Village of Lawrencetown
Source Water Protection Plan
- DRAFT

Prepared for the Village of Lawrencetown

November 2012

Table of Contents

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 Introduction

A Source Water Protection Plan (SWPP) is a working document to assist municipalities in cost-effectively maintaining a safe water supply for their communities. The SWPP identifies potential hazards and outlines simple and straight-forward pro-active approaches to prevent drinking water problems from occurring.

The Province of Nova Scotia has developed a multiple barrier approach that has three lines of defence:

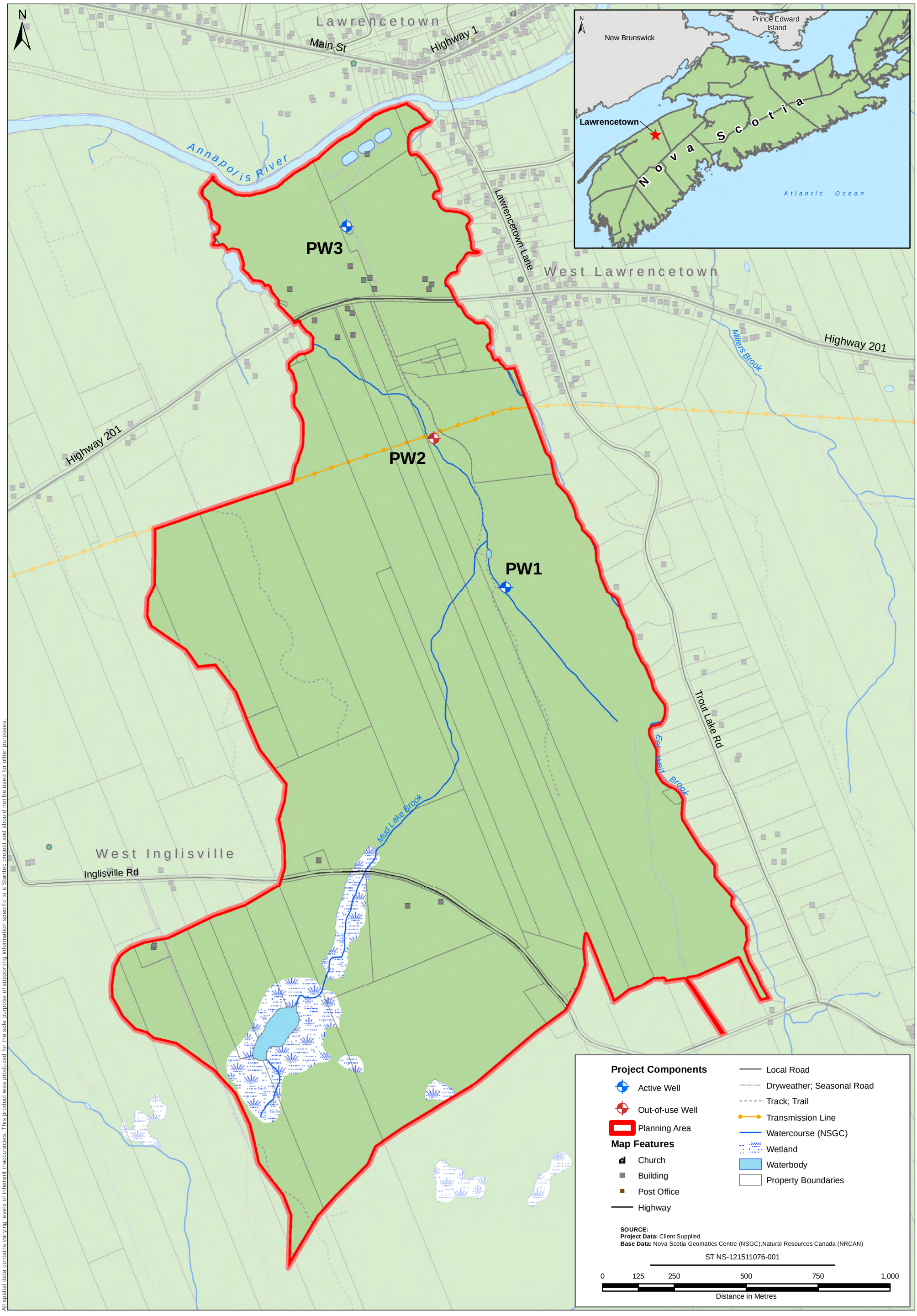
Keep clean water clean by selecting the highest quality sources of water and protect these sources from contamination;

Make the water safe by treating water to remove natural and manmade impurities; and

Prove the water is safe by consistently monitoring water quality and take swift, corrective action when deficiencies are identified.

1.1 BACKGROUND

The Village of Lawrencetown (Village) currently serves a population of approximately one thousand people, including the College of Geographic Sciences and several commercial operations. The Village obtains water from two municipal production wells (PW1 and PW3) located on the south side of the Village. An additional production well, PW2, is currently out-of-service due to water quality and low yield concerns, but has not been decommissioned as it could be brought on-line in the future with proper treatment or could be used for local non-potable uses, such as fire service or recreation. See Figure 1 for a map of the Study Area and well locations. The water demand is estimated to range from 60,000 to 80,000 imperial gallons per day (40 to 55 imp. gallons per minute) (Hiltz *et al*. 2009). The current treatment and storage components of the water system consist of a chlorination system and an enclosed 400,000 gallon capacity reservoir that is located within a couple hundred feet of PW1.



PREPARED BY: K Taylor	Village of Lawrencetown Source Water Protection Plan	FIGURE NO.: 1
REVIEWED BY: C Shupe	**Study Area**	DATE: Oct 31, 2012
CLIENT:		Stantec

File Path: V:\1215\active\121510xxx\121511076_lawrenctown_swpp\geomatics\mapping\mxd\report\ST NS_121511076_001_Study_Area_20120817.mxd

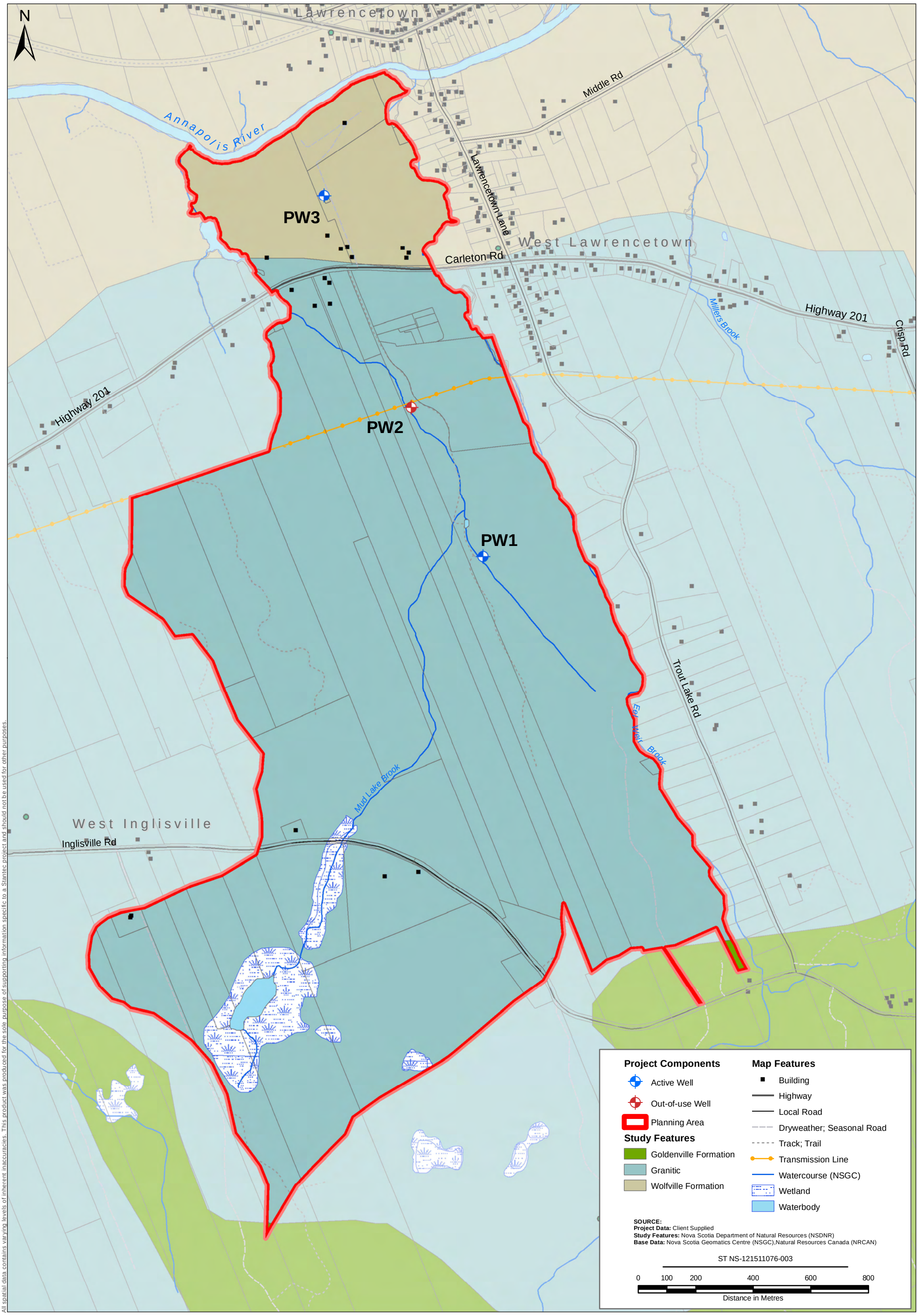
Production wells PW1 and PW2 are located near the flank of South Mountain and PW3 is located between Highway 201 and the Annapolis River. PW1 and PW3 have been determined through a Step 1 assessment to not be **g**roundwater **u**nder the **d**irect **i**nfluence of surface water (*e.g.*, non-GUDI), whereas PW2 is considered to potentially be a GUDI well. Table 1 summarizes available production well information (Hiltz *et al*. 2009).

Table 1 Summary of Production Well Construction Details – Village of Lawrencetown, N.S.

	PW1	PW2	PW3
Drill Date	1949 (2002)[1]	1997	2008
Elevation (m)[2]	85.0	43.0	26.0
Depth (m)	59.7	74.1	51.8
Diameter (mm)	152	203	203
Casing (m)	21.9	24.4	21.3
Screen stabilizers (m)	open hole	44.2-50.3; 62.4-65.5	24.4-30.5; 42.7-48.8
Overburden (m)	unknown	18.3	18.3 glacial till
Aquifer	Granite	Sandstone; Granite	Sandstone
Pumping Rate (igpm)	55	30	83.6
Static Water (m)	33.5	Flowing	10.8
Transmissivity (m^2/d)	23.4	4.5	40.1
Specific capacity (m^2/d)	39.2	6.4	67.2
Safe Yield (igpm)	48.9	23	83.6

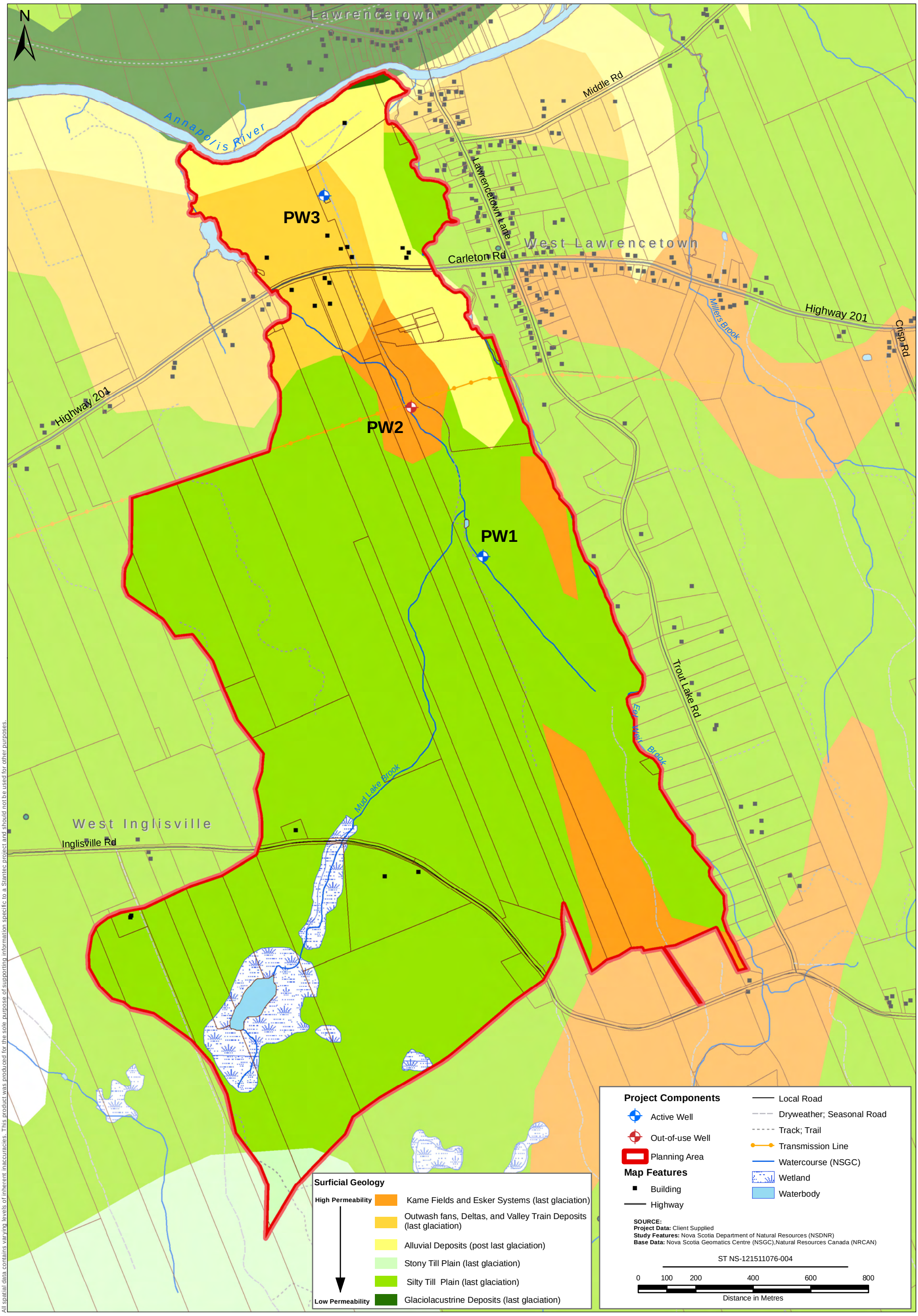
1. *PW1 cleaned and well head upgraded 2002 ; 72 Hr. Pump Test July 17/04*
2. *Approx. elevation from Figure 4.*

A detailed description of site surficial and bedrock geology is included in previous reports (JWEL 2004a; 2004b). Bedrock and surficial geology information is included on Figures 2 and 3, respectively. Of note is that pumping well PW1 is established in a granitic bedrock aquifer with silty glacial till overburden on relatively steep slope, which would limit the infiltration of surface water and potential contaminants. PW3 is drilled in the Wolfville sandstone aquifer, overlain by outwash fans, deltas and valley train deposits, which are expected to exhibit stratified deposits of varying permeability. Out-of-use PW2 was installed at the sandstone/granite contact and is overlain by the more permeable stratified sand and gravel deposits of kame fields and esker systems. Ranked by degree of overburden protection, water supply well PW1 is the most protected and well PW2 is least protected, with the overburden at water supply well PW3 offering moderate protection. It is noted that based on observations during drilling, the Wolfville sandstone/granitic boundary is further south (south of PW2) than what is shown on current NSDNR bedrock mapping, included as Figure 2.



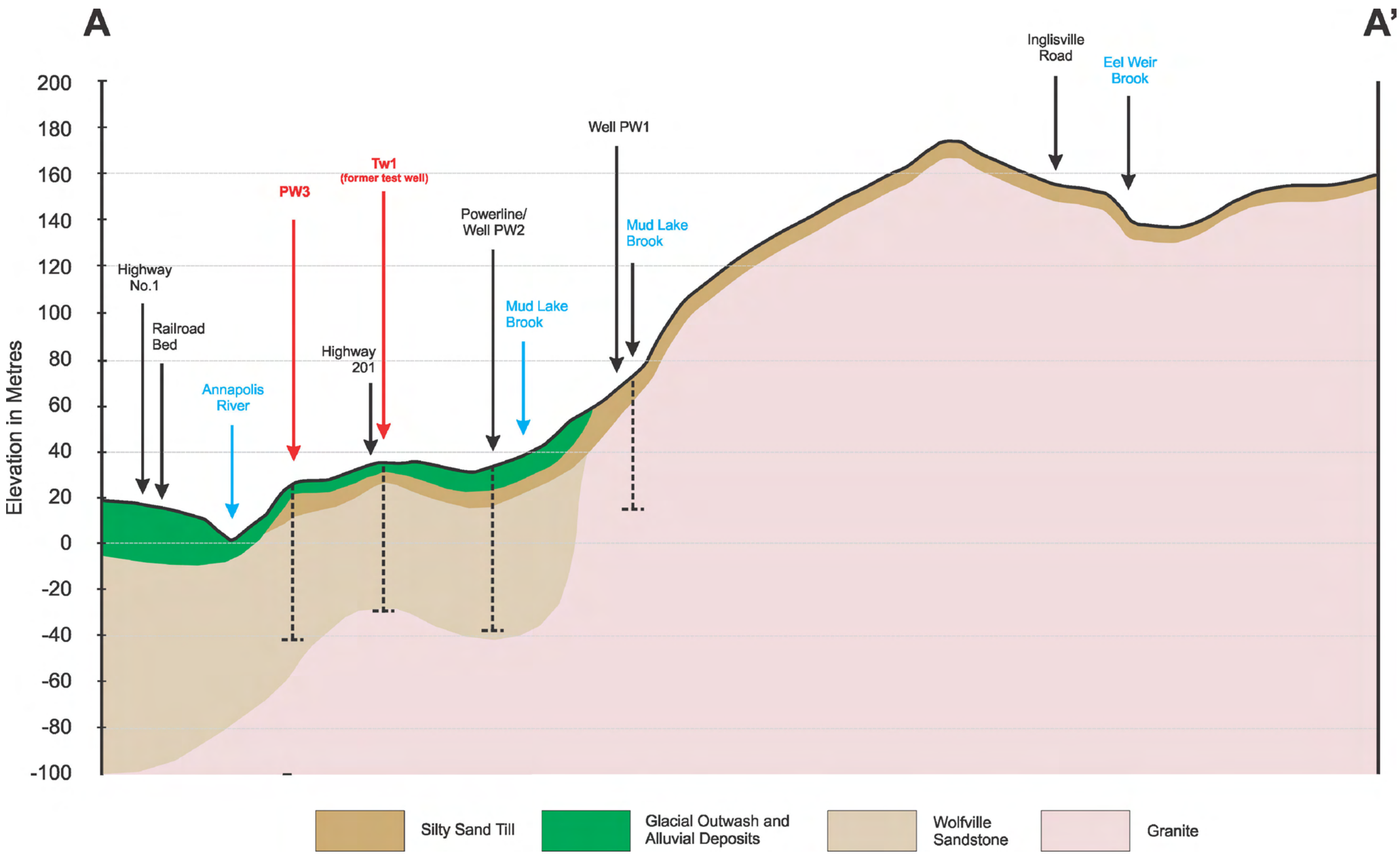
PREPARED BY: K Taylor	Village of Lawrencetown Source Water Protection Plan	FIGURE NO.: 2
REVIEWED BY: C Shupe	**Bedrock Geology**	DATE: Oct 31, 2012
CLIENT:		Stantec

File Path: V:\1215\active\121510xxx\121511076_lawrenctown_swpp\geomatics\mapping\mxd\report\ST NS_121511076_003_Bedrock_20120815.mxd



PREPARED BY: K Taylor	Village of Lawrencetown Source Water Protection Plan	FIGURE NO.: 3
REVIEWED BY: C Shupe	**Surficial Geology**	DATE: Oct 31, 2012
CLIENT:		Stantec

File Path: V:\1215\active\121510xxx\121511076_lawrenctown_swpp\geomatics\mapping\mxd\report\ST NS_121511076_004_Surficial_20120815.mxd



ST NS-121511076-010

Approximate Horizontal Scale 1:18,000
Approximate Vertical Scale 1:10

PREPARED BY: K Taylor	Village of Lawrencetown Source Water Protection Plan
REVIEWED BY: C Shupe	**Conceptual North to South Geological Cross Section Through Study Area**
CLIENT:	FIGURE NO.: 4
	DATE: Nov 23, 2012

File Path: V:\1215\active\121510xxx\121511076_lawrenctown_swpp\geomatics\mapping\mxd\report\ST NS_121511076_010_Cross_Section_20121026.mxd

1.2 METHODOLOGY

The Source Water Protection Advisory Committee followed the Nova Scotia Environment 2004 Guidelines for the development of the source water protection plan identified in Section 1.4. Public participation was sought through surveys conducted with residents within the source water protection area. A public meeting is planned following the development of the draft source water protection plan, after which this report will be updated.

1.3 LIMITATIONS AND ASSUMPTIONS

Information presented in this report is based on historical data and data provided by the Village of Lawrencetown. A model was developed in 2004 for the Village of Lawrencetown and revised in 2007 (JWEL 2004b; 2007). The output of the 2007 model was used as the basis of this report; no additional modeling was performed. This report assumes the PW1 and PW3 pumping scenario modeled in 2007 (Jacques Whitford, 2007). Should PW2 once again come back into production, the current model will require revision. In addition, if the overall total pumping rate changes, it is strongly recommended that the current model be revised.

1.4 NOVA SCOTIA SWPP PROCESS

Nova Scotia Environment and Labor (now Nova Scotia Environment) has published a five part series of technical documents that provide detailed guidance for those who have to deliver effective source water protection plans (NSE 2004). The NSE Guidance outlines a five step process for the development of a SWPP. The Village of Lawrencetown has followed the suggested process including the five steps as follows:

- **Step One:** Form a Source Water Protection Advisory Committee;
- **Step Two:** Delineate the Source Water Protection Area Boundary;
- **Step Three:** Identify Potential Contaminants and Assess Risks;
- **Step Four:** Develop and Adopt a Source Water Protection Management Plan; and
- **Step Five:** Monitor and Evaluate the Plan.

An outline of each step is provided in the following sections of this Plan.

2.0 STEP 1: Source Water Protection Advisory Committee

Step 1 involves the formation, selection and identification of responsibilities and objectives of a Source Water Protection Advisory Committee.

Form an Advisory Committee	• Define goals and objectives and review consensus process • Determine the stakeholders, members of the public, residents, business, government agencies, and environmental groups • Choose representative stakeholders • Set out the Terms of Reference • Officially recognize the committee and its mandate (including its goals, objectives and Terms of Reference)

The Source Water Protection Advisory Committee (Advisory Committee) generally includes three residents of the Village with at least one resident who lives within the source water protection area, two Village Commissioners, the Municipality of the County of Annapolis Councillor for the area, one technical representative from Municipality of the County of Annapolis, two technical representatives from the Village of Lawrencetown, and representatives from each of the NS Department of Transportation and Infrastructure Renewal, NS Department of Natural Resources and NS Department of Environment. The Terms of Reference were established for the committee on February 2012 and are provided in Appendix A.

The Advisory Committee meets regularly, including the Advisory Committee workshop held on September 13 2012. The minutes of regular meetings are available at the Village Office.

3.0 STEP 2: Define Well Field Protection Boundaries

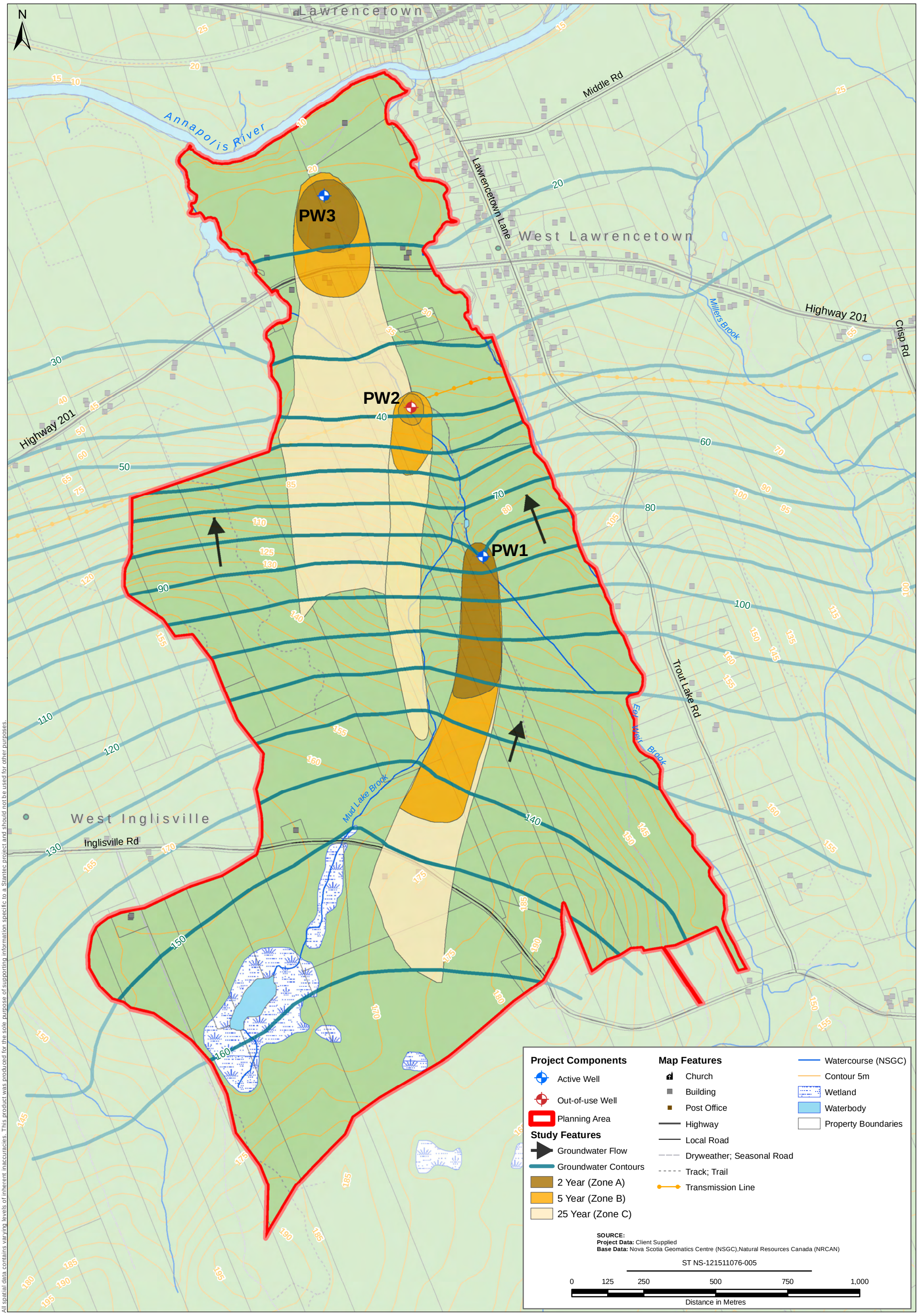
The intent of this Step is to identify and delineate the boundary of the source water supply area, referred to as the Source Water Protection Area (SWPA).

Delineate Boundary	• Gather information on watershed and/or aquifer • Delineate the source water area boundary • Gather information on land ownership, development patterns, and land use activities • Determine portions that should be excluded or added • Delineate the source water protection area boundary

Prior to the installation of the newest production well PW3, groundwater modeling was performed (based on pump test results and regional hydrogeological properties) to delineate theoretical capture zones for pumping wells PW1 and PW3 (JWEL 2004b, 2007). During preparation of this SWPP, the model parameters were reviewed and it is considered to be adequately conservative and reflective of current pumping conditions.

Groundwater modeling was previously performed for the PW1 and PW2 pumping scenario (JWEL, 2004b). It should be noted that modeling has not been performed for the PW2 and PW3 pumping scenario, a scenario where all three wells are pumping together or if the wells are operating at higher pumping rates. If one of these situations are anticipated, additional modeling simulations should be completed to revise the individual well capture zones.

The location and capture zones for the three wells, as well as groundwater flow, are shown on Figure 5.



PREPARED BY: K Taylor	Village of Lawrencetown Source Water Protection Plan	FIGURE NO.: 5
REVIEWED BY: C Shupe	**Capture Zones**	DATE: Oct 31, 2012
CLIENT:		Stantec

File Path: V:\1215\active\121510xxx\121511076_lawrenctown_swpp\geomatics\mapping\mxd\report\ST NS_121511076_005_Capture_Zones_20120817.mxd

In addition to theoretical capture zones (2-year, 5-year and 25-year) delineated during modeling for pumping wells PW1 and PW3, an exclusion zone in the immediate vicinity of each well was assigned to prevent impact with the well heads or the presence of potentially hazardous materials adjacent to the wells. In addition, for regulatory, environmental and practical purposes, it is good practice to manage a municipal water supply well field on a watershed basis in a manner similar to surface source water supplies, especially for land use and monitoring purposes. Because overland runoff can carry potential contaminants from other areas of the watershed into the designated protection zones, where they could theoretically recharge to groundwater, a fourth zone, Zone D, was also delineated. The boundary of Zone D is equivalent to the SWPA boundary and was delineated (based on topography) as the area in which overland surface flow is directed toward the supply wells or their respective capture zones.

The Lawrencetown SWPA therefore considers five water quality protection zones. The protection zones are defined as follows:

- Exclusion Zone (30 m around each well) - it is considered the distance groundwater travels in 90 days;
- Zone A - represents the distance groundwater travels in up to 2 years and provides protection from microbial and chemical contaminants;
- Zone B – represents the distance groundwater travels in 2 to 5 years and provides protection from all chemical contaminants, including petroleum hydrocarbons;
- Zone C – represents the distance groundwater travels in 5 to 25 years and provides protection from persistent and mobile organic and inorganic contaminants; and
- Zone D (SWPA) – the area considers overland surface flow directed toward the supply wells.

The predicted 2 year capture zone (Zone A) for pumping well PW1 extends approximately 470 m south of the well, the 5 year capture zone (Zone B) extends approximately 950 m south of the well, and the 25 year capture zone (Zone C) extends approximately 1,500 m south of the well. The maximum width of the 25 year capture zone is on the order of 300 m.

In the case of pumping well PW3, the 2 year capture zone (Zone A) extends approximately 210 m south of the well, the 5 year capture zone (Zone B) extends approximately 360 m south of the well, and the 25 year capture zone (Zone C) extends over 1,500 m south of the well. The maximum width of the 25 year capture zone is on the order of 500 m.

The source of recharge for all the wells is identified as the areas immediately surrounding and hydraulically up-gradient of each well to the south (Figure 5).

4.0 STEP 3: Hazard Identification and Risk Assessment

Step 3 identifies known and suspected point and non-point sources of groundwater quality impact within the SWPA, and provides a qualified opinion on the level of risk to the underlying groundwater resource.

Identify and Assess Risks to Water Quality	• Conduct an inventory and assessment of land-use and activities occurring within the source water supply area • Determine which land uses and activities impair or could impair water quality • Identify existing and potential sources of contamination • Assess the risk that each activity of source of contamination poses to the quality of source water • Compile all the information • Solicit Public Input

4.1 LAND USE INVENTORY

A detailed inventory of land use within the SWPA was developed based on results of a survey distributed to local residents within the SWPA. A survey was conducted in May 2010 to identify potential hazards within the 2 year zone at PW3. Including property owned by the Village of Lawrencetown, there are six properties that were contacted for the survey. The properties surveyed varied from vacant open fields, residential, winery and cranberry bogs. The results of the survey are provided in Appendix B. Additionally, data from the existing land use zoning, Service Nova Scotia's (SNS) Property On-line, and Nova Scotia Department of Natural Resources (NSDNR) GIS data were used in the development of the land use inventory. The land use inventory has been verified during meetings with the Advisory Committee. The Advisory Committee was given a map to identify current land uses within the SWPA.

The current land uses identified during these exercises are shown on Figure 6. Property ownership is shown in Figure 7 as well as Table 1 in Appendix C. The identified land uses include cemeteries, hay fields, farming activities, sewage treatment plant, scrap metal facility, water treatment plant, residential uses, power lines, and road ways.

N

3. Municipal Sewage Treatment Plant

Annapolis River

PW3

2. Cranberry Bogs

1. Scrap Metal / Debris

6. Winery

7. Cemetery

4. Highway 201

5. Nova Scotia Power Lines

PW2

9. Water Treatment Plant

PW1

10. Mud Lake Brook

8. Inglisville Road

Middle Rd

Lawrencetown Lane

West Lawrencetown

Highway 201

Crisp Rd

Trout Lake Rd

Mud Lake Brook

West Inglisville

Inglisville Rd

Project Components
- Active Well
- Out-of-use Well
- Planning Area

Study Features

Infrastructure
- Hydrant
- Valve
- Sewage Treatment Plant
- Treatment Building
- Laterals
- Agriculture
- Urban
- Beach
- Beaver Area
- Brush
- Clear Cut
- Corridor
- Forest
- Forest Alders
- Forest Dead / Regrowth
- Forest Partial Cut
- Forest Silverculture/ Plantation
- Gravel Pit
- Rock/Dune/Barren
- Waterbody
- Wetlands
- Municipal Sewer
- Municipal Water Distribution

Capture Zones
- 2 Year (Zone A)
- 5 Year (Zone B)
- 25 Year (Zone C)

Map Features
- Church
- Building
- Post Office
- Highway
- Local Road
- Dryweather; Seasonal Rd
- Track; Trail
- Transmission Line
- Watercourse (NSGC)
- Property Boundaries

SOURCE:
Project Data: Client Supplied
Base Data: Nova Scotia Geomatics Centre (NSGC),Natural Resources Canada (NRCAN), Nova Scotia Department of Natural Resources (NSDNR)

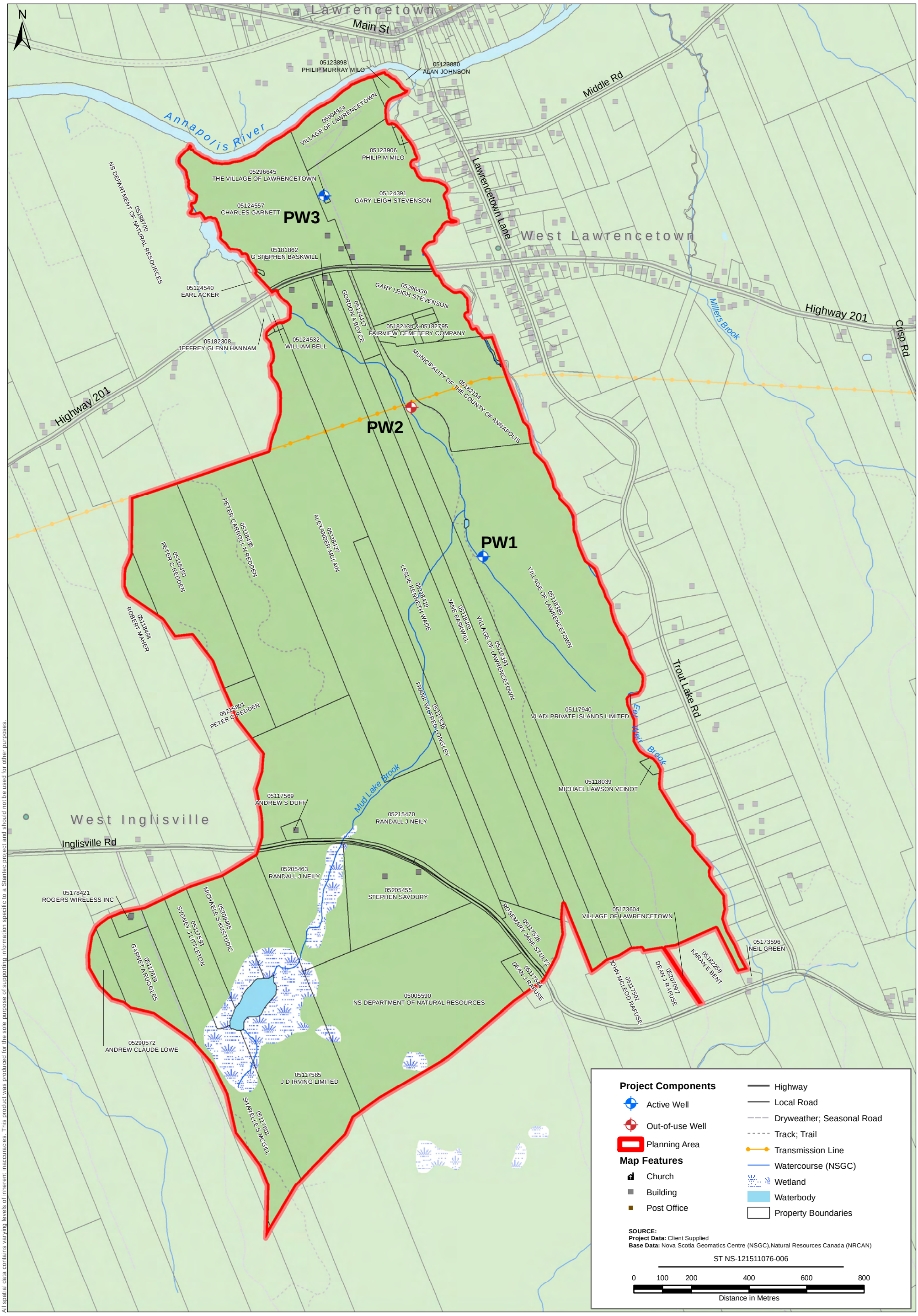
ST NS-121511076-002

0 100 200 400 600 800

Distance in Metres

PREPARED BY: K Taylor	Village of Lawrencetown Source Water Protection Plan	FIGURE NO.: 6
REVIEWED BY: C Shupe	**Land Use**	DATE: Oct 31, 2012
CLIENT:		Stantec

File Path: V:\1215\active\121510xxx\121511076_lawrenctown_swpp\geomatics\mapping\mxd\report\ST NS_121511076_002_Land_Use_20120815.mxd



PREPARED BY: K Taylor	Village of Lawrencetown Source Water Protection Plan	FIGURE NO.: 7
REVIEWED BY: C Shupe	**Property Ownership**	DATE: Oct 31, 2012
CLIENT:		Stantec

File Path: V:\1215\active\121510xxx\121511076_lawrenctown_swpp\geomatics\mapping\mxd\report\ST NS_121511076_006_Property_Ownership_20120823.mxd

4.2 LAND USE HAZARDS

4.2.1 Potential Contaminant Types

Potential groundwater contaminants can be divided into two broad categories, microbial contaminants and chemical contaminants. The chemical parameters can be further sub-divided into naturally-occurring and anthropogenic (man-made).

4.2.1.1 Microbial Contaminants

Microbial contaminants, or pathogens (*e.g.*, bacteria and viruses), are microscopic organisms that may produce disease in humans. Typical sources of pathogens in groundwater include private septic systems, municipal wastewater treatments systems, surface water runoff, and agricultural activities (*e.g.,* manure storage and application). Bacterial pathogens are generally of concern only within Zone A due to their limited lifespan and larger size, which limits their mobility. Viral pathogens are considerably smaller than bacteria, can persist over long time periods, and are mobile in most groundwater environments. Protection is best afforded by low permeability materials containing clay that can effectively adsorb and retard virus movement, and by the chlorination-disinfection procedures mandated for municipal water supplies.

4.2.1.2 Naturally-Occurring Chemical Contaminants

The potential for naturally-occurring contaminants is largely related to the geology of the aquifer. The Lawrencetown wells are installed within either a granite aquifer (PW1) or a sandstone aquifer (PW3). Well PW2 is installed at the granite/sandstone contact.

Granite aquifers in Nova Scotia typically produce a good quality groundwater to drilled wells. Based on over 80 analyses from around the province (NSDNR Interactive Groundwater Inventory, 2010), the groundwater is typically described as a clear, medium-soft (mean hardness 67 mg/L), naturally acidic (mean alkalinity 56 mg/L, mean pH 7.1), calcium-bicarbonate water type of low dissolved solids (mean TDS 135 mg/L). While most parameters typically meet drinking water guidelines, local exceedences can occur for arsenic, uranium, radon, and fluoride. Areas with thin overburden in the vicinity of organic wetlands can also exhibit elevated concentrations of iron and manganese. Based on the NSDNR interactive groundwater inventory, plutonic rocks in Nova Scotia have geometric mean concentrations of arsenic 2.55 ug/L (N= 87), uranium 3.1 ug/L (N = 79), iron 115 ug/L (N = 76), manganese 33.6 ug/L (N = 106), and fluoride 0.24 mg/L (N = 76).

In comparison, four analysis of PW1 (2002, 2005, 2010, 2012) indicates a similar clear, soft (mean hardness 32 mg/L), naturally acidic (mean alkalinity 35 mg/L, mean pH 7.2), calcium-bicarbonate water type of low dissolved solids (mean TDS 71 mg/L). All parameters except arsenic (range 13 to 14, mean 13.5 ug/L (N=3)) typically meet the drinking water guidelines. Mixing this water with PW3 (mean As 4.4 ug/L) is expected to keep concentrations below the guideline in the treated water (2 to 6.1, mean 4.7 ug/L noted in available data).

The **Wolfville sandstone aquifers** in Nova Scotia typically produce a good quality groundwater to drilled wells. This aquifer typically produces a clear, medium-hard (mean hardness 109 mg/L), neutral (mean alkalinity 102 mg/L, mean pH 7.8), calcium-bicarbonate water type of low dissolved solids (mean TDS 199 mg/L). Depending on location, this aquifer can exhibit elevated concentrations of hardness, bicarbonate, salinity, and uranium. Limited data for PW3 (2008, 2009, 2012) indicates a clear, medium-hard (mean hardness 92 mg/L), neutral (alkalinity 87 mg/L, mean pH 7.8), calcium-bicarbonate water type of low dissolved solids (mean TDS 175 mg/L) with all parameters falling within drinking water guidelines (one anomalous Mn detect).

Based on a review of the aquifer type and a limited review of chemistry data, low level arsenic exceedences in granitic aquifer waters of PW1 are the only naturally occurring hazard identified for the Lawrencetown wells. This issue is currently controlled through mixing with water from PW3. A proactive monitoring program (discussed in Section 6) is critical to identifying increasing trends and taking early mitigative action.

4.2.1.3 Antropogenic Chemical Contaminants

With the exception of naturally-occurring arsenic, potential hazards to the Lawrencetown wells are considered to be essentially man-made.

Different chemical contaminants have different toxicity levels and behave differently in the natural environment. Some degrade quickly and have low toxicity, while others may take years to degrade and are toxic at low levels. The further the contaminant source is from the water supply source, the greater opportunity for degradation and dilution before impacted water reaches the water supply.

Chemical contaminants that are readily degraded in the natural environment include petroleum hydrocarbons, such as gasoline, fuel oil, and diesel fuel, and most lower atomic weight volatile organic compounds that tend to volatilize and biodegrade relatively quickly within short distances of transport.

Chemical contaminants that are persistent and/or mobile in nature include chlorinated solvents found in paint thinners, dry cleaning chemicals, and engine cleaners; polychlorinated biphenyls (PCBs) found in electrical equipment and other materials; polycyclic aromatic hydrocarbons (PAHs) that result from incomplete combustion of coal, wood, and petroleum fuel; pesticides and herbicides; road salts; and nutrients (nitrogen, phosphorus) from fertilizers, manure, septic systems, and wastewater treatment systems.

4.2.2 Potential Contaminant Sources

Potential contaminant sources (point and non-point) and risks to the water source (aquifer) within the established source water protection zones were identified using the land use mapping, windshield surveys, property owner survey data supplied by the Village, and additional anecdotal information supplied by members of the Source Water Protection Committee and

other community members. These included: barns, manure piles and farm fields, waste sites, chemical storage areas, above or below ground oil tanks, septic fields, wastewater treatment stations, roads and parking lots, *etc*.

When assessing the level of risk of a potential contaminant, consideration was given to the chemical and physical properties of the contaminant, the attenuation properties of the aquifer materials, especially overburden, and its location within the SWPA. The risk ranking is based on severity of impact, should a significant release occur, and did not estimate the probability of such an occurrence.

A complete list of potential sources of contamination and identified risks, and the degree of risk to the underlying groundwater, is found following in Table 2 and Table 3. Figure 8 indicates the location of point sources with an overlay of Zones A, B, C and D (SWPA).

Table 2 Potential Sources of Contamination – Point Sources

Scale of Problem Ranking: 1= Very High Risk, 2 = High Risk, 3 = Moderate Risk, 4 = Low Risk, 5 = Very Low Risk

Map ID No.	Potential Contaminant – Point Sources	Potential Hazard	Chemical			Microbial	Well Site 90 Day	A 2yr	B 5yr	C 25yr	D >25yr
			Degrading	Persistent	Mobile						
1	Scrap metal / debris* (PID 05124391)	Petroleum hydrocarbons	√					1	2		
		Solvents			√			1	2		
		Metals (typically bind to soils)		√	varies			3	4		
2	Cranberry bogs (PID 05124557)	Septic system				√		2	3	5	5
		Petroleum hydrocarbons	√					1	2	4	5
		Fertilizers		√	varies			2	3	3	5
		Pesticides/herbicides		√	varies			2	3	3	5
3	Municipal Sewage Treatment Plant (STP)	Pathogens – although located in Zone D, short distance (<200 m), potential flooding, different pumping conditions, *etc*. may increase risk.				√					2
4	Highway 201*	Road salt		√	√				3	4	5
		Herbicides		√	varies				3	3	5
		Runoff – hydrocarbons	√						3	4	5
		Potential spills	√	√	√				2	3	4
5	NSPI Power Lines	PCBs		√						5	5
		Herbicides		√	varies				3	3	5
		Treated utility poles		√	varies				5	5	5
		Petroleum hydrocarbons - spills							4	4	5
6	Winery (PID 05118419)	Septic system				√			3	5	5
		Heating oil	√						2	4	5
7	Cemetery**	Pathogens				√				5	5
		Fertilizers		√	varies					4	5
		Pesticides/herbicides		√	varies					4	5
		Embalming chemicals	varies	varies	varies					4	5
8	Inglisville Road**	Road salt		√	√					4	5
		Herbicides		√	varies					4	5
		Residential fuel oil and septic fields				√				5	
		Runoff – hydrocarbons	√							5	5
		Potential spills	√	√	√					4	5

Table 2 Potential Sources of Contamination – Point Sources

Scale of Problem Ranking: 1= Very High Risk, 2 = High Risk, 3 = Moderate Risk, 4 = Low Risk, 5 = Very Low Risk

Map ID No.	Potential Contaminant – Point Sources	Potential Hazard	Chemical			Microbial	Well Site 90 Day	A 2yr	B 5yr	C 25yr	D >25yr
			Degrading	Persistent	Mobile						
9	Water Treatment Plant	Chlorine storage	√								5
10	Mud Lake Brook	Pathogens				√				5	5
*Ranked as a high priority by the Advisory Committee **Ranked as a medium priority by the Advisory Committee											

Table 3 Potential Sources of Contaminants – Non-Point

Scale of Problem Ranking: 1= Very High Risk, 2 = High Risk, 3 = Moderate Risk, 4 = Low Risk, 5 = Very Low Risk

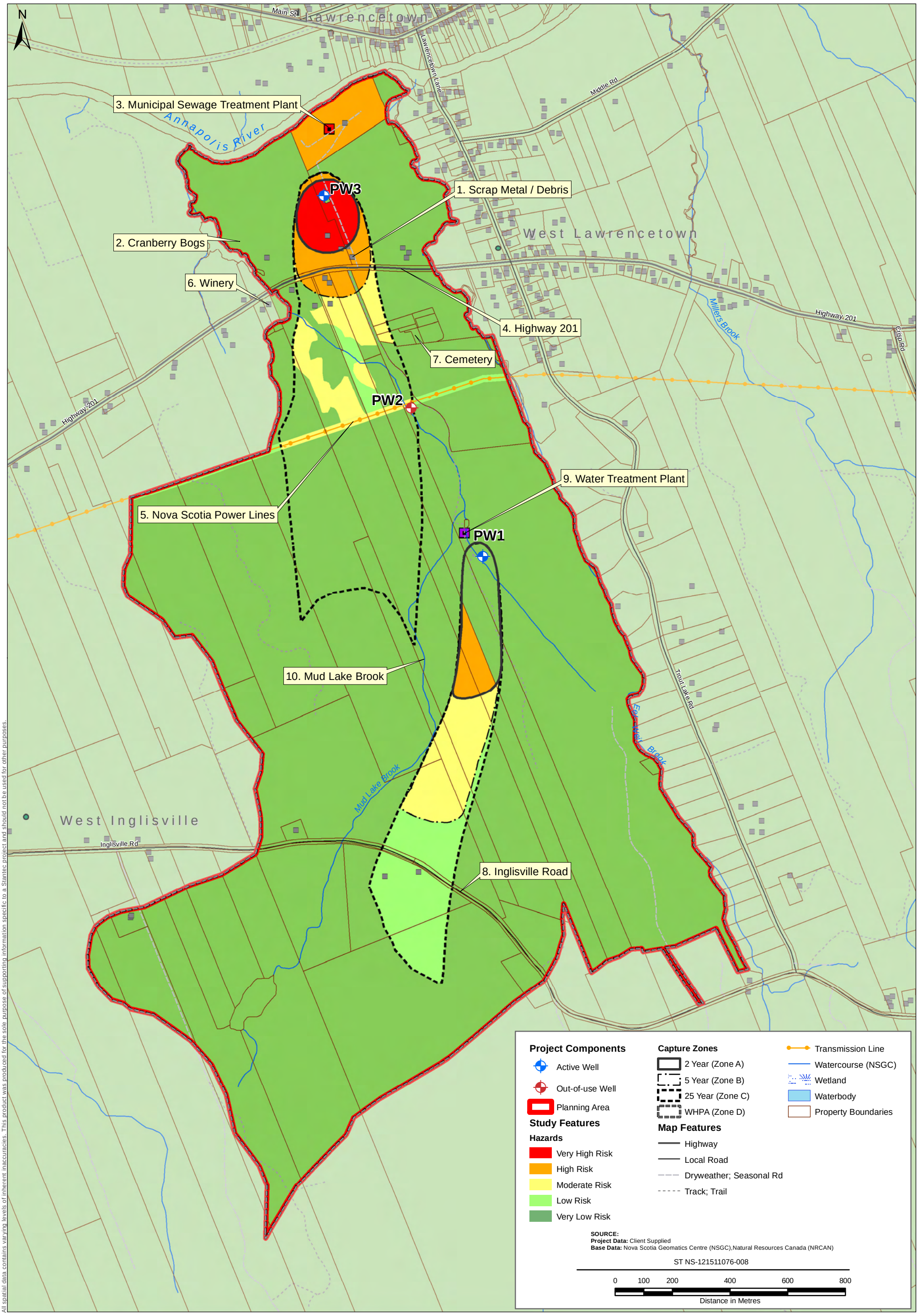
Potential Contaminant – Non- Point Sources	Potential Hazard	Type				Zone / Scale of Problem				
		Chemical			Microbial	Well Site 90 Day	A 2yr	B 5yr	C 25yr	D >25yr
		Degrading	Persistent	Mobile						
Agriculture / Livestock / Hay Fields*	Pathogens (manure)				√		1	3	5	5
	Fertilizers		√	varies			2	3	3	5
	Pesticides/herbicides		√	varies			2	3	3	5
	Petroleum hydrocarbons (machinery fuel – spills)	√					1	2	4	5
Septic systems*	Residential – pathogens				√	1	1	3	4	5
Heating oil tanks*	Residential	√				1	1	2	4	5
Gasoline	Residential – lawnmowers, *etc*.	√				1	2	3	5	5
Diesel*	Agricultural	√				1	1	2	4	5
Roadways*	Road salt		√	√		1	2	3	4	5
	Herbicides		√	varies		1	2	3	3	5
	Runoff – hydrocarbons	√				1	2	3	4	5
	Potential spills	√	√	√		1	1	2	3	4

Table 3 Potential Sources of Contaminants – Non-Point

Scale of Problem Ranking: 1= Very High Risk, 2 = High Risk, 3 = Moderate Risk, 4 = Low Risk, 5 = Very Low Risk

Potential Contaminant – Non- Point Sources	Potential Hazard	Type				Zone / Scale of Problem				
		Chemical			Microbial	Well Site 90 Day	A 2yr	B 5yr	C 25yr	D >25yr
		Degrading	Persistent	Mobile						
Pesticides / Herbicides	Residential		√	varies		2	2	3	4	5
	Agricultural		√	varies		1	2	3	3	5
Fertilizers	Residential		√	varies		2	2	3	4	5
	Agricultural		√	varies		1	2	3	3	5
Manure*	Agricultural				√	1	2	4	5	5
Pool Maintenance Chemicals	Residential	√				2	2	4	5	5
	Municipal	√				1	2	3	4	5
Cleaning Agents	Residential	varies	varies	varies		2	3	4	5	5
	Agricultural	varies	varies	varies		2	3	4	4	4
Municipal Sanitary and Storm Sewer	Leaking lines				√	1	2	4	5	5
Flooding	Surface infiltration to well – STP				√	1	2	5	5	5
Forestry / Silviculture	Fire / Road Construction – Sedimentation	n/a	n/a	n/a	n/a	3	4	4	5	5
	Fire Suppression Chemicals	varies	varies	varies		1	2	3	4	5
	Petroleum hydrocarbons - spills	√				1	2	3	4	5
	Pesticides		√	varies		1	2	3	4	5
Private Abandoned Wells	Potential conduit for contaminant transport	varies	varies	varies	√	1	3	3	4	5

*Ranked as a Medium to High priority by the Advisory Committee



PREPARED BY: K Taylor	Village of Lawrencetown Source Water Protection Plan	FIGURE NO.: 8
REVIEWED BY: C Shupe	**Hazards**	DATE: Oct 31, 2012
CLIENT:		Stantec

File Path: V:\1215\active\121510xxx\121511076_lawrenctown_swpp\geomatics\mapping\mxd\report\ST NS_121511076_008_Hazards_20120906.mxd

4.3 PRIORITY HAZARDS

The Advisory Committee met for a one day workshop to discuss land use hazards priority and potential management options. Members were provided with a copy of Table 2 and Table 3 above to identify which potential hazards pose the greatest risk and which hazards were a priority to the Village. The point and non-point hazards of highest priority are included in Table 4 along with the rationale for selection. These potential hazards became the focus for identifying management options as is outlined in Section 5.0.

Table 4 Hazard Priority

Potential Hazard	Priority	Rationale
Agriculture / livestock / hay fields	High	• Dependent on location – agricultural lands near well field higher priority • Consider future uses of agricultural lands • Potential future use for Biomass production
Scrap metal / debris	High	• Former Department of Lands and Forest with chemical storage/usage • Use of chemicals or solvents
Highway 201	High	• Road salt or potential spills
Cemetery	Medium	• Historical burial practices unknown • Close to Zone B
Inglisville Road	Medium	• Located at the top of hill therefore potential for spills to run into the source water protection area • Illegal dumping along roadway
Land inside Zone A	High	• Current and future land uses within Zone A have high potential to affect existing and future water quality
Land inside Zone B	High	• Current and future land uses within Zone B have high potential to affect existing and future water quality
Septic systems	Low - High	• Dependent on location and proximity to the production wells
Heating oil tanks	Low - High	• Dependent on location and proximity to the production wells
Diesel fuel use and storage	Medium	• Commonly used for agriculture and/or residential activities
Roadways	Medium – High	• Potential for chemical or fuel spillage • Road salt • Illegal dumping
Manure	Medium	• Cattle on nearby farmland

5.0 STEP 4: Management Plan

Step 4 focuses on the development and implementation of the management plan within the SWPA. Twelve potential risks/hazards were identified during Step 3 as having medium to high priority for the Village. Step 4 develops management options for those risks to water quality.

Management Plan	• Set Management Goals and Objectives • Identify Management Options for issues identified in Step Three • Develop Contingency Plan • Solicit Input from Stakeholders and the Public • Draft the Management Plan • Update Information

5.1 MANAGEMENT PLAN OBJECTIVES

The overall objective of the SWPP is to manage land uses within the defined protection zones to those which are compatible with, or limit impact to, the source aquifer. This will be highly applicable to any new or future development within the protection areas. However, in any watershed or well field protection planning process, there will be several cases where existing land uses do not conform to the SWPP. A management plan therefore addresses both existing and future uses, and aims to address water quality concerns by mitigating any potential negative future effects to the water supply. It is important that the management plan responds to the input of the public and key stakeholders so that the individuals within the source water protection area can design a coordinated management plan that builds upon existing programs and resources.

5.2 STRATEGIES TO MANAGE IDENTIFIED RISKS

A key component of the SWPP is the establishment of appropriate monitoring and management of the lands located within the established protection boundaries. The degree of monitoring and management would be dependent on the Zone, *e.g.*, highest for the 30 m exclusion, and lower for the more remote 0-2, 2-5 and 5-25 year transport Zones A, B and C, respectively.

Source water protection management options identified in the NSE 2004 Guidelines include: acquisition of land; best management practices (BMPs); land use bylaws and municipal

planning strategy; contingency planning; designation as source water protection area; and education and stewardship initiatives.

Table 5 NSE Suggested Management Options

Acquisition of Land	The most effective long term financial strategy is land acquisition, in other words, the direct purchase and ownership by the Village of Lawrencetown of lands within the SWPA. This management option allows one of the highest levels of water quality protection because the Village of Lawrencetown can control, survey and regulate the use of the lands within the supply area. However, based on practical considerations, and the size of the SWPA, this option would initially be applied to the more critical areas within the exclusion zone and zones A and B.
Bylaws	Land use planning in the form of a Municipal Planning Strategy or land use bylaws allows the Village of Lawrencetown and the Municipality of Annapolis County to manage future development and control land use near the protected areas. Currently a Lawrencetown Water Supply Area Land Use By-law (2008) is in place providing policies for source water protection. Within the Lawrencetown Water Supply Planning Area there are five zones each permitting different uses, which presently reflect the use of wells PW1 and PW2. These zones should be adjusted to reflect the presence of well PW3. The County will be requested to adjust these zones to reflect this SWPP, specifically the presence of well PW3.
Best Management Practices (BMPs)	BMPs for source water protection areas are standardized and widely accepted practices most effective and practical for preventing or reducing contaminants from reaching source water. There are BMPs for most activities that generally occur within the SWPA, including residential development, septic systems, oil tank installation, construction, agriculture and commercial activities. *Appendix D identifies a list of potential BMPs.*
Contingency Planning	Contingency planning identifies personnel, testing equipment, procedures and protocols to use in case of a contamination emergency in the source water protection area. The contingency plan generally identifies emergency contact personnel, emergency response procedures, and regulatory reporting criteria.
Designation	Designation of an area as a Protected Water Area is permitted by the Minister of Environment under Section 106 of the *Environment Act* given certain requirements are met. An area can be designated a Protected Water Area following a formal request, sufficient public consultation and development of regulations required to control or prohibit activities or development that may harm water quality.
Education and Stewardship	Education and stewardship initiatives can be an effective mechanism for protecting source water quality by educating stakeholders and residents. It is key to inform people who live and work within the water supply boundary of the importance of protecting the water supply and how they can help. Educating people on the importance of source water protection works to develop a sense of ownership and responsibility and move toward environmental stewardship.

5.3 IDENTIFIED MANAGEMENT OPTIONS

During the Advisory Committee workshop held September 13, 2012, members identified 12 potential risks as priority to the community. Management options for each risk were identified, shown in Table 6. The group was asked to consider whether or not the identified management option would require significant resources or expertise in its implementation. Subsequently the group was asked to prioritize their top management priorities. The results of this exercise and the management options receiving the highest Advisory Committee rankings are highlighted in yellow and * in the table following.

Table 6 Management Options

Risk	Option	Priority	Easy to Implement	Costly to Implement	Additional Expertise Required
Agriculture/ Livestock/ Hayfields	Bylaws and enforcement governed by best practice guidelines *	✓ (8)	✓ (2)		
	Creation of buffer zones as required	✓ (3)	✓ (2)		✓ (2)
	Soil testing within the (edge) of the capture zone		✓ (1)	✓ (6)	
Scrap Metal / Debris	Enforcement of County By Law – unsightly premises dangerous materials *	✓ (9)	✓ (4)		
	Acquisition of land			✓ (6)	
	Cooperative approach with landowner	✓(1)	✓(7)		✓ (1)
	Education and stewardship				
	Amend Municipal Planning Strategy (MPS) and Land Use Bylaw (LUB)				✓(1)
Hwy 201	Contingency planning (*e.g.*, remodel hazard specific plan, first responder, education) *	✓(7)			✓(4)
	Education and stewardship (*e.g.*, signage)		✓(5)		
	Designation			✓(3)	
	BMPs (*e.g.*, construction, drainage diversion, maintenance and salting)		✓(1)		✓(2)
Cemetery	Soil testing within capture zone *	✓ (4)		✓ (4)	
	Recommend best (modern) practice in burial methods	✓ (3)			✓ (5)
	Ask for government regulations regarding all cemeteries in water source areas	✓ (1)			
Inglisville Road	Cooperation between government department and village *	✓ (8)	✓(5)		
	Signage and education		✓(3)		
	Land Use Bylaw (LUB)		✓(1)		✓(2)
	Designated protective watershed area		✓(4)		✓(1)
	Contingency plans for potential spills		✓(1)	✓ (2)	✓(6)
Zone A (2-year capture zone)	Land acquisition	✓(1)		✓ (9)	
	Land Use Bylaw (LUB) *	✓(9)	✓(2)		
	Contingency planning (*e.g.*, remodel hazard specific plan, first responder, education)		✓(2)		✓(1)

Table 6 Management Options

Risk	Option	Priority	Easy to Implement	Costly to Implement	Additional Expertise Required
	Education and stewardship		✓(2)		
	BMPs through education on activities occurring		✓(1)		
	Designated protective watershed area				✓(3)
Zone B (5-year capture Zone)	By Law authority to inspect fuel / heating oil storage facilities *	✓ (7)	✓ (2)		
	Requirement for metal tanks to stand in containment units			✓ (3)	
	Inventory and testing of abandoned wells	✓ (1)			
	Bylaws and enforcement governed by best practice guidelines	✓ (1)			
Septic Systems	Extend sewer systems			✓(10)	✓ (1)
	Education / inspection *	✓(7)	✓(5)	✓(1)	
	Regular maintenance	✓ (1)	✓(2)	✓(2)	
Heating Oil Tanks	Education and stewardship *	✓ (5)	✓ (5)		
	Bylaws			✓(1)	
	Contingency planning			✓(1)	✓(1)
	BMPs	✓(1)			
Diesel	Soil testing			✓ (3)	
	By Law authority to inspect fuel / heating oil storage facilities *	✓ (4)			
	Requirement for metal tanks to stand in containment Units	✓ (2)	✓ (2)		
Roadways	Cooperation between government department and village *	✓ (9)	✓(3)		
	Education and stewardship (*e.g.*, signage)		✓(1)		
	Land Use Bylaw (LUB)				✓ (1)
	Designated protective watershed area				✓(2)
	Contingency planning for potential spills			✓(1)	✓ (4)
Manure	Education and stewardship	✓(1)	✓(4)		
	BMPs (Nutrient Management Plans) *	✓(8)	✓(1)	✓(2)	✓(1)
	Designation (Location, Storage)				✓ (2)

Note: (#) is the number of Advisory Committee members that chose that response during the workshop September 13 2012.

5.4 PRIORITY MANAGEMENT OPTIONS

The management options with highest priority have been expanded upon, including a description, objective, planned actions and implementation timeline.

This implementation plan is outlined in Appendix E and represents the actions the Village and key stakeholders will take to manage land use and hazards within the Source Water Protection Area Boundary and Capture Zones.

It is noted that these action items were identified as first priorities and are not exclusive of other management options outlined in Table 6. Action items will be reconsidered during the annual review process and the actions outlined in Appendix E will be updated and modified as needed in the annual report.

5.5 PUBLIC INPUT

The Public Consultation process has two main objectives; to educate the community in ways to protect water supplies, and to gain stakeholder support for the SWPP.

The successful implementation of the SWPP necessitates the full participation of the citizens and businesses of the Village of Lawrencetown. Public consultation has the following objectives;

- Convince the community that the protection of local water resources is a necessary and worthwhile endeavour;
- Educate the community on how the activities that take place on their property can affect the quality of the local water supplies;
- Promote the procedures for event reporting and Emergency Response;
- Through an open consultation process together with the County, refine the set of recommended land uses such that the objectives of source water protection are met without undue socio-economic impacts to the community;
- Provide clear instructions and guidelines on how citizens can manage property in a manner that will not pose a risk to water resources; and
- Provide a mechanism for the gradual phase-out of non-conforming land uses and the purchase of critical land areas near wells.

5.6 CONTINGENCY PLAN

As part of the implementation phase, a contingency plan will be developed for use in the event that the Village' water supply is threatened or compromised despite the measures undertaken as part of well field protection.

Generally the contingency plan should include at a minimum:

- Procedures for reporting and correcting deficiencies in water supply quality
    - A contingency plan will be activated if certain contaminant concentrations are detected above Preventive Action Limits (PALs) in monitoring wells or production wells during routine monitoring of production wells or specific point or non-point hazard sources, in the event of a major loss of one or more production wells due to natural causes or man-made accidents, or in the event of a major contaminant release event.
    - Preventive Action Limits are set percentages (determined by The Village of Lawrencetown, in consultation with NSE, and a groundwater consultant) of the Health Canada Drinking Water Guidelines (2010) for each contaminant of concern. With this system, problems can be identified and addressed before contamination reaches levels where human health risks may be manifested.
    - If a PAL is exceeded during routine monitoring, the Village will immediately notify NSE, retest, and begin an investigation to locate the source of contamination so that prompt action can be taken to avoid a public health threat.
- General procedures for routine emergencies or major emergencies within the Source Water Protection Area Boundary
    - The plan will also be activated in the event of an emergency within the Source Water Protection Area that threatens water quality.
    - In the event that a major event results in the temporary or partial loss of a well or well field, the contingency plan would address replacement water supply alternatives. These options would need to be considered during the implementation phase and may include:
        - provision of redundant pumps and controls to quickly rehabilitate a damage well system;
        - cross-connection to other well fields;
        - well rehabilitation or replacement at a location remote from the risk, or
        - emergency well drilling at pre-designated future exploration sites.
    - The plan would provide procedures for rapid deployment of resources to quickly repair or replace the loss of supply.
    - The plan should also identify a communication plan for critical information to be provided to emergency responders about the source water supply area.

- A procedure for equipment failure or inoperability in a major emergency and/or due to power failure

- This procedure would follow the same basic steps outlined for replacement water supplies under routine or major emergencies, with a focus on provision of redundant equipment.

- A procedure for dealing with spills or releases
  - This plan would be activated in the event of a spill or release within the Source Water Protection Area that threatens water quality.
  - The plan would clearly identify roles, responsibilities, and contact information of key personnel and agencies.
  - The plan would identify appropriate emergency responders and their 24-hour contact information.
  - The plan would identify a communication plan for critical information to be provided to emergency responders about the source water supply area.
  - The communication plan would also outline required and/or recommended communication with other stakeholders, including, but not limited to, NSE, the County, and residents of Lawrencetown.
  - The plan would include equipment and materials that may be necessary to respond to a spill or release and identify the responsibility for and location of these materials and equipment.
  - The plan would provide procedures for rapid deployment of resources to quickly contain the spill or release and protect, repair, or replace the loss of supply.
  - In the event that a spill or release results in the temporary or partial loss of a well or well field, the contingency plan would address replacement water supply alternatives. These options would need to be considered during the implementation phase and may include:
    - cross-connection to other well fields;
    - well rehabilitation or replacement at a location remote from the risk, or
    - emergency well drilling at pre-designated future exploration sites.

- Provision for an annual review and update by the Village of Lawrencetown

6.0 STEP 5: Monitoring Strategy

6.1 PURPOSE

The purpose of the monitoring program is to ensure that:

1) the plan is reviewed regularly and updated if it is not meeting its objectives;

2) changes in the state of the health of the SWPA are identified and evaluated; and

3) the plan remains current with changing conditions and priorities in the SWPA.

6.2 GROUNDWATER MONITORING PROGRAM

In addition to the regulatory compliance monitoring required under the Village of Lawrencetown's *Approval to Operate* and *Approval to Withdraw Water*, a groundwater monitoring program will be implemented.

6.2.1 Monitoring Parameters and Schedule

The groundwater monitoring program considers the potential contaminants that were identified in Section 4.0. The monitoring schedule is outlined in Table 7, below.

Table 7 Source Water Monitoring Schedule

Parameter	LOCATION	
	Water Supply PW1	Water Supply PW3
RCAp-MS	Every 2 years	Every 2 years
Coliform Bacteria	Twice per year	Twice per year
Turbidity	Weekly	Weekly
pH (field)	Quarterly	Quarterly
Pesticides (MAC/IMAC)	Every 5 years	Every 5 years
BTEX (MAC/IMAC)	Every 5 years	Every 5 years
VOCs (MAC/IMAC)	Every 5 years	Every 5 years

It is noted that Village of Lawrencetown may opt for a more rigorous sampling schedule. Additional cost and effort spent on early detection and correction of contaminants can prevent significantly greater cost and effort for wellhead rehabilitation or replacement.

Recognized and established protocols for sampling will be followed and the sampling will be conducted by qualified water utility personnel or a qualified third-party. Baseline data is available

for many of the parameters and will be used to identify water quality trends that may forecast degradation of the water supply.

6.3 SOURCE WATER PROTECTION AREA INSPECTION

The Village will visually inspect the SWPA on an annual basis, with particular focus on Zone A, to identify any new or changing land uses or activities that may impact source water quality. Every 3 to 5 years, or more frequently if a concern is identified, the Village will survey property owners within the SWPA.

The visual inspections and surveys, in addition to regular discussions with property owners, will assist in:

- assessing whether BMPs are being followed;
- determining if additional education efforts are required;
- identifying problems that are not being adequately addressed; and
- identifying activities that are in violation of bylaws or regulations that have been put in place to protect water quality.

6.4 WELL HEAD AND SECURITY INSPECTION

The Village will visually inspect the well heads and surrounding secure areas on a regular basis (presumably in conjunction with sampling program, however, a minimum of every six months). The visual inspection will document the condition of the wellhead and detect any possible tampering or damage in the area.

6.5 PLAN REVIEW AND UPDATE

The Source Water Protection Committee will review the plan annually and will update if necessary. Information gathered during the groundwater sampling and monitoring program and the SWPA inspection will be considered during the plan review process. The review will include:

- review of monitoring results to evaluate the effectiveness of management options;
- identification of any changes to risks in the area (*i.e.*, new or ceased land uses or activities);
- inclusion of any changes to water supply infrastructure (*e.g.,* construction of a new well);
- review of implementation plan and update of action items to reflect what was completed over the year;
- modification of existing action items or addition of new action items, as needed; and
- consideration of new legislation.

6.6 REPORTING

An annual Source Water Monitoring Report will be prepared for the Village and for submission to Nova Scotia Environment (NSE).

The annual report will include:

- a summary of water usage and water chemistry, with a comparison to regulatory guidelines and a discussion and interpretation of observed trends;
- an assessment of aquifer water levels and water quality from the various monitoring locations;
- any modifications made to the well field or pumping rates during the previous year;
- recommendations regarding the monitoring program, including modifications to sampling parameters, sampling frequency, and sampling locations;
- a summary of the results of the annual SWPA inspection;
- a summary of the results of the regular well head and security inspections;
- actions completed regarding source water protection and any changes to the implementation plan; and
- any other modifications to the plan resulting from the annual plan review.

7.0 References

Hiltz and Seamone Co. Ltd. And W.G. Shaw and Associates Ltd. 2009. Lawrencetown Wellfield Report on Well Construction and Pump Testing of Lawrencetown Production Well No. 3. Prepared for the Village of Lawrencetown, Annapolis County, Nova Scotia.

Jacques Whitford Environment Limited (2004b). Groundwater Model and Well Head Protection Study, Village of Lawrencetown, NS. Report to Municipality of the County of Annapolis, Project No, 18602-4, July 15, 2004.

Jacques Whitford Environment Limited (2007). Groundwater Modeling for a Proposed New Pumping Scenario, Village of Lawrencetown Well Field, Lawrencetown, Nova Scotia. Letter report to CBCL Limited, JWEL Project No. 1029202, October 1, 2007.

Jacques Whitford Environmental Limited (2004a). Step 1 GUDI Assessment for Lawrencetown Well Field. Letter report to Mr. Laurie Emms, P.Eng., Municipal Services Director, Planning Services Office, Lawrencetown, N.S. JWEL Project No. 18602-1, March 10, 2004.

Nova Scotia Environment and Labour. 2004. Developing a Municipal Source Water Protection Plan: A Guide for Water Utilities and Municipalities. Environmental and Natural Areas Management.

Village of Lawrencetown. 2008. Lawrencetown Water Supply Area Land Use By-law.

Health Canada 2012. Guidelines for Canadian Drinking Water Quality. August 2012 Summary Table.

APPENDIX A
Source Water Protection Advisory Committee

LAWRENCETOWN SWPP COMMITTEE

Committee information, including member contact information, meeting schedule, and meeting minutes are available from the Lawrencetown Village Commission:

Village of Lawrencetown
12 Prince Street, P.O. Box 38
Lawrencetown, NS
B0S 1M0

Phone: (902) 584-3082
Fax: (902) 584-3878

Email: villagelawrencetown@ns.aliantzinc.ca

LAWRENCETOWN SOURCE WATER PROTECTION ADVISORY COMMITTEE

Terms of Reference
February 2012

These Terms of Reference shall serve to constitute the Source Water Protection Plan (SWPP) Committee as an advisory committee to the Village of Lawrencetown and it's Utility. It will address problems, solutions and recommendations to matters concerning land-use issues, as well as water quality and levels and flows in the source water protection area.

MANDATE

The Committee will report to the Lawrencetown Village Commission and the members will be appointed by the Village Commission.

GENERAL

1. The Committee will review and make recommendations on all activities affecting the source water protection area as requested by the Village Commission.

2. The Committee may from time to time request individuals or groups to make representation to the Committee on matters affecting the source water protection area.

3. The Committee will review and comment on water quality and quantity monitoring programs and other studies related to the source water protection area. All applicable water quality information available from member agencies shall be made available to the Committee.

4. The Committee may liaise with government agencies not represented on the Committee with regards to matters affecting the source water protection area.

5. The Committee will develop information and education programs about source water protection for local residents, land owners and other users of the area.

6. The Committee will elect a Chair and Vice Chair.

MEMBERSHIP

Committee Members

- three (3) residents of the Village with at least one resident that lives within the source water protection area.
- two (2) Village Commissioners

- Municipality of the County of Annapolis Councilor for the area (or her/his alternate)

Technical Advisors

- one (1) technical representative from Municipality of the County of Annapolis
- two (2) technical representatives from the Village of Lawrencetown
- representatives from: NS Dept of Transportation & Infrastructure Renewal
  NS Dept of Natural Resources
  NS Dept of Environment
- other advisory members may be added depending on the needs of the Committee

OPERATION OF COMMITTEE

1. The Chair and the Vice Chair of the Committee are appointed annually by the membership at the meeting in December. Members will serve on the Committee for at least one year, after which the Village Commission shall appoint members as necessary.

2. The Village of Lawrencetown will provide the administrative/secretarial services for the Committee.

3. The Committee members will receive a meeting notice and agenda approximately four (4) days prior to each meeting.

4. The Committee will endeavour to conduct business by consensus however, should the Committee be unable to attain a consensual agreement on an issue, the Village Commission may appoint a facilitator. Should this process fail, voting may be necessary. **All motions require support from at least two-thirds majority of the voting members. Four (4) members will constitute a quorum. In the event that the quorum includes 3 possible representatives of the Village Commission, a unanimous vote will be required.**

5. The Committee will meet as necessary, but not less than two (2) times a year.

6. The Village Commission may amend the Terms of Reference for the Committee as needed, in consultation with the SWP Committee.

7. The Committee shall prepare an annual report of its activities for the Village Commission by March 15th of each year. This report will also be presented at the Village Commission's Annual General meeting in June. At the direction of the Village Commission, the report may also be available to other interested parties.

8. The Chair will act as the Committee spokesperson and in his/her absence the Vice Chair will perform this duty.

9. The Committee may call for the input of other land owners in the source water supply area as deemed necessary.

AS APPROVED BY THE LAWRENCTOWN VILLAGE COMMISSION AT THE DULY CALLED MONTHLY COMMISSION MEETING ON **MARCH 1, 2012**.

COMMISSION CHAIR: _____

CLERK/TREASURER: _____

APPENDIX B
Survey Results

THE VILLAGE OF LAWRENCETOWN
WATER SOURCE PROTECTION PLAN
MAY 2010

The Village of Lawrencetown Source Water Protection Plan has identified 3 capture zones – 2 year, 5 year and 25 year – for potential contaminants or risks to Production Well # 3.

2 YEAR CAPTURE ZONE

This zone is where Production Well # 3 is located and an inventory of potential contaminants or risks has been conducted. Including the property owned by the Village of Lawrencetown there are **6 properties** in the 2 year capture zone and after conducting an inventory/survey of these properties, the following conclusions are submitted:

1. **Village of Lawrencetown – site for Production Well # 3 -** No potential contaminants or risks identified.

2. **Gary Stevenson – 05124391 & 05296439 –** One area (05124391) is mostly open vacant field that is not developed at this time and only used to cut hay each season. In the corner of this property in the 2 year capture zone is an old house that is used for storage. There is a large amount of "junk" stored there but there are no washroom facilities. The Municipality of the County of Annapolis has visited this property as part of their "Unsightly and Dangerous Property Bylaw" so are aware of what is stored there. After visiting the property, we do not feel that there is anything there that could pose a risk. The second area (05296439) has a small open field in capture zone 2 that poses no risk, with the bulk of the property in capture zone 5. In capture zone 5 just on the outskirts of capture zone 2, there is a residential dwelling that has a private septic system. On the outskirts of capture zone 5 adjacent to the 25 year capture zone is a barn with a small manure pile behind it that is used to spread on the adjacent vegetable field. At this time there is no livestock housed in the barn.

3. **Gordon Boyce – 05124417** – This property is an open vacant field that is not used for any activity and does not contain any dwelling units or barns. It is split between the 2 year capture zone (approx. 20%) and the 5 year capture zone (approx. 80%).

4. **Stephen/Jane Baskwill – 05118401** – This property extends to both the 2 & 5 year capture zone. In the 2 year capture zone (approx. 10%) there is a residential dwelling that has a private septic system. The main source of heating for the dwelling is oil furnace and the storage tank is seven years old. In the 5 year capture zone (approx. 90%) there is a barn with a small storage pile of manure used for spreading on a vegetable garden and some flower beds. The owners no longer have a horse and the manure pile is being used up with no intention of adding to it in the future.

5. **Leslie Wade – 05118419** – This property extends to both the 2 & 5 year capture zones. In the 2 year capture zone there is a small area (approx. 5 %) that has no development on it and is part of their front yard. In the 5 year capture zone, there is a residential dwelling unit that has a private septic system and also, an outbuilding that contains a winery. The wines are made with fruit juices and kits that they bring in and the production is very

limited. They have no vineyards therefore; they do not harvest or have any type of production/processing taking place.

6. **Don Taylor, Riverbend Cranberries – 05124557** – This property is mainly in the 5 year capture zone with a portion of one of the cranberry bogs in the 2 year capture zone. In the 2 year capture zone, there is vacant fields and a clay lined cranberry bog. The clay lining prevents seepage both into and out of the cranberry bogs. In the 5 year capture zone, there are the remaining cranberry bogs and a residential dwelling that has a private septic system. The primary heat source for the dwelling is an oil furnace and the oil storage tank is inside the dwelling. There are 2 out buildings in the 5 year capture zone, one houses equipment, and the other houses clippings from the cranberry bushes. These clippings are packaged and sent off the property. In the 5 – 25 year capture zone there is a storage building that houses chemicals used in the production of the cranberries. Fertilizers, fungicides, insecticides and herbicides are all stored in locked freezers in a locked building used specifically for this purpose with all the applicable safeguards and signage required by the Dept. of Agriculture. Diesel is also stored in certified tanks, indoors. After a thorough inventory of this property and the location with regards to Production Well # 3, we feel that there is no potential risk from this property.

The only other potential risks identified in this area could be a traffic accident/hazardous spill on Highway # 201. In speaking with the local Fire Department, should a traffic accident or spill occur, they would respond with local equipment and if the need was greater than they could provide, they have a back-up response team that deals with hazardous spills.

Based on the information gathered, we are confident that any of the potential risks identified are being well monitored and should not impact on the Lawrencetown Watershed Area or the Water Source Protection Plan.

Should you have any further questions or would like to discuss these findings further, please contact me.

Regards,

Kelly Rice
Clerk/Treasurer
584-3082
villagelawrencetown@ns.aliantzinc.ca

APPENDIX C
Property Ownership

PID	OWNER_NAME	Lname_	Fname	OWNER_CODE	AREA_m2
05290572	LOWE ANDREW CLAUDE	LOWE	ANDREW CLAUDE	D	998388.89
05205463	NEILY RANDALL J	NEILY	RANDALL J	D	98752.30
05205455	SAVOURY STEPHEN	SAVOURY	STEPHEN	D	92769.76
05209465	KUSTUDIC MICHAELE S	KUSTUDIC	MICHAELE S	D	70599.71
05117593	LITTLETON SYDNEY J	LITTLETON	SYDNEY J	D	53740.58
05117585	J D IRVING LIMITED	J D IRVING LIMITED		P	1324729.24
05117601	MCGILL SHARELLE S	MCGILL	SHARELLE S	D	617018.62
05178421	ROGERS WIRELESS INC	ROGERS WIRELESS INC		P	11381.40
05005590	NS DEPARTMENT OF NATURAL RESOURCES	NS DEPARTMENT OF NATURAL RESOURCES			3392015.29
05117619	RUGGLES GARNET A	RUGGLES	GARNET A	D	680030.20
05117544	RAFUSE DEAN J	RAFUSE	DEAN J	D	15828.21
05123898	MILO PHILIP MURRAY	MILO	PHILIP MURRAY	D	7401.15
05004924	VILLAGE OF LAWRENCETOWN	VILLAGE OF LAWRENCETOWN		P	55075.76
05123880	JOHNSON ALAN	JOHNSON	ALAN	D	433.95
05198700	NS DEPARTMENT OF NATURAL RESOURCES	NS DEPARTMENT OF NATURAL RESOURCES			364601.83
05124391	STEVENSON GARY LEIGH	STEVENSON	GARY LEIGH	D	160284.69
05123898	MILO PHILIP MURRAY	MILO	PHILIP MURRAY	D	272.96
05123906	MILO PHILIP M	MILO	PHILIP M	D	1994.65
05124557	GARNETT CHARLES	GARNETT	CHARLES	D	176727.47
05296645	THE VILLAGE OF LAWRENCETOWN	THE VILLAGE OF LAWRENCETOWN		P	557.45
05124540	ACKER C. EARL	ACKER	C. EARL	D	6059.22
05296439	STEVENSON GARY LEIGH	STEVENSON	GARY LEIGH	D	62151.84
05118385	VILLAGE OF LAWRENCETOWN	VILLAGE OF LAWRENCETOWN		P	706372.12
05124417	BOYCE GORDON A	BOYCE	GORDON A	D	19924.47
05118401	BASKWILL JANE	BASKWILL	JANE	D	162157.08
05181862	BASKWILL G STEPHEN	BASKWILL	G STEPHEN	D	1685.52
05118419	WADE LESLIE KENNETH	WADE	LESLIE KENNETH	D	362171.45
05124532	BELL WILLIAM	BELL	WILLIAM	D	3898.81
05182308	HANNAM JEFFREY GLENN	HANNAM	JEFFREY GLENN	D	4122.47
05118427	MCLAIN ALEXANDER	MCLAIN	ALEXANDER	D	406820.06
05182746	FAIRVIEW CEMETERY COMPANY	FAIRVIEW CEMETERY COMPANY		P	1658.47
05182753	FAIRVIEW CEMETERY COMPANY	FAIRVIEW CEMETERY COMPANY		P	2187.18
05124409	FAIRVIEW CEMETERY COMPANY	FAIRVIEW CEMETERY COMPANY		P	4752.21
05182761	FAIRVIEW CEMETERY COMPANY	FAIRVIEW CEMETERY COMPANY		P	4578.60
05182787	FAIRVIEW CEMETERY COMPANY	FAIRVIEW CEMETERY COMPANY		P	894.39
05182779	FAIRVIEW CEMETERY COMPANY	FAIRVIEW CEMETERY COMPANY		P	1543.26
05182795	FAIRVIEW CEMETERY COMPANY	FAIRVIEW CEMETERY COMPANY		P	5225.74
05182134	MUNICIPALITY OF THE COUNTY OF ANNAPOLIS	MUNICIPALITY OF THE COUNTY OF ANNAPOLIS		20	2185.65
05182134	MUNICIPALITY OF THE COUNTY OF ANNAPOLIS	MUNICIPALITY OF THE COUNTY OF ANNAPOLIS		20	121847.76
05118435	REDDEN PETER CARROLL N	REDDEN	PETER CARROLL N	D	359956.68
05118393	VILLAGE OF LAWRENCETOWN	VILLAGE OF LAWRENCETOWN		P	175572.49
05182134	MUNICIPALITY OF THE COUNTY OF ANNAPOLIS	MUNICIPALITY OF THE COUNTY OF ANNAPOLIS		20	205.91
05118450	REDDEN PETER C	REDDEN	PETER C	D	216767.83
05118484	MAHER ROBERT	MAHER	ROBERT	D	162328.70
05117536	LONGLEY FRANK WILFRED	LONGLEY	FRANK WILFRED	D	75487.11
05117940	VLADI PRIVATE ISLANDS LIMITED	VLADI PRIVATE ISLANDS LIMITED		P	9744.70
05215801	REDDEN PETER C	REDDEN	PETER C	D	45724.73
05215470	NEILY RANDALL J	NEILY	RANDALL J	D	315015.00
05118039	VEINOT MICHAEL LAWSON	VEINOT	MICHAEL LAWSON	D	12391.14
05117569	DUFF ANDREW S	DUFF	ANDREW S	D	4512.09
05117528	STULTZ ROSEMARY JANE	STULTZ	ROSEMARY JANE	D	61704.96
05182258	BENT KARAN E	BENT	KARAN E	D	38129.57
05173604	VILLAGE OF LAWRENCETOWN	VILLAGE OF LAWRENCETOWN		P	3144.81
05117502	RAFUSE JOHN MCLEOD	RAFUSE	JOHN MCLEOD	D	51472.56
05207097	RAFUSE DEAN J	RAFUSE	DEAN J	D	20172.26
05173596	GREEN NEIL	GREEN	NEIL	D	3054.62

APPENDIX D
Best Management Practices

BEST MANAGEMENT PRACTICES

Land Use Type	Contaminant	BMP	Source
Agriculture	Manure - Pathogens	• Establish minimum separation distances to provide adequate buffer from watercourses and wells. The recommended separation distance from an off-farm well is 100 m (330 feet). • Conduct soil testing and prepare a nutrient management plan prior to land application of manure. Do not over-apply manure. • Avoid spreading manure between December 1 and April 1. • Avoid spreading manure on frozen or snow covered ground. • Avoid application of manure on excessively wet soils. • Do not apply manure on slopes greater than 10%. • Calibrate manure spreaders. • Limit manure storage and spreading within Zone A.	Manure Management Guidelines (http://www.gov.ns.ca/agri/rs/envman/manureguide_2006lowres.pdf)
	Fertilizers	• Private wells should have a 30 metre buffer in which no pesticides or fertilizers are applied and public water supply wells require a larger buffer. • Conduct soil testing and prepare a nutrient management plan prior to land application of fertilizers. Do not over-apply fertilizers. • Consult and inform all parties who may be affected by the fertilizer activities. • Read and follow all label directions. • Hire licensed and certified applicators when required legally and if unsure of the effectiveness or impacts of the fertilizers. • Avoid spreading fertilizer between December 1 and April 1. • Avoid spreading fertilizer on frozen or snow covered ground. • Avoid application of fertilizer on excessively wet soils or before heavy rain events. Limit irrigation following application. • Do not apply fertilizer on slopes greater than 10%. • Calibrate fertilizer spreaders. • Limit fertilizer storage and spreading within Zone B. • Use fertilizers that have low solubility in water where there is concern for impacts to water supply or streams. • Properly dispose of spent containers. • Have contingency and emergency response/containment plans in place to address potential spills.	North Dakota State University – Managing Nitrogen Fertilizer to Prevent Groundwater Contamination http://www.ag.ndsu.edu/pubs/plantsci/soilfert/eb64w.htm National Management Measures to Control Nonpoint Source Pollution from Agriculture (http://water.epa.gov/polwaste/nps/agriculture/agmm_index.cfm)
	Pesticides / Herbicides	• Private wells should have a minimum 30m buffer in which no pesticides or fertilizers are applied. Public water supply wells require a larger buffer. • Ensure all pesticide applications adhere to the requirements of the *Environment Act*, *Pest Control Products Act, Pesticide Storage Regulations* and associated Regulations. • Consult and inform all parties who may be affected by the pest control activities. • Read and follow all label directions. Always store in original containers. • Hire licensed and certified applicators when required legally and if unsure of the effectiveness or impacts of the pesticides. • Use pesticides that have low solubility in water where there is concern for impacts to water supply or streams. • Do not apply pesticides before heavy rainfall events and limit irrigation after application. • Limit pesticide storage and spreading within Zone B. • Calibrate spreaders regularly. • Do not spray during high winds or other conditions that increase risk of drift. • Implement available non-chemical control practices, such as crop rotation. • Pesticide storage area should be used for no other purpose and should be well-marked. Avoid cross-contamination. • Properly dispose of spent containers. Nova Scotia has a container recycling program. • Have contingency and emergency response/containment plans in place to address potential spills.	You Asked About….Pesticides http://www.gov.ns.ca/nse/pests/docs/YouAskedAboutPesticides.pdf Farm Safety: Standards of Practice for Farms in Nova Scotia http://www.gov.ns.ca/agri/farmsafety/standards/chemicals.shtml BC Ministry of Agriculture – Pesticide Wise http://www.agf.gov.bc.ca/pesticides/c_2.htm National Management Measures to Control Nonpoint Source Pollution from Agriculture (http://water.epa.gov/polwaste/nps/agriculture/agmm_index.cfm)

Land Use Type	Contaminant	BMP	Source
	Petroleum Hydrocarbons	• Storage tanks should be installed by a trained/licensed installer and labeled to show that it meets national construction standards. These standards include: ▪ National Standard of Canada's CAN/ULC-S602, Aboveground Steel Tanks for the Storage of Combustible Liquids Intended to Be Used as Heating and/or Generator Fuels ▪ Underwriters' Laboratories of Canada's ULC/ORD C80, Aboveground Non-metallic Tanks for Fuel Oil • Use ULC approved dispenser systems. • Petroleum storage greater than 25,000L is not permitted within 300 metres of a municipal supply well. • Limit petroleum storage volumes within Zone B. • Consider double-walled tanks, fibreglass tanks, composite plastic/metal tanks, lined tanks, stainless steel tanks, and heavier-walled, 2.5-mm (12 gauge) steel tanks to extend life of tanks. • Install secondary containment systems and/or leak detection devices. • Install tanks indoors rather than outdoors, whenever feasible. • Seal existing floor drains, sumps or other openings near the tank to prevent any spills from escaping. • Install tanks so that they can be inspected from all sides and inspect tank condition weekly. • Complete NSE's Domestic Heating Oil Tank System Check-Up. • Maintain fuel inventory logs. • Ensure that outdoor oil tanks are properly supported, with the legs centred to prevent it from shifting, settling, or falling over. • Ensure oil supply lines are protected from damage and are equipped with a protective covering. • Remove water and sludge from tank every year and keep tank full to avoid condensation. • Have oil filter services once per year. • Have contingency and emergency response/containment plans in place to address potential spills.	Homeowners Guide to Heating Oil Tank Systems http://www.gov.ns.ca/nse/petroleum/docs/OilTankGuide.pdf Installation and Environmental Management Guide for Aboveground Domestic Oil Tanks in Nova Scotia http://www.gov.ns.ca/nse/petroleum/docs/OilTankInstall.pdf Nova Scotia Standards for Construction and Installation for Petroleum Storage Tank Systems http://www.gov.ns.ca/nse/dept/docs.policy/petroleum.storage.tank.systems.pdf New Brunswick Petroleum Storage Fact Sheet http://www.gnb.ca/0173/30/PetroleumStorage.pdf
Residential	Septic Systems	• Flush only human waste, waste water and toilet paper into septic systems. Use only small amounts of household cleaners. • Inspect and pump out your septic system at least once every three years. Maintain records. • Use only reputable, licensed septic waste haulers to pump out or repair your system. • Spread water use out over time. Implement water-saving measures. • Plant grass and keep large roots out of disposal system. • Don't drive or park vehicles on septic system. • Keep roof drains, basement sump pump discharge, and other rain water away from septic field. • Limit septic system construction within Zone A.	A Homeowner's Guide to Septic Systems http://www.gov.ns.ca/nse/wastewater/docs/Homeowners.Guide.to.Septic.Systems.pdf The Drop on Water – Wastewater – Septic Systems http://www.gov.ns.ca/nse/water/docs/dropon waterFAQ_Wastewater-Septic.pdf
	Heating Oil Tanks	• Storage tanks should be installed by a trained/licensed installer and labeled to show that it meets national construction standards. These standards include: ▪ National Standard of Canada's CAN/ULC-S602, Aboveground Steel Tanks for the Storage of Combustible Liquids Intended to Be Used as Heating and/or Generator Fuels ▪ Underwriters' Laboratories of Canada's ULC/ORD C80, Aboveground Non-metallic Tanks for Fuel Oil • Consider double-walled tanks, fibreglass tanks, composite plastic/metal tanks, lined tanks, stainless steel tanks, and heavier-walled, 2.5-mm (12 gauge) steel tanks to extend life of tanks. • Install secondary containment systems and/or leak detection devices. • Install tanks indoors rather than outdoors, whenever feasible. • Seal existing floor drains, sumps or other openings near the tank to prevent any spills from escaping. • Install tanks so that they can be inspected from all sides and inspect tank condition at least monthly. • Complete NSE's Domestic Heating Oil Tank System Check-Up.	Homeowners Guide to Heating Oil Tank Systems (http://www.gov.ns.ca/nse/petroleum/docs/OilTankGuide.pdf) Installation and Environmental Management Guide for Aboveground Domestic Oil Tanks in Nova Scotia http://www.gov.ns.ca/nse/petroleum/docs/OilTankInstall.pdf Nova Scotia Standards for Construction and Installation for Petroleum Storage Tank Systems

Land Use Type	Contaminant	BMP	Source
		• Ensure that outdoor oil tanks are properly supported, with the legs centred to prevent it from shifting, settling, or falling over. • Ensure oil supply lines are protected from damage and are equipped with a protective covering. • Remove water and sludge from tank every year and keep tank full to avoid condensation. • Have oil filter services once per year. • Have contingency and emergency response/containment plans in place to address potential spills.	http://www.gov.ns.ca/nse/dept/docs.policy/petroleum.storage.tank.systems.pdf New Brunswick Petroleum Storage Fact Sheet http://www.gnb.ca/0173/30/PetroleumStorage.pdf
	Pesticides / Herbicides	• Private wells should have a minimum 30m buffer in which no pesticides or fertilizers are applied. Public water supply wells require a larger buffer. • Limit pesticide storage and spreading within Zone B. • Ensure all pesticide applications adhere to the requirements of the *Environment Act*, *Pest Control Products Act, Non-Essential Pesticides Control Act, Pesticide Storage Regulations* and associated Regulations. • Read and follow all label directions. Always store in original containers. • Do not apply pesticides before heavy rainfall events and limit watering after application. • Keep lawns healthy without pesticides/herbicides by: aerating, raking, fertilizing, over-seeding, adding lime, limiting watering, keeping grass higher. • Properly dispose of spent containers. Do not flush un-used pesticides down toilet. • Immediately contain and clean up any spills.	You Asked About….Pesticides http://www.gov.ns.ca/nse/pests/docs/YouAskedAboutPesticides.pdf Pesticide Safety at Home http://www.gov.ns.ca/nse/pests/docs/PesticideSafetyHome.pdf NS Guide to Healthy Lawns Without Pesticides http://www.gov.ns.ca/nse/pests/docs/Non-Essential-Consumer.Brochure.pdf NS Guide to Growing a Healthy Lawn http://www.gov.ns.ca/nse/pests/docs/Healthy.Lawns.pdf
	Fertilizers	• Private wells should have a minimum 30m buffer in which no pesticides or fertilizers are applied. Public water supply wells require a larger buffer. • Read and follow all label directions. Always store in original containers. • Avoid excessive or unnecessary use. • Use nitrogen fertilizers – phosphorus and potassium addition is generally not needed. • Plant native plants and grasses requiring less fertilizer and water. • Keep lawns healthy without fertilizers by: aerating, raking, over-seeding, using mixed grasses, adding lime, limiting watering, keeping grass higher. • Leave grass clippings on lawn or use compost. • Fertilize in April/May or September when lawn is actively growing. • Use slow-release fertilizers, rather than “fast-acting” ones. • Properly dispose of spent containers. Do not flush un-used fertilizers down toilet. • Immediately contain and clean up any spills.	NS Guide to Growing a Healthy Lawn http://www.gov.ns.ca/nse/pests/docs/Healthy.Lawns.pdf

	Abandoned wells	• Properly decommission wells no longer in use.
		• Use contractors holding a valid certificate of qualification:
		  ▪ for drilled wells – a certified well driller
		  ▪ for dug wells – a certified well digger.
		• Special decommissioning methods may be needed for wells that:
		  ▪ have flowing artesian conditions;
		  ▪ are affected by salt water;
		  ▪ are high yield production wells;
		  ▪ are extremely deep;
			The Drop on Water – Well Decommissioning
			http://www.gov.ns.ca/nse/water/docs/droponwaterfaq_welldecommission.pdf
			
			Well Decommissioning Guidelines
			www.gov.ns.ca/nse/water/groundwater/docs/WellDecommissioningGuidelines.pdf.

Land Use Type	Contaminant	BMP	Source
		▪ have been contaminated by natural or man-made conditions; ▪ have been constructed by neither drilling nor digging; or ▪ have other unusual conditions. • If more than one well exists on the property, you should find out why. It may indicate previous ▪ water shortages ▪ well contamination ▪ improper construction of a well ▪ construction of a well for purposes other than drinking and regular household use	
	Cleaning agents	• Inform residents about less-toxic alternatives to household hazardous wastes. The use of alternative products can be promoted through pamphlets, inserts in utility bills, or workshops. Nontoxic products can offer the same effectiveness as hazardous products but with less impact on the environment. • Citizens should also know how to properly apply hazardous materials, especially how much is sufficient and how to avoid releasing materials into the environment. • Immediately contain and clean up any spills.	EPA – NPDES, Household Hazardous Waste http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=3 NS Household Hazardous Waste http://www.reduceyourwaste.ca/hhw.asp
Transportation	Road Salt	• Environment Canada's Best Management Practices for Salt Use on Private Roads, Parking Lots and Sidewalks recommend consideration of "4 R's" of snow and ice control: ▪ Right Material – The right material will depend upon the conditions being treated. In situations where the pavement temperature is extremely cold, chemicals with lower working temperatures or sand/salt mixtures may be warranted. ▪ Right Amount – The right amount of material is dependent upon the type of slippery condition being treated, the amount of residual chemical on the pavement surface, the expected pavement temperature and the amount of precipitation that is expected. ▪ Right Place – Precise placement of materials is important to keeping it in the right place to do the job rather than wasted to the environment. Proper material placement requires the right equipment and skilled operators. ▪ Right Time – The timing of salt placement is important to minimizing waste and maximizing chemical effectiveness. There are times when the pavement temperature is above freezing and therefore may not warrant salt application. • Employ proper material storage and handling practices and equipment selection to reduce unnecessary salt releases to the environment. • Operators should receive training and follow application guidelines. • Consider mechanical snow removal (i.e., ploughing) and/or sanding as alternatives to salting where feasible. • Several solid and liquid freezing point depressants are available for road de-icing. Their efficiency as de-icers and their relative effects on the environment should be reviewed on an individual basis to determine when and how each material is to be used. • Proper drainage design and stormwater management can reduce potential impacts by directing runoff / meltwater that may contain salt away from salt vulnerable areas (e.g., meltwater should be directed to sediment ponds or sanitary sewers where permitted by the local municipal sewer use by-law). • Use liquid anti-icing or pre-wetting to reduce the amount of salt lost due to blowing or bouncing. • Plan and design roadways to avoid salt sensitive areas. • Consider paving ditches and/or excluding salt application within the Protection Area.	Environment Canada Best Management Practices for Road Salt Usage on Private Roads, Parking Lots, and Sidewalks http://www.ec.gc.ca/nopp/roadsalt/reports/ParkingLot/EN/parkinglot_E.pdf Road Salt and Winter Maintenance Activities for BC Municipalities – Best Management Practices to Protect Water Quality http://www.env.gov.bc.ca/wat/wq/bmps/roadsalt.html#31 Transportation Association of Canada – Syntheses of Best Management Practices http://www.tac-atc.ca/english/resourcecentre/roadsalt.cfm
	Herbicides	• Private wells should have a minimum 30m buffer in which no pesticides or fertilizers are applied. Public water supply wells require a larger buffer. • Ensure all herbicide applications adhere to the requirements of the *Environment Act*, *Pest Control Products Act, Pesticide Storage Regulations* and associated Regulations. • Consult and inform all parties who may be affected by the herbicide application activities. • Read and follow all label directions. Always store in original containers. • Hire licensed and certified applicators when required legally and if unsure of the effectiveness or impacts of the herbicides. The type, rate and method of herbicide application should be subject to approval by Engineer and applicable government agencies. • Use herbicides that have low solubility in water where there is concern for impacts to water supply or streams.	Standard Specifications for Municipal Services http://www.landscapenovascotia.ca/attach/1245868851.Standard_Specification_for_Municipal_Services.pdf

Land Use Type	Contaminant	BMP	Source
		• Consider excluding herbicide application within Zone B. • Consider alternative methods of control such as mowing. • Do not apply herbicides before heavy rainfall events and limit irrigation after application. • Calibrate spreaders regularly. • Do not spray during high winds or other conditions that increase risk of drift. • Properly dispose of spent containers. Nova Scotia has a container recycling program. • Have contingency and emergency response/containment plans in place to address potential spills.	
	Urban Runoff – Hydrocarbons	• Site design features such as providing rain barrels, dry wells or infiltration trenches to capture rooftop and driveway runoff, maintaining open space, preserving stream buffers and riparian corridors, using porous pavement systems for parking lots and driveways, and using grassed filter strips and vegetated swales in place of traditional curb-and-gutter type drainage systems can greatly reduce the amount of storm water generated from a site and the associated impacts. • Street construction features such as placing sidewalks on only one side of the street, limiting street widths, reducing frontage requirements and eliminating or reducing the radius of cul-de-sacs also have the potential to significantly reduce the amount of impervious surfaces and therefore the amount of rainfall that is converted to runoff. • Construction practices such as minimizing disturbance of soils and avoiding compaction of lawns and greenways with construction equipment can help to maintain the infiltrative capacity of soils. • Categories of structural BMPs include the following: ▪ Infiltration systems capture a volume of runoff and infiltrates it into the ground. ▪ Detention systems capture a volume of runoff and temporarily retain that volume for subsequent release. Detention systems to not retain a significant permanent pool of water between runoff events. ▪ Retention systems capture a volume of runoff and retain that volume until it is displaced in part or in total by the next runoff event. Retention systems therefore maintain a significant permanent pool volume of water between runoff events. ▪ Constructed wetland systems are similar to retention and detention systems, except that a major portion of the BMP water surface area (in pond systems) or bottom (in meadow-type systems) contains wetland vegetation. This group also includes wetland channels. ▪ Filtration systems use some combination of a granular filtration media such as sand, soil, organic material, carbon or a membrane to remove constituents found in runoff. ▪ Vegetated systems (biofilters) such as swales and filter strips are designed to convey and treat either shallow flow (swales) or sheetflow (filter strips) runoff ▪ Minimizing directly connected impervious surfaces describes a variety of practices that can be used to reduce the amount of surface area directly connected to the storm drainage system by minimizing or eliminating traditional curb and gutter. This is considered by some to be a non-structural practice, but is has been included under the structural heading in this report due to the need to design and construct alternative conveyance and treatment options. ▪ Miscellaneous and vendor-supplied systems include a variety of proprietary and miscellaneous systems that do not fit under any of the above categories. These include catch basin inserts, hydrodynamic devices, and filtration devices. • Non-structural BMPs include the following institutional and pollution-prevention type practices designed to prevent pollutants from entering storm water runoff or reduce the volume of storm water requiring management: • Proper education on day-to-day activities such as recycling of used automotive fluids, household chemical and fertilizer use, animal waste control and other activities can significantly reduce non-point source pollutant loadings to urban streams. • Small residential spills or leaks of automotive products should be cleaned up using a dry absorbent such as cat litter or commercially available absorbents and disposed of appropriately. • Car washing should be done away from storm drains using biodegradable cleaners, or at a commercial carwash. • All used automotive fluids should be recycled or disposed of appropriately. • All automotive fluid leaks should be repaired as soon as possible to reduce loss to the environment. • Do not dump materials down storm drains. • Follow guidelines for use, storage and disposal of household hazardous wastes.	Description and Performance of Stormwater Best Management Practices http://water.epa.gov/scitech/wastetech/guide/stormwater/upload/2006_10_31_guide_stormwater_usw_c.pdf

Land Use Type	Contaminant	BMP	Source
		• Avoid unnecessary water use on properties that can generate stormwater runoff. • Have contingency and emergency response/containment plans in place to address potential spills.	
	Potential Spills	• Have contingency and emergency response/containment plans in place to address potential spills.	
Forestry	Sedimentation	• Avoid clear-cutting. • Install sediment and erosion control structures (e.g., silt fences) as necessary. • Install appropriate size and type of stream crossing structures. • Install landing drainage structures to avoid sedimentation to the extent practicable. Disperse landing drainage over sideslopes.	National Management Measures to Control Nonpoint Source Pollution from Forestry http://water.epa.gov/polwaste/nps/forestry/forestrymgmt_index.cfm NSDNR – Forests and Woodlots http://www.gov.ns.ca/natr/forests/ Nova Forest Alliance - Contractors & Operators Best Management Practices Manual http://novaforestalliance.com/uploads/nfa/documents/BMP_Manual_Final_Mar_2012.pdf
	Spills	• Have contingency and emergency response/containment plans in place to address potential spills.	
	Pesticides	• Private wells should have a minimum 30m buffer in which no pesticides or fertilizers are applied. Public water supply wells require a larger buffer. • Ensure all pesticide applications adhere to the requirements of the *Environment Act*, *Pest Control Products Act, Pesticide Storage Regulations* and associated Regulations. • Consult and inform all parties who may be affected by the pest control activities. • Read and follow all label directions. Always store in original containers. • Hire licensed and certified applicators when required legally and if unsure of the effectiveness or impacts of the pesticides. • Use pesticides that have low solubility in water where there is concern for impacts to water supply or streams. • Do not apply pesticides before heavy rainfall events and limit irrigation after application. • Limit pesticide storage and spreading within Zone B. • Calibrate spreaders regularly. • Do not spray during high winds or other conditions that increase risk of drift. • Implement available non-chemical control practices, such as crop rotation. • Pesticide storage area should be used for no other purpose and should be well-marked. Avoid cross-contamination. • Properly dispose of spent containers. Nova Scotia has a container recycling program. • Have contingency and emergency response/containment plans in place to address potential spills.	NSDNR – Forests and Woodlots http://www.gov.ns.ca/natr/forests/ Nova Forest Alliance - Contractors & Operators Best Management Practices Manual http://novaforestalliance.com/uploads/nfa/documents/BMP_Manual_Final_Mar_2012.pdf BC Ministry of Agriculture – Pesticide Wise http://www.agf.gov.bc.ca/pesticides/c_2.htm
	Fire	• Prescribed fire should not cause excessive sedimentation due to the combined effect of partial or full removal of canopy and removal of ground fuels, litter layer and duff. • Prescriptions for wildland fire use should protect against excessive erosion or sedimentation to the extent practicable. • All bladed firelines, for prescribed fire and wildfire, should be stabilized with water bars and/or other appropriate techniques if needed to control excessive sedimentation or erosion of the fireline. • Wildfire suppression and rehabilitation should consider possible NPS pollution of watercourses, while recognizing the safety and operational priorities of fighting wildfires. • Anyone who wants to set a fire in or within 305 meters (1000 feet) of the woods in Nova Scotia during the fire season (for industrial or domestic purposes) requires a Burning Permit. • Comply with provincial and regional burning restrictions / advisories / closures.	National Management Measures to Control Nonpoint Source Pollution from Forestry http://water.epa.gov/polwaste/nps/forestry/upload/ch3g.pdf NSDNR – Forests and Woodlots http://www.gov.ns.ca/natr/forests/ Nova Forest Alliance - Contractors & Operators Best Management Practices Manual

Land Use Type	Contaminant	BMP	Source
		• Allow smoking only in designated areas. • Use non-water soluble fire suppressants. • Have contingency and emergency response/containment plans in place to address potential fires and releases of fire suppression chemicals. • Plan burning to take into account weather, time of year, and fuel conditions so that these help achieve the desired results and minimize effects on water quality. • Execute the prescribed burn with an agency-qualified crew and burn boss. • Avoid conditions that require extensive blading of fire lines by heavy equipment when planning burns. • Use handlines, firebreaks, and hose lays to minimize blading of fire lines. • Avoid burning on steep slopes in high-erosion-hazard areas or areas that have highly erodible soils. • Whenever possible, conduct burns in wetlands in a manner that does not completely remove the organic layer of the forest floor. • When conducting prescribed fire to regenerate fire-dependent species, such as aspen, minimize consumption of the organic layer and openings in the vegetation to that which is necessary to obtain adequate regeneration. • Do not construct firelines that could drain wetlands. • Avoid intense burning. • Whenever possible leave a 300-foot buffer on both sides of a waterway when using aerially applied fire retardants. If necessary to apply retardant within the 300-foot zone, used the application method that will most accurately keep the retardant from entering the stream. • Do not clean application equipment in watercourses or locations that drain into watercourses. • Close water wells and temporary water catchments excavated for wildfire-suppression activities as soon as practical following fire control. • During wildfire emergencies, firelines, road construction, and stream crossings are unrestricted by BMPs when necessary for health and safety of firefighters and the public and protection of resources from greater damage due to wildfire. However, use BMPs whenever possible and begin remediation as soon as possible after the emergency is controlled. • Fireline construction involves removing all organic material to expose mineral soil, and this can result in excessive erosion and water quality degradation. Minimize fireline construction by taking advantage of natural barriers, rock outcrops, trails, roads, streams, and other existing fuel breaks. Construct firelines to be as narrow as necessary to halt the spread of the fire and place them to avoid impacts to water resources. Leave unburned material within the final line. Minimize clearing and scraping. Flag the route to the fire from the nearest trail or road to minimize off-road travel and soil disturbance. • Get cover on the site as soon as possible after the fire is out to maintain erosion control measures on firelines. • Install grades, ditches, and water bars as soon as it is safe to begin rehabilitation work. • Install water bars on any fireline running up and down the slope, and direct runoff onto a filter strip or sideslope, not into a drainage.	http://novaforestalliance.com/uploads/nfa/documents/BMP_Manual_Final_Mar_2012.pdf
Power lines	PCBs	• Visually inspect transformers with the Protection Area annually. • Any new installations should be free of PCBs.	
	Herbicides	• Private wells should have a minimum 30m buffer in which no pesticides or fertilizers are applied. Public water supply wells require a larger buffer. • Ensure all herbicide applications adhere to the requirements of the *Environment Act*, *Pest Control Products Act, Pesticide Storage Regulations* and associated Regulations. • Consult and inform all parties who may be affected by the herbicide application activities. • Read and follow all label directions. Always store in original containers. • Hire licensed and certified applicators when required legally and if unsure of the effectiveness or impacts of the herbicides. The type, rate and method of herbicide application should be subject to approval by Engineer and applicable government agencies. • Use herbicides that have low solubility in water where there is concern for impacts to water supply or streams. • Consider excluding herbicide application within Zone B. • Consider alternative methods of control such as mowing. • Do not apply herbicides before heavy rainfall events and limit irrigation after application. • Calibrate spreaders regularly. • Do not spray during high winds or other conditions that increase risk of drift.	BC Ministry of Agriculture – Pesticide Wise http://www.agf.gov.bc.ca/pesticides/c_2.htm

Land Use Type	Contaminant	BMP	Source
		• Properly dispose of spent containers. Nova Scotia has a container recycling program. • Have contingency and emergency response/containment plans in place to address potential spills.	
	Treated Utility Poles	For surface water: • Existing treated wooden utility poles need not be removed as long as they are not located within the high water mark of the intake pond, or in the case of a river intake, within 1 km upstream of the intake, provided they are not impacting water quality. • Existing treated wooden utility poles which are located within the high water mark should be replaced with untreated wooden, concrete or steel structures. • During the design of any new transmission line, or the placement of any new poles, the following options should apply in decreasing order of preference: ▪ (1) Avoid crossing any protected water supply area entirely through re-routing; ▪ (2) Use untreated wood poles, or steel or concrete structures; or ▪ (3) Use chromated copper arsenate (CCA) or ammoniacal copper arsenate (ACA) or copper napthanate (CuNap) pressure treated poles. If this option is approved, poles should not be placed within the following buffer zones from the high water mark of any body of water: ▪ Intake pond / lake – 150 m ▪ River intake – 150 m for a distance of 1 km upstream and 100 m downstream ▪ Main river channel – 75 m ▪ Major tributaries / lakes / ponds – 50 m ▪ Other bodies of water – 30 m	Policy for Treated Utility Poles in Water Supply Areas http://www.env.gov.nl.ca/env/waterres/regulations/policies/utility_poles.html
	Petroleum Hydrocarbons (Spills during mowing / maintenance)	• Use proper equipment that is in good working order. • Conduct regular inspection and maintenance of all vehicles and equipment. • Only conduct equipment/vehicle refueling or maintenance/repair activities in designated areas, on flat ground, and using absorbent pads and/or a drip pan. • Have contingency and emergency response/containment plans in place to address potential spills.	
Treatment Plant	Pathogens	• Follow inspection and monitoring requirements • Have contingency and emergency response/containment plans in place to address 100-year flood conditions. • Have contingency and emergency response/containment plans in place to address potential spills. • Monitor groundwater between treatment plant and water supply. • Educate community on appropriate sewer discharge.	Atlantic Canada Wastewater Guidelines Manual http://www.gov.ns.ca/nse/water/docs/AtlCanStdGuideSewage.pdf The Drop on Water – Wastewater – Central Treatment http://www.gov.ns.ca/nse/water/docs/droponwaterFAQ_Wastewater-Central.pdf
Cemetery	Pathogens	• Use appropriate set-backs: ○ 250 m minimum distance from potable groundwater supply source. ○ 30 m minimum distance from watercourse or spring. ○ 10 m minimum distance from field drains. • No burials into standing water. • No burials in Zone A. • Restrictions in Zone B.	Assessing the Groundwater Pollution Potential of Cemetery Developments http://publications.environment-agency.gov.uk/PDF/SCHO0404BGLA-E-E.pdf
	Pesticides / Herbicides	• Private wells should have a minimum 30m buffer in which no pesticides or fertilizers are applied. Public water supply wells require a larger buffer. • Limit pesticide storage and spreading within Zone B. • Ensure all pesticide applications adhere to the requirements of the *Environment Act*, *Pest Control Products Act, Non-Essential Pesticides Control Act, Pesticide Storage Regulations* and associated Regulations. • Read and follow all label directions. Always store in original containers. • Do not apply pesticides before heavy rainfall events and limit watering after application.	You Asked About….Pesticides http://www.gov.ns.ca/nse/pests/docs/YouAskedAboutPesticides.pdf Pesticide Safety at Home http://www.gov.ns.ca/nse/pests/docs/Pesticide

Land Use Type	Contaminant	BMP	Source
		• Keep lawns healthy without pesticides/herbicides by: aerating, raking, fertilizing, over-seeding, adding lime, limiting watering, keeping grass higher. • Properly dispose of spent containers. Do not flush un-used pesticides down toilet. • Immediately contain and clean up any spills.	SafetyHome.pdf NS Guide to Healthy Lawns Without Pesticides http://www.gov.ns.ca/nse/pests/docs/Non-Essential-Consumer.Brochure.pdf NS Guide to Growing a Healthy Lawn http://www.gov.ns.ca/nse/pests/docs/Healthy.Lawns.pdf
	Fertilizers	• Private wells should have a minimum 30m buffer in which no pesticides or fertilizers are applied. Public water supply wells require a larger buffer. • Read and follow all label directions. Always store in original containers. • Avoid excessive or unnecessary use. • Use nitrogen fertilizers – phosphorus and potassium addition is generally not needed. • Plant native plants and grasses requiring less fertilizer and water. • Keep lawns healthy without fertilizers by: aerating, raking, over-seeding, using mixed grasses, adding lime, limiting watering, keeping grass higher. • Leave grass clippings on lawn or use compost. • Fertilize in April/May or September when lawn is actively growing. • Use slow-release fertilizers, rather than “fast-acting” ones. • Properly dispose of spent containers. Do not flush un-used fertilizers down toilet. • Immediately contain and clean up any spills.	NS Guide to Growing a Healthy Lawn http://www.gov.ns.ca/nse/pests/docs/Healthy.Lawns.pdf

	Embalming Chemicals	• Use appropriate set-backs:
		  ○ 250 m minimum distance from potable groundwater supply source.
		  ○ 30 m minimum distance from watercourse or spring.
		  ○ 10 m minimum distance from field drains.
		• No burials into standing water.
		• No burials in Zone A.
		• Restrictions in Zone B.
			Assessing the Groundwater Pollution Potential of Cemetery Developments
			http://publications.environment-agency.gov.uk/PDF/SCHO0404BGLA-E-E.pdf

APPENDIX E
Implementation Plan

Title: Best Management Practices or Bylaws for Agriculture Activities Within the Capture Zone (including manure storage)

Description:

Agricultural land use was identified in close proximity to supply well PW3. Potential hazards from agricultural land use include pathogens (from manure and carcasses/waste), nutrients (from fertilizers and manure), pesticides/herbicides, and petroleum hydrocarbons (primarily heating oil and diesel for farm machinery). Protection of the water supply can be supported by the application of agricultural best management practices within Zones A, B, and C. Ideally, the implementation of the most critical best management practices would be supported through the creation of regulations governed by these best practices.

Objectives:

- Proper use and storage of manure, fertilizers, pesticides, and petroleum hydrocarbons within Zones A, B and C.

Actions	Responsibility	Status	Completion Date
• Meet with appropriate land owner (s) within Zones A, B, and C to identify present and possible future agricultural uses on their land			
• Discuss with land owners current and future best management practices for the use and storage of manure, fertilizers and pesticides i.e: http://www.gov.ns.ca/agri/agaware/teacher/86-87sustain5.pdf			
• Identify any existing or new best practices that should be adopted			
• Identify any potential barriers to land owners (cost, implications to production) that might result from any change in management practices			
• Identify and acknowledge any mitigative actions taken by land owners to improve management of agricultural activities			
• Work in partnership with the Nova Scotia Environment, Department of Agriculture, and County of Annapolis to determine the feasibility of potential regulatory mechanisms that would support the implementation of the most critical best management practices			

Start Date:	**Leader:**

Title: Scrap Metal and Debris

Description:

The presence of materials such as scrap metal and debris in close proximity to the wellhead near the boundary between Zone A and Zone B could pose a threat to water quality.

Objectives:

- Minimize the potential risk associated with hazardous materials within the source water protection area

Actions	Responsibility	Status	Completion Date
• Identify and meet with appropriate land owner (s) within Zone A and Zone B to identify present and possible future hazardous uses on their land			
• Discuss with land owners current and future best management practices for the use and storage of hazardous materials			
• Discuss with land owners the Annapolis County Dangerous and Unsightly Premises Policy			
• Identify required actions for remediation of the site to minimize potential impacts to the wellfield			
• Work with the County of Annapolis to determine if it is necessary to pursue further enforcement of the Dangerous and Unsightly Premises Policy			

Start Date:	**Leader:**

Title: Cemeteries

Description: Evaluate cemetery sites within or adjacent to the capture zone for potential contaminants.

Objective:

To understand potential contaminants within the cemetery area extending into the Zone A capture area

Actions	Responsibility	Status	Completion Date
• Contact and meet with the owners of the cemetery to gain better understanding of current practices			
• Research of history of uses and practices within the area			
• Depending on results, consider further action as required, including but not limited to engaging a consultant to conduct soil/groundwater testing and analysis			

Start Date:	**Leader:**

Title: Roadways (including Highway 201)

Description: A variety of government departments influence the roadway activities (i.e.: road resurfacing, signage, illegal dumping, plowing and salting). It is important for the departments to be aware of the presence of the water supply and cooperate to develop appropriate best management practices for the roadway areas.

Objective:

- To identify any necessary actions required to manage the interactions between roadways and the water supply area

Actions	Responsibility	Status	Completion Date
• Identify government departments that are involved in management of roadways within the Source Water Protection Area Boundary			
• Identify a contact person for each department			
• Arrange for a meeting to discuss best management practices and identify potential management actions			
• Identify a list of management actions and a government department action owner			
• Take further action as required			

Start Date:	**Leader:**

Title: Land Use Bylaws within the Capture Zones

Description:

Land uses that pose a risk to the source water supply can be controlled through the Lawrencetown Water Supply Area Municipal Planning Strategy and Land Use Bylaw (LWSA MPS and LUB). The current LWSA MPS and LUB regulate land use around the PW1 and PW2 well fields and within the Source Water Protection Boundary Area by controlling what types of uses can occur and the form of said uses. With the addition of the PW3 well, amendments to the LWSA MPS and LUB will be required, both to extend the Source Water Protection Area Boundary and delineate new areas of protection that align with the PW3 capture zones.

Objectives:

- To restrict/control land use within the capture zones and Source Water Protection Boundary to minimize negative impacts to the well fields.

Actions	Responsibility	Status	Completion Date
• At a minimum the Village of Lawrencetown will approach Annapolis County Council asking to amend the Lawrencetown Water Supply Area Planning Strategy and Land Use Bylaw to reflect the revised Source Water Protection Area Boundary and Capture Zones.			
• The Village of Lawrencetown will approach the Lawrencetown Watershed Area Advisory Committee to review key public concerns, identified hazards, management options and recommended actions as identified by the Advisory Committee and the citizens of the Village of Lawrencetown			
• The Village of Lawrencetown, County of Annapolis, Advisory Committee and the Lawrencetown Watershed Area Advisory Committee will work together to identify land use bylaw mechanisms or other methods for mitigation and management of priority hazards (agricultural use, scrap metal and debris).			

Start Date:	**Leader:**

Title: Heating Oil Tanks / Petroleum Storage

Description:

There is heating oil storage throughout the source water protection area. Heating oil storage and storage of other petroleum products within Zone A and Zone B can pose a risk to source water.

Objectives:

- To educate homeowners on best management practices to prevent potential negative impacts from heating oil storage and petroleum storage within the capture zones

Actions	Responsibility	Status	Completion Date
• Inventory all heating oil tanks within the SWPA			
• Develop and distribute educational materials to homeowners on best management practices for heating oil storage. Recommend replacement tanks be double walled or fiberglass and installed correctly. For example see: http://www.gov.ns.ca/nse/petroleum/docs/OilTankGuide.pdf			
• Identify mechanisms to facilitate inspection of heating oil tanks for those tanks located within the capture zones			
• Develop and distribute educational materials to homeowners on best management practices for petroleum product storage.			

Start Date:	**Leader:**

Title: Septic Systems

Description:

There are septic systems throughout the source water protection area, specifically located in Zone A and Zone B, which can pose a risk to source water.

Objectives:

- To educate homeowners on best management practices to prevent potential negative impacts from septic systems within the capture zones

Actions	Responsibility	Status	Completion Date
• Inventory all septic systems within the SWPA			
• At minimum distribute educational materials directly to homeowners within the SWPA on best management practices for septic system installation and maintenance			
• Request that homeowners with parcels (or a portion thereof) that fall within Zone A and Zone B show proof of regular septic system maintenance			
• If required, request that homeowners with parcels (or a portion thereof) that fall within Zone A and Zone B conduct septic system loading and dye tests to identify any failing systems			
• Meet with Annapolis County to identify whether or not there is a need for the establishment of a Wastewater Management District within the area. http://www.gov.ns.ca/snsmr/pdf/mun-local-government-resource-handbook-5-10.pdf			

Start Date:	**Leader:**

Title: Public Education

Description:

Public education was recognized by the Advisory Committee as a foundational management option that underlies each of the recommendations of the management strategy, and therefore was identified as a specific recommended area for action.

Objectives:

- Educate the community on how the activities that take place on their property can affect the quality of the local water supplies
- Promote the procedures for event reporting and Emergency Response
- Through an open consultation process, refine the set of recommended land use controls such that the objectives of Source Water Protection are met without undue socio-economic impacts to the community
- Negotiate with owners of non-complying lands for mutually acceptable remediation of potential risks
- Provide clear instructions and guidelines on how citizens can manage property in a manner that will not pose a risk to water resources

Actions	Responsibility	Status	Completion Date
• Review the management strategy recommendations and actions and develop a summary list of public education activities to be undertaken in association with the management of the source water protection area			
• Identify a timeframe for implementation, key stakeholders, as well as owners for specific activities			

Start Date:	**Leader:**

Title: Land Acquisition

Description:

Land Acquisition was recognized by Advisory Committee members as one of the best tools to enable protection of source water. The Village of Lawrencetown and the County of Annapolis already own a number of parcels within the Source Water Protection Area Boundary. Acquisition of land should be an ongoing consideration as land becomes available in the protection area boundary. Specific parcels of higher risk may also be targeted for acquisition.

Objectives:

- On an ongoing basis consider opportunities for acquisition of land within the Source Water Protection Area Boundary
- Identify potential partners to assist in land acquisition, such as the County of Annapolis or the Provincial Government
- Identify if there are particular parcels of land of higher risk that should be targeted for acquisition

Actions	Responsibility	Status	Completion Date
• Regularly monitor sales activity of properties within the Source Water Protection Area Boundary			
• Develop a list of potential funding partners that could be approached should an opportunity arise for acquisition			
• On a yearly basis the Source Water Protection Committee should review the Source Water Protection Plan and monitoring results and determine if particular parcels of land should be targeted for acquisition			

Start Date:	**Leader:**

Title: Contingency Plan

Description:

A contingency plan will be developed for use in the event that the Village of Lawrencetown water supply is threatened or compromised despite the measures undertaken as part of the source protection plan.

Objectives:

- To develop a contingency plan that identifies critical actions and necessary responses if the Village of Lawrencetown water supply is threatened or compromised.

Actions	Responsibility	Status	Completion Date
• Identify general procedures for routine emergencies or major emergencies within the Source Water Protection Area Boundary			
• Identify a procedure for equipment failure or inoperability in a major emergency and/or due to power failure			
• Identify a procedure for dealing with spills or releases			
• Identify procedures for reporting and correcting deficiencies in water supply quality			
• Provide provision for an annual review and update by the Village of Lawrencetown			

Start Date:	**Leader:**