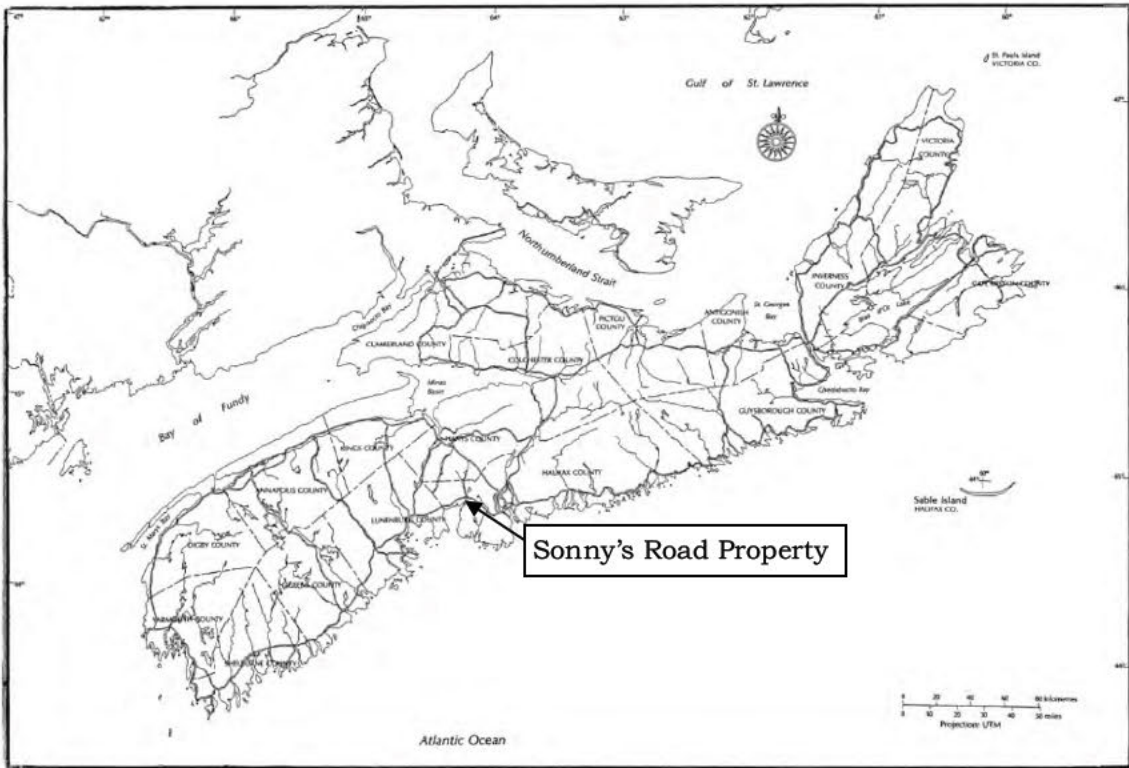


Figure #1 Location of the Sonny's Road Property on map of Nova Scotia

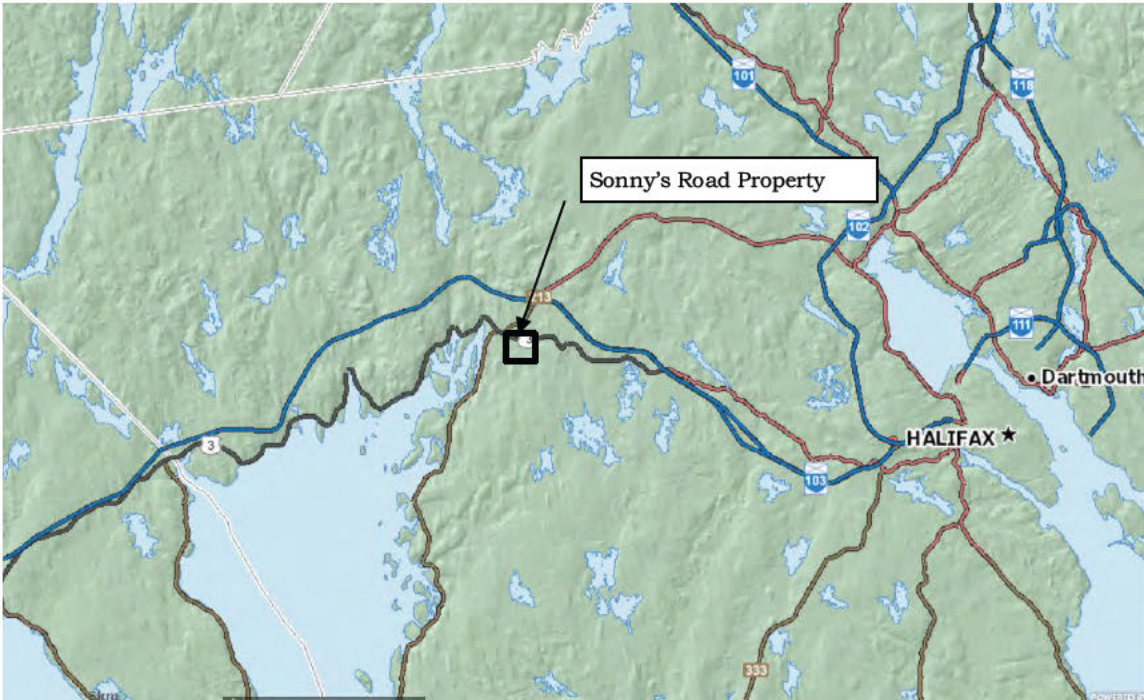


Figure #2 Location of Sonny's Road Property on Regional Map

Sonny's Road Property, HRM, N.S.  
Level 1 Groundwater Assessment  
September 12, 2024



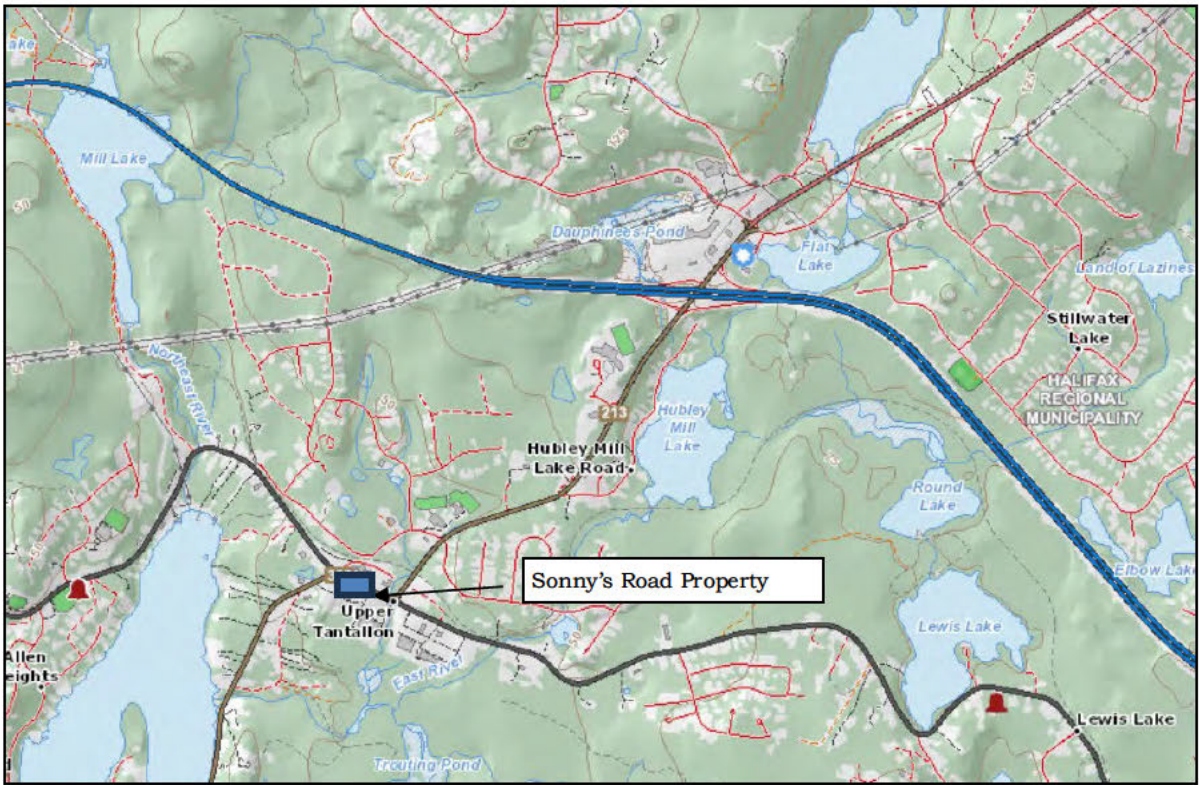


Figure #3 Sonny's Road Property on Local Topographic Map

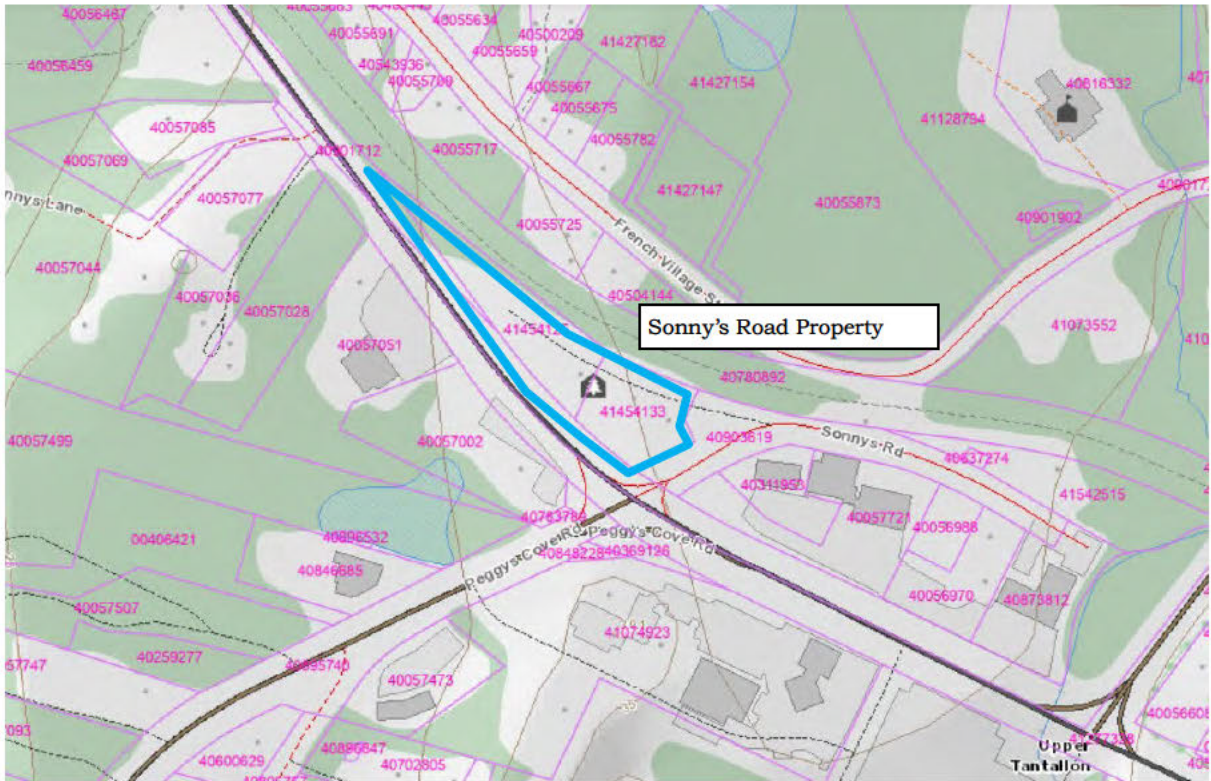


Figure #4 General Outline of the Property

Sonny's Road Property, HRM, N.S.  
Level 1 Groundwater Assessment  
September 12, 2024



## 2.0 Natural Landscape and Climate

### 2.1 Natural Landscape and Topography

The Property is located within the Pennant Granite Barrens Natural Landscape of Nova Scotia. This landscape is characterized by low undulating terrain dominated by a mosaic of boreal and coastal coniferous forests with interspersed barrens.

The Property lies within a parcel of land that slopes gently toward the southwest from a maximum elevation of 95 metres on the southeast corner to 60 metres in the south corner (Figures #3 and #7).

### 2.2 Climate and Precipitation

Climate normals for the Property are derived from the Environment Canada (EC), climate monitoring station located at St. Margaret's Bay which is located approximately 10 kilometres to the southwest. The results indicate the area receives total annual precipitation of from 1,300 to 1,400 millimetres of which approximately 85% occurs as rain. The average total annual precipitation for the 1981 to 2010 period was 1,380 millimetres (1.38 metres).

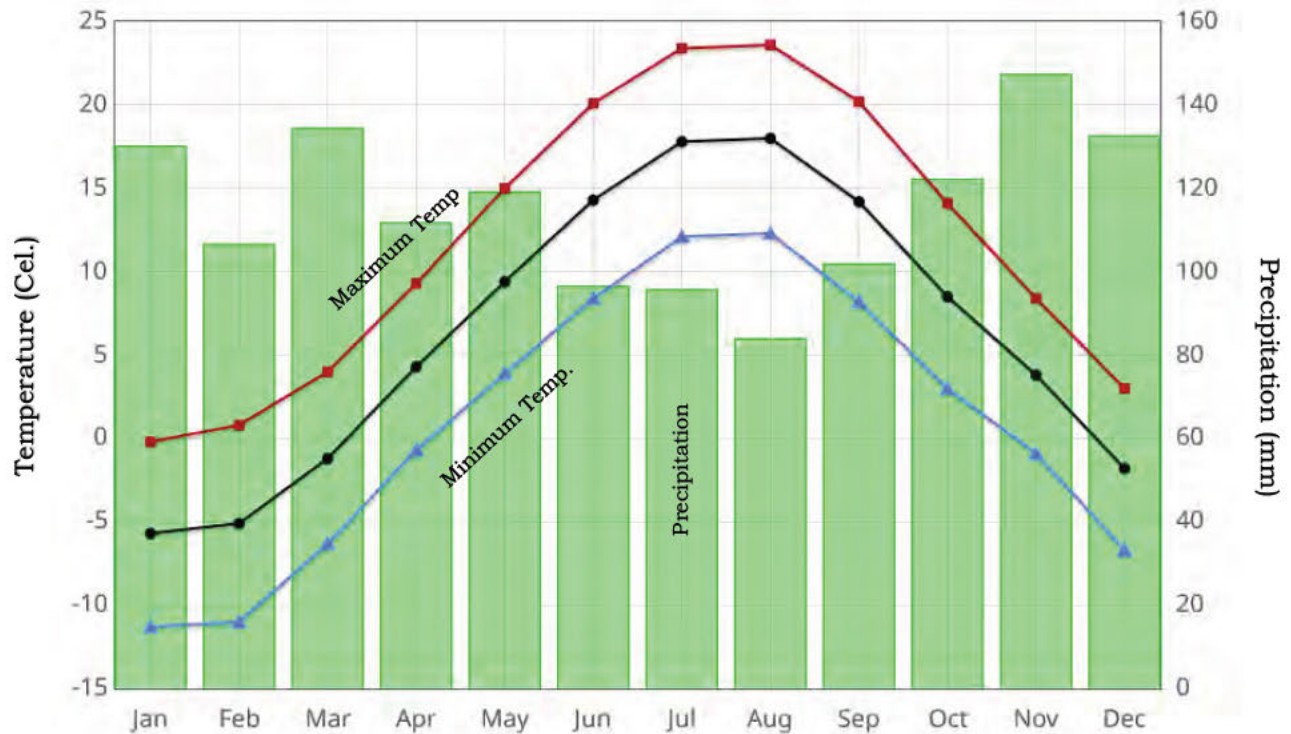


Figure #4 Climate Normals for the St. Margaret's Bay Climate Station from 1981 to 2010

### 2.3 Surface Water Features

The Property lies within the East Indian River Primary Watershed and within the East River Secondary Watershed (Figures #5 and #6). There are no watercourses on the Property. Surface water runoff is by overland flow toward the east in the direction of a small, unnamed watercourse located 300 metres to the east of the Property. This watercourse discharges into East River at a location of 1.2 kilometres south of the Property (Figure #7).

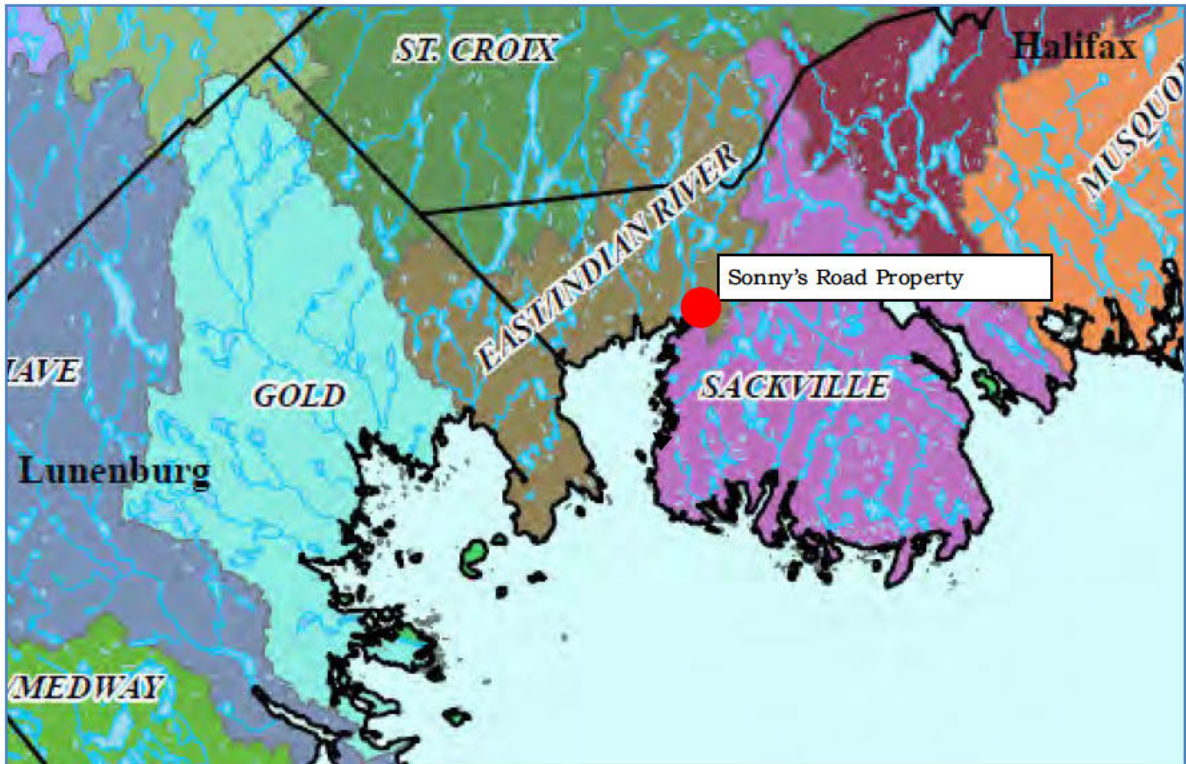


Figure #5 Primary Watersheds of Nova Scotia



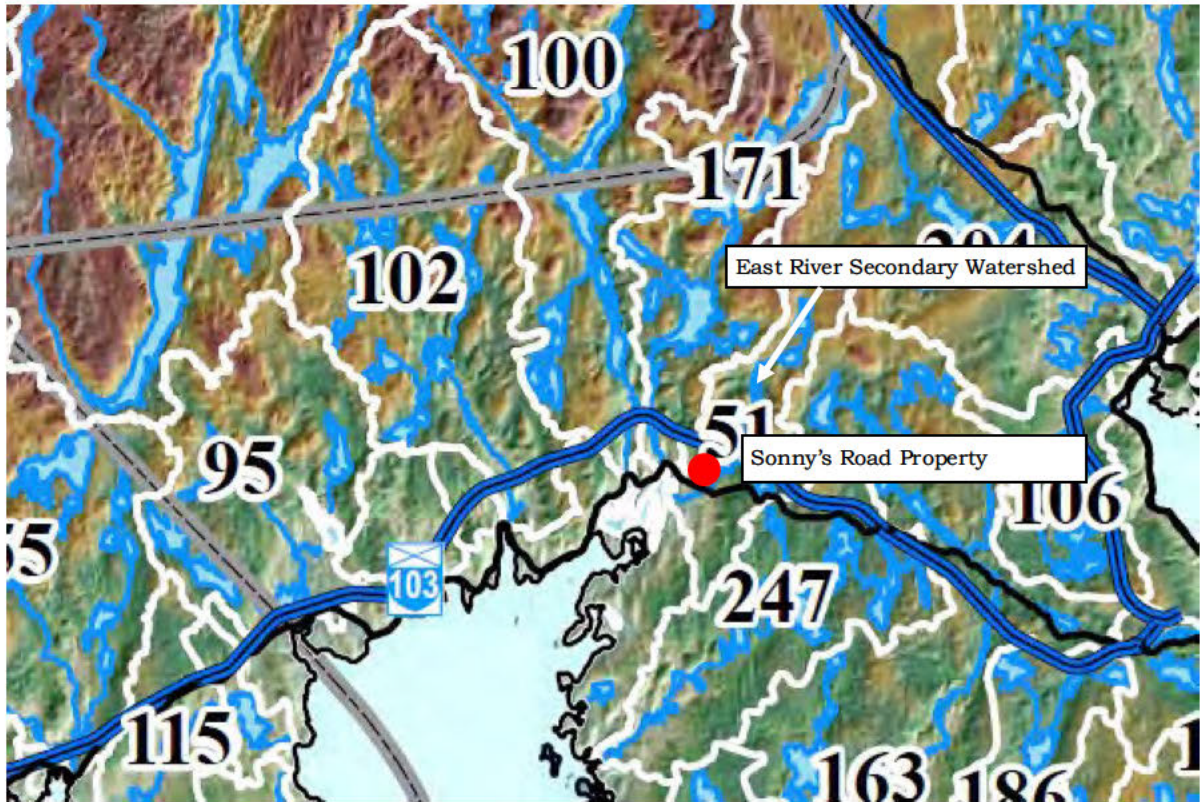


Figure #6 Secondary Watersheds of Nova Scotia

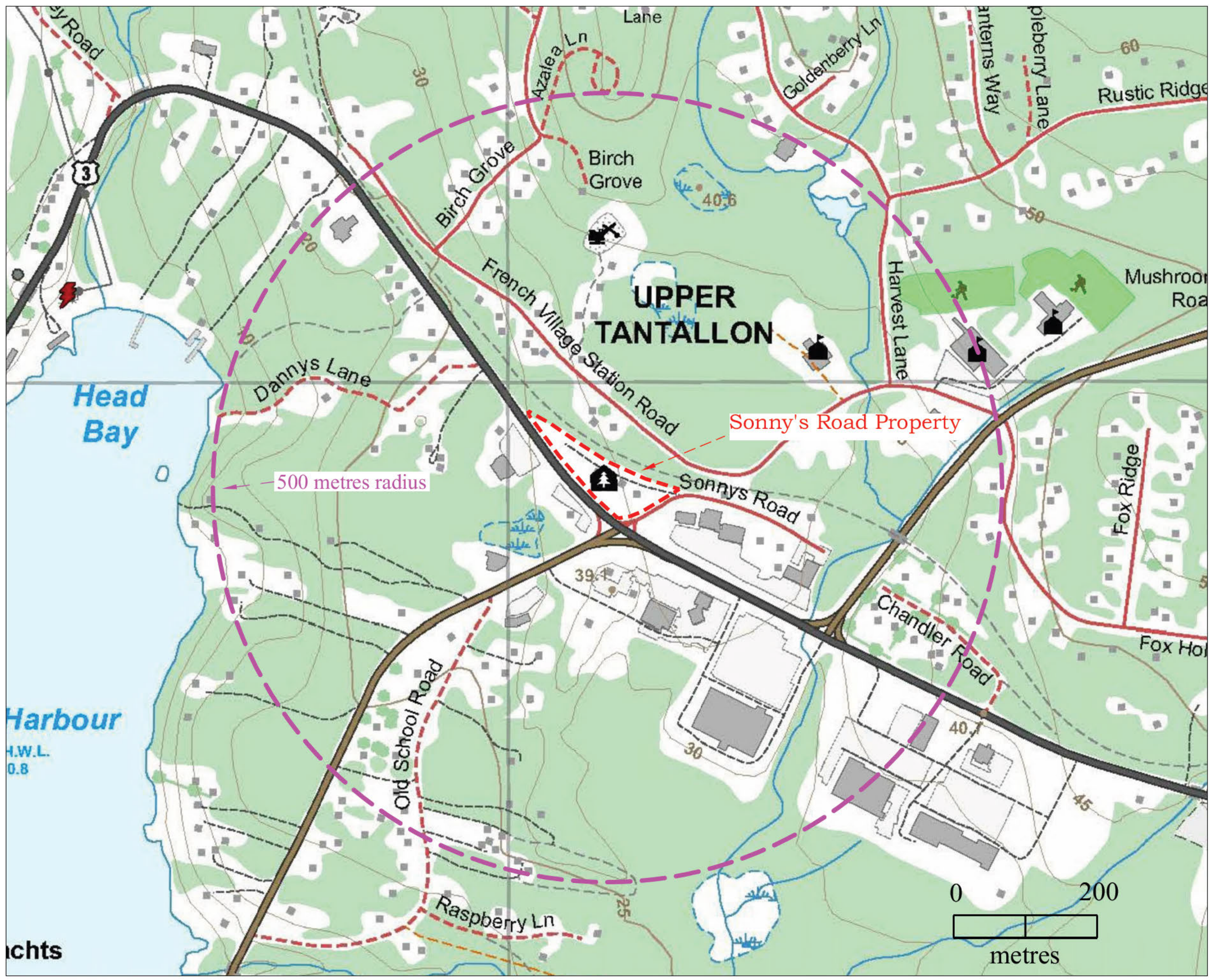
## 2.4 Wetlands

In Nova Scotia, a wetland is a term that includes the land areas that are commonly referred to as a marsh, swamp, fen or bog that either periodically or permanently has a water table at, near or above the land's surface or that is saturated with water. These land areas sustain aquatic processes as indicated by the presence of poorly drained soils, hydrophytic vegetation and biological activities adapted to wet conditions.<sup>1</sup>

A search of the Nova Scotia Ecological Land Classification mapping indicates there are no significant wetlands within the Property or within 1 kilometre of the Property.


<sup>1</sup> NS *Environment Act* as amended in 2006





## Explanation

- Residential Building (private well)
- Commercial Building (private well)

W.G. Shaw & Associates Ltd.  
 Consulting Geoscientists  
 Antigonish, Nova Scotia  
 Canada  
 Phone: 902-863-1903

## Sonny's Road Property

Upper Tantallon, Nova Scotia

Figure #7

September, 2024



### **3.0 Anticipated Demand and Supply of Potable Water**

#### **3.1 Anticipated Demand**

Current plans for the project are to build an 18,000 square feet commercial space on the lower floor of a multi-storey building with 30 residential, apartment style units on the upper floors. Anticipated water use by the project, at full build-out, are estimated by DesignPoint to be 16,000 litres per day.

#### **3.2 Anticipated Supply**

The planned water supply to the Property is a central water system with the raw water being supplied by one or more water supply wells depending on the results of future groundwater resource assessments (drilling and hydraulic testing).



## 4.0 Summary of Hydrogeology

### 4.1 Surficial Sediments

The Property is covered by a layer of surficial sediments that consist of yellowish-grey coloured, gravely sand and silt (glacial till) which, according to the Driller's Report of the existing well on the Property, NSE #20,958, is 5.5 metres thick (Table #1).

### 4.2 Bedrock Hydrogeology

The Property is underlain by bedrock that consists of orangish-grey coloured granite where all of the porosity, permeability and storage of groundwater is within fractures in the bedrock (Illustration #1).

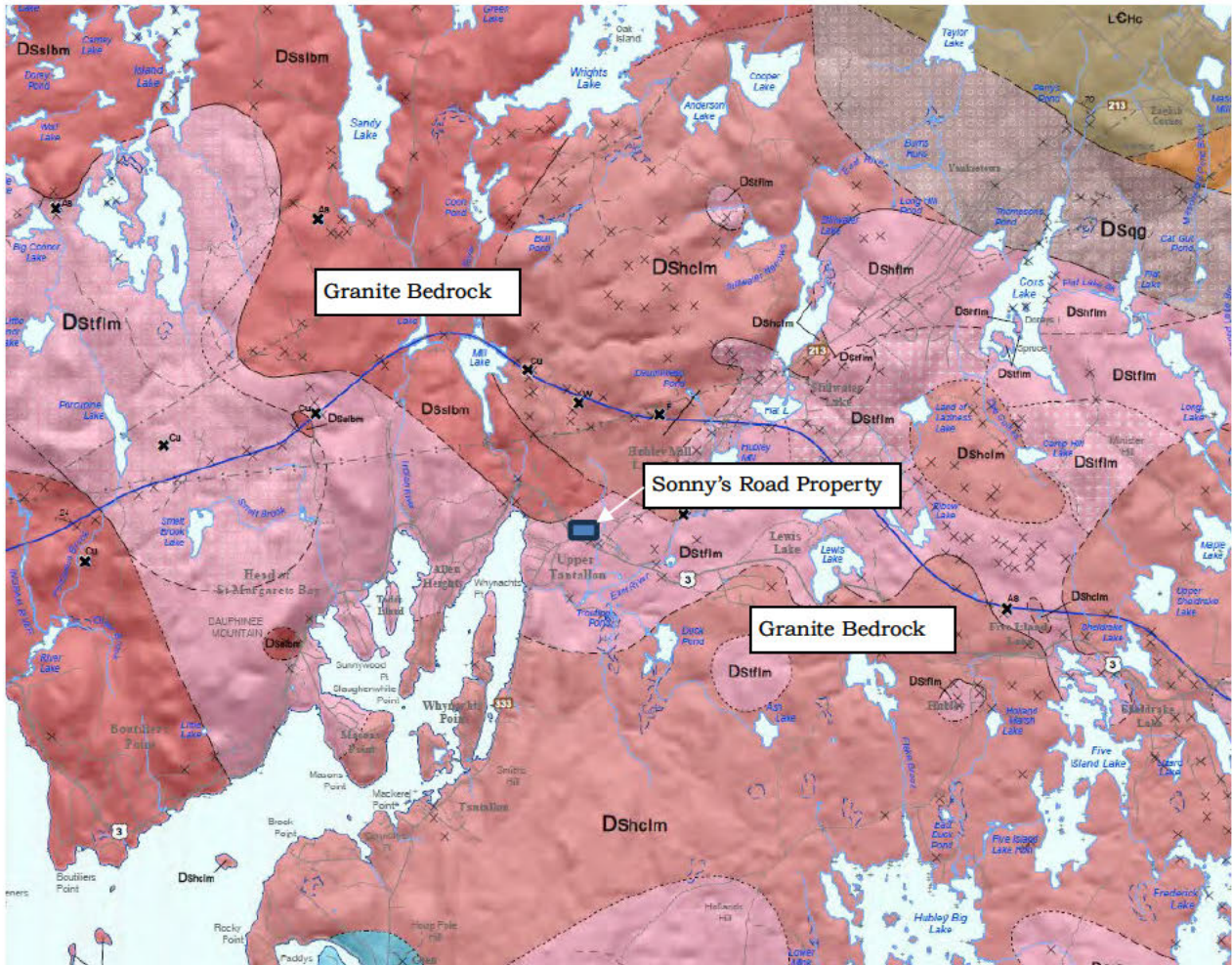


Figure #8 Bedrock Map of Property and Surrounding Area  
(Nova Scotia Dept. of Natural Resources Open File Map #2014-010)

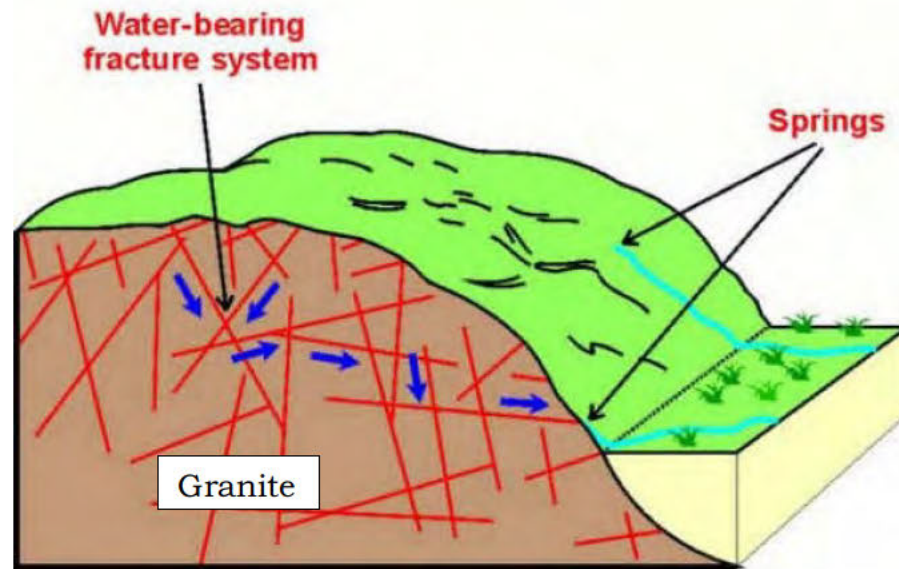


Illustration #1 Schematic Illustration of a Fractured Rock Aquifer System

Permeability of a fractured rock aquifer is dependent on the following factors:

- the number of fracture sets
- the orientation of the fracture sets
- the density of the fracture surfaces (spacing)
- the aperture of the fractures (distance between walls of fractures), and
- the degree of interconnection of the fracture sets.

Fractured rock aquifers generally have a much lower capacity to transmit water than sand & gravel aquifers or sandstone aquifers. This lower capacity results from both a smaller amount of open space (porosity) and heterogeneities of the fracture patterns that are always present in the aquifer as compared to the primary permeability found in sand & gravel and sandstone aquifers. As a result, many fractured rock aquifers are limited in the amount of water they can reliably produce in the long term and should be assessed in a cautious manner.



## **5.0 Water Supply Wells and Water Quantity**

### **5.1 Well Construction Characteristics**

There is one existing water well on the Property with the following characteristics:

#### NSE #20,958: Summary of Characteristics

Total Depth	=	50.2 metres (90 feet)
Casing (15.2 cm; 6")	=	12.2 metres
Screens	=	none metres
Bentonite Grout	=	none metres
Static Water Level	=	4.9 metres BTC
Producing Aquifer	=	Bedrock (top at 5.5 metres)
Yield (Driller Estimate)	=	60 litres per minute
PID	=	4145 4133

A review of topographic maps and air photos indicates there are approximately 100 residential and commercial properties within 500 metres of the Property boundaries, all of which have private water wells (Figure #7).

Research of the NSE Groundwater Atlas and NSE Drilled Well Database indicates NSE has records for 60 of these drilled wells (Table #1 and Figure #7). The NSE Drilled Well Database indicates these drilled wells have total depths of from 27.4 to 129.4 metres with driller's estimates of yields of from 2 to 91 litres per minute<sup>2</sup>.

---

<sup>2</sup> Driller's estimates of well yield are made by the drilling contractor after completion of well construction and are always greater than the sustainable yield of the well.

## 5.2 Well Yields

A rough estimate of the anticipated yield of water wells to be constructed on the Property can be made using two methods: 1) using the Nova Scotia Department of Environment's Toolkit for Groundwater Assessments, and 2) comparing these results to driller's estimates of yields for the 60 well records within 500 metres of the Property that are in the NSE database.

### Method #1

For Method #1, it is assumed the future test wells will be constructed to total depths of 80 metres, the pumps will be installed to depths of 70 metres and the deepest static water level will be 10 metres below grade. Using the median transmissivity estimates for the granite aquifer in the NSE Toolkit of 1.15 m<sup>3</sup>/day/m and applying the Farvolden formula for generating a calculated estimate of yields ( $Q_{20}$ ), the results are as follows:

### Method #1

Total Depth of Well	=	80 metres (below ground surface)
Pump Depth	=	70 metres
Static Water Level	=	10 metres (below ground surface)
Saturated thickness	=	60 metres
Available drawdown ( $H_A$ )	=	45 metres (75% of saturated thickness)
Aquifer Transmissivity (T)	=	1.15 m <sup>3</sup> /day/m (NSE toolkit)
Safety Factor ( $S_f$ )	=	0.7
Estimated Yield (rounded)	=	24.7 cubic metres per day
	=	24,700 litres per day
	=	17 litres per minute (rounded)

$$Q_{20} = (0.683)(T)(H_A)(S_f)$$

(Farvolden Method)

## Method #2

The second method of predicting the yields of wells to be constructed on the Property is to examine the well construction and yield data for existing wells located within 500 metres of the Property.

Range of Well Depths	=	27.4 to 129.4	metres
Range of Driller's Estimates of Yield	=	2 to 91	litres/minute
Average (Median) of Driller's Estimates	=	18	litres/minute
50% of Average of Driller's Estimates	=	9	litres/minute

Therefore, the two methods of estimating yields of future wells to be constructed on the Property are in reasonable agreement.

The Driller's Estimate of well yield for the existing well on the Property at 60 litres per minute is significantly higher than the yields predicted by the two methods described above.

Table #1

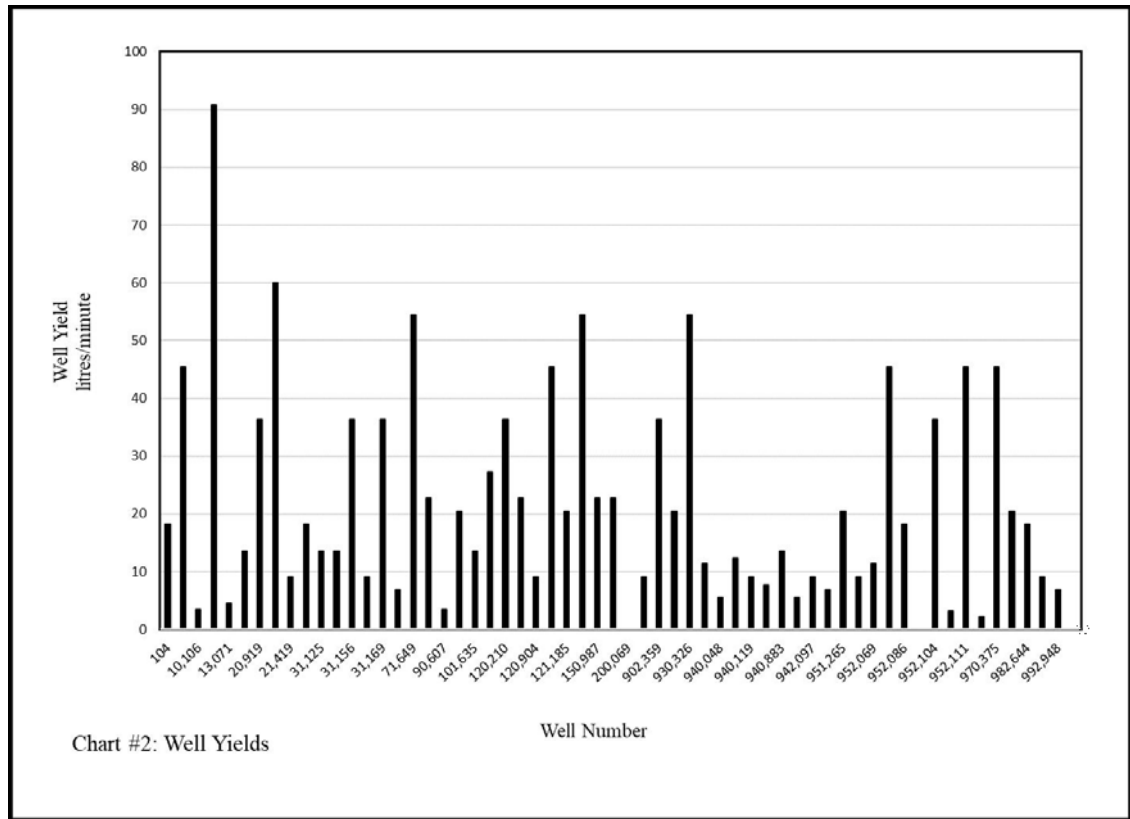
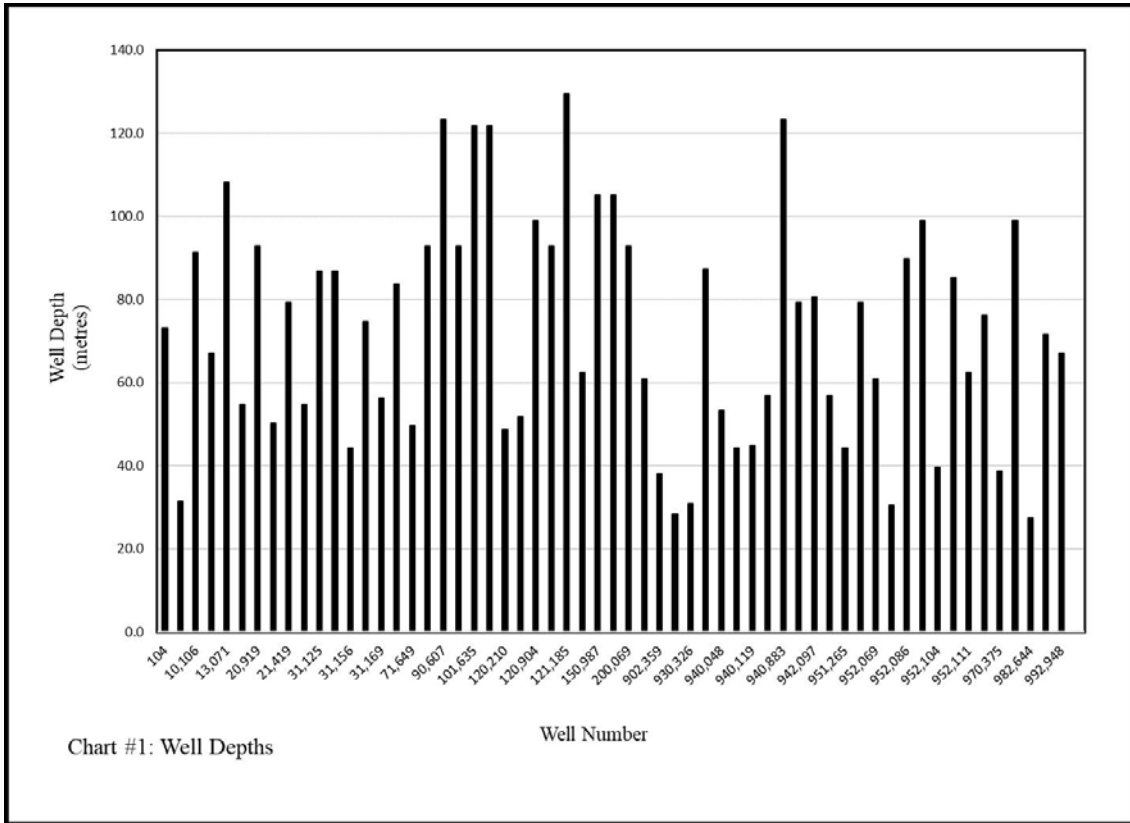
Sonny's Road Property

Summary of Drilled Wells in NSE Drilled Well Database

Well Number (NSE)	Date Completed year-mo-day	Address (as listed in NSE database)	Well Well Depth (metres)	Casing Depth (metres)	Top of Bedrock (metres)	Static Water Level (metres)	Yield (Lpm) L/min.
104	2000-08-03	Upper Tantallon	73.1	6.1			18
243	2000-09-12	Fox Hollow Drive	31.4	7.3	4.6		45
10,106	2001-08-17	13578 Highway #333, Tantallon	91.4	9.6	5.5		3
10,321	2001-10-23	Chandler Road	67.0	6.1	4.6		91
13,071	2001-12-20		108.1	6.1			5
20,397	2002-10-24	4 French Village Station Road	54.8	7.9	6.4	4.6	14
20,919	2002-08-12	Highway #213, Tantallon	92.9	18.3	9.1	10.7	36
20,958	2002-04-22	5249 St. Margaret's Bay Road, Tantallon	50.2	12.2	5.5	4.9	60
21,419	2002-05-01	Tantallon	79.2	18.3	12.2	3.0	9
30,230	2003-08-19	St. Margaret's Bay Road	54.8	12.2	6.7	4.6	18
31,125	2003-07-25	MC	86.8	5.6	4.3	9.1	14
31,151	2003-04-15		86.8	5.5	1.8		14
31,156	2003-05-15		44.2	5.5	3.0		36
31,165	2003-05-15		74.6		3.0		9
31,169	2003-03-15		56.3	5.5	3.0		36
40,185	2004-06-11	21 Fox Hollow Drive	83.7	6.4	1.2	3.7	7
71,649	2007-12-06	St. Margaret's Bay Road, HRM	49.6	14.0	10.7	3.7	54
90,553	2009-05-05	5152 St. Margaret's Bay Road, HRM	92.9	12.2	12.2	4.6	23
90,607	2009-07-29	5110 St. Margaret's Bay Road, HRM	123.3	16.8	10.7	7.6	3
90,608	2009-08-06	5110 St. Margaret's Bay Road, HRM	92.9	18.3	9.7	7.6	20
101,635	2010-11-11	13589 Peggys Cove Road	121.8	12.2	5.5	7.6	14
110,081	2011-03-04	26 French Village Station Road	121.8	12.2	10.1		27
120,210	2012-04-19	5210 St. Margaret's Bay Road (HIGHWAY #3)	48.7	6.1	4.9		36
120,211	2012-04-19	5210 St. Margaret's Bay Road(HIGHWAY #3), HRM	51.8	7.3	6.1		23
120,904	2012-08-17	French Village Station	99.0	12.2	1.8	4.6	9
121,184	2012-11-05	5110 St. Margaret's Bay Road, HRM	92.9	12.2	5.5	4.6	45
121,185	2012-11-01	5110 St. Margaret's Bay Road, HRM	129.4	12.2	3.0	3.0	20
150,986	2015-12-16		62.4	14.3	12.2	6.1	54
150,987	2015-12-09		105.1	15.2	12.2	6.4	23
150,989	2015-12-09		105.1	15.2	12.2	6.4	23
200,069	2020-12-08	5178 St. Margaret's Bay Road	92.9				
200,252	2020-09-25	52 Old School Road	60.9	24.4	21.3		9
902,359	1990-08-22		38.1	7.3	3.7	7.9	36
912,337	1991-06-28		28.3	6.1			20
930,326	1993-07-06	Tantallon	30.8	7.3		1.8	54
931,034	1993-10-26		87.4	8.2	4.9	2.4	11
940,048	1994-03-14	Fox Ridge Drive	53.3	13.4	9.1		5
940,060	1994-01-14		44.2	6.1	3.7		12
940,119	1994-06-14		44.8	6.7	2.4		9
940,130	1994-04-26	Fox Ridge Street	56.9	6.1	3.4		8
940,883	1994-11-03		123.3	6.1	3.4	6.1	14
941,441	1994-11-03		79.2			18.3	5
942,097	1994-11-15		80.7	6.1	3.4		9
950,093	1995-06-27		56.9	7.3	6.4		7
951,265	1995-12-14		44.2	6.1	4.3	3.7	20
951,913	1995-10-04	Fox Hollow Drive	79.2	6.1	4.6	6.1	9

Well Number (NSE)	Date Completed year-mo-day	Address (as listed in NSE database)	Well Well Depth (metres)	Casing Depth (metres)	Top of Bedrock (metres)	Static Water Level (metres)	Yield (Lpm) L/min.
952,069	1995-10-05	Birch Grove Drive	60.9	7.6	5.2		11
952,070	1995-10-10		30.5	6.1	0.9		45
952,086	1995-07-18		89.8	13.4	5.5	6.1	18
952,093	1995-07-21		99.0	7.3	4.9	10.7	
952,104	1995-03-31		39.6	12.2	9.1	8.2	36
952,106	1995-04-26		85.3	18.3	3.0		3
952,111	1995-05-23	Birch Grove Drive	62.4	9.7	6.7		45
960,335	1996-07-30	Old School Road	76.1	9.7	9.1	3.7	2
970,375	1997-06-19	MURRAY Road, Tantallon	38.7	6.1	3.4	2.4	45
982,583	1998-09-03		99.0	12.2	9.7	3.0	20
982,644	1998-10-01	20 Fox Hollow Road	27.4	6.1	4.6		18
992,839	1999-10-25		71.6	7.3	5.2		9
992,948	1999-12-17	St. Margaret's Bay	67.0	21.3	18.3		7
Minimum			27.4	5.5	0.9	1.8	2
Maximum			129.4	24.4	21.3	18.3	91
Average (Median)			73.1	7.8	5.2	4.9	18
Average (Mean)			72.5	10.1	6.5	5.9	23





### **5.3 Generalized Groundwater Flow Direction and Recharge**

Ambient and natural groundwater flow patterns are expected to be a subdued replica of the local topography which indicates flow toward the south and southeast. These groundwater flow patterns may be affected by nearby water wells that are withdrawing large volumes of groundwater.

Recharge to the bedrock aquifer underlying the Property is from rainfall and snow-melt infiltration both locally and in areas hydraulically upgradient of the Property. Watercourses in the area may provide a small component of recharge to the aquifer system.

### **6.0 Water Balance (Groundwater Recharge)**

Considering potable water for the development will be provided by a central water system with one or more water supply wells providing the raw water to the system, an estimate of groundwater recharge to the Property will be provided after the completion of test well drilling and pump testing of the wells (Level 2 GW Assessment).

### **7.0 Expected Water Quality**

The Property is located in a part of Nova Scotia that is considered to have low to medium risk of groundwater having elevated concentrations of uranium, iron, manganese and arsenic that may exceed the Guidelines for Canadian Drinking Water Quality.

## **8.0 Evaluation of Potential Effects**

### **8.1 Potential Well Interference**

Considering the Property is expected to have 1 or more water supply wells that will provide raw water to a central water system, a reasonable attempt at determining potential well interference will depend on the results of future test well drilling and hydraulic testing (a Level 2 Groundwater Assessment).

### **8.2 Potential Effects on Surface Water and the Environment**

The proposed development may have an influence on surface water resources by increasing the amount of impervious surfaces within the Property after full build-out. The degree to which the facility will affect surface water resources will depend on the amount of the Property covered by hard surfaces such as roofs, paved areas, concrete areas and lawns and the mitigating measures that are included in the development.

### **8.3 Risk of On-Site Septic Systems on Water Wells**

The waste water management plan for the Property is to construct an on-site septic system in accordance with Provincial guidelines.

## **9.0 Summary and Conclusions**

Current plans for the project are to build an 18,000 square feet commercial space on the lower floor of a multi-storey building with 30 residential, apartment style units on the upper floors. Anticipated water use by the project, at full build-out, are estimated by DesignPoint to be 16,000 litres per day.

The planned water supply to the Property is a central water system with the raw water being supplied by one or more drilled wells depending on the results of future groundwater resource assessments (Level 2 GW Assessment).

The anticipated demand for water at full build-out could be provided by a water well, or wells, with a long term sustainable yield of 12 litres per minute. The results of research of water well records and aquifer properties in the vicinity of the Property, indicate there is a moderate to high probability of constructing one or two wells that could provide sufficient quantity of water to the Property.

The Property is located in a part of Upper Tantallon that has a fairly high density of private water supply wells that service both residential and commercial operations. Therefore, potential interference with existing water supply wells may limit the daily water withdrawals from wells on the Property. See Recommendations in Chapter 10.0.

The Property is located in a part of Nova Scotia that is considered to have low to medium risk of groundwater having elevated concentrations of uranium, iron, manganese and arsenic that may exceed the Guidelines for Canadian Drinking Water Quality.

## **10.0 Recommendations**

In order to further evaluate the potential to develop groundwater resources on the Property, we recommend conducting a Level 2 Groundwater Assessment of the Property in accordance with the Provincial Guidelines.