

Prepared for:
Middleton Wellfield
Protection Management
Plan Steering Committee

Middleton Wellfield Protection Management Plan

FINAL REPORT

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ISO 9001
Registered Company

Town of Middleton Wellfield Protection Management Plan

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A Property Owners in the Middleton Wellfield Protection Area

1. Groundwater Protection

The Town of Middleton receives its drinking water from groundwater. In order to protect public health, it is therefore vital to ensure the protection of the groundwater. Once a groundwater source is contaminated it can be impossible, or extremely costly to clean up. Preventing contamination is the most effective way to ensure safe drinking water in the Town of Middleton.

The goal of the Town of Middleton Wellfield Protection Management Plan is to provide a proactive approach to protecting groundwater, integrating municipal land use planning and other management tools.

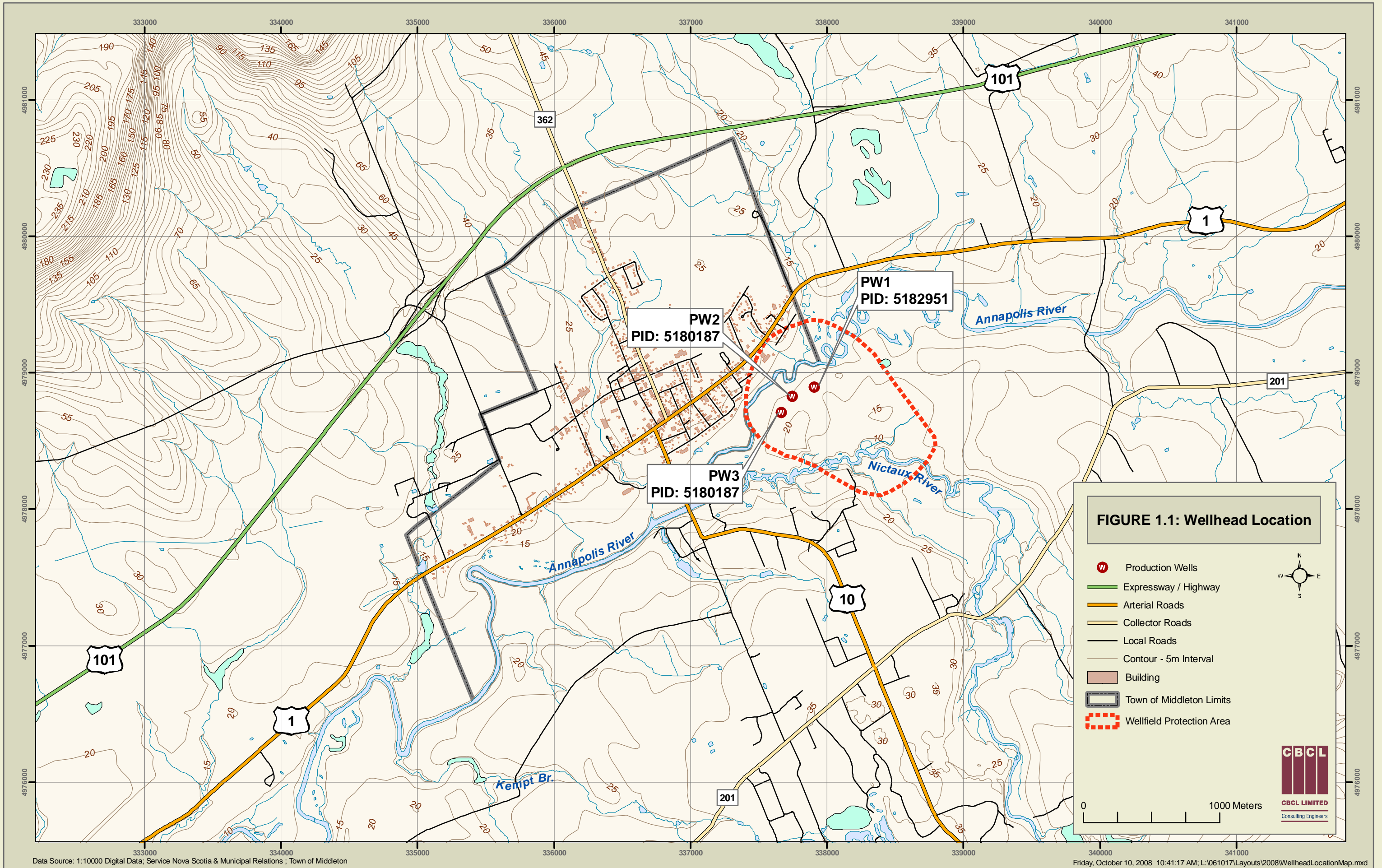
1.1. Town of Middleton Wellfield Protection Area

This document builds on groundwater flow analysis summarized in the Town of Middleton Capture Zone Modelling Technical Report by CBCL in December 2007. The technical report established the Wellfield Protection Area based on the groundwater capture zones for the Town of Middleton's three production wells. Figure 1.1 shows the location of the wellheads, which are just beyond the Town's southern boundary as delineated by the Annapolis River, and within land falling under the land use planning jurisdiction of the County of Annapolis. This report was developed in consultation with the Middleton Wellfield Protection Management Plan Steering Committee and community resource members, including community members, Town and County Councillors and organization representatives from the Town of Middleton and the County of Annapolis.

This report lays out the regulatory and policy contexts within which planning for the protection of the Middleton Wellfield takes place. Land use planning and management tools available to the Town of Middleton are highlighted. Provided is a detailed discussion and analysis of zoning, ownership and current land use in the Wellfield Protection Area. This is followed by an analysis of potential sources of risk to the groundwater supply. Specific strategies for managing risk, using a range of land use planning and other municipal tools are recommended. An implementation plan including action items for each strategy is provided. Developing a contingency plan in the case of a water emergency is recommended. Following are recommendations for a monitoring program, which would evaluate the effectiveness of the Wellfield Protection Management Plan.

2. Regulatory Framework

Planning to protect the groundwater supply for Middleton, takes place within the broader context of federal, provincial and municipal planning regulations and policies. The following section highlights areas of provincial and federal jurisdiction and relevant legislation and guidelines related to land use practices which pose potential risk to groundwater quantity and quality. Section 3, will focus on the municipal level and how land use planning can be used as a tool for groundwater protection.



2.1. Drinking Water in Nova Scotia

Nova Scotia Environment (NSE) is the lead agency for the provision of access to safe, adequate and reliable public water supplies. The *Environment Act, 1994-95* and the *Water Resources Protection Act, 2000* provide the legislative framework for protecting water resources. The *Environmental Goals and Sustainable Prosperity Act, 2007* is also relevant to water protection as it establishes two of the Province's long-term environmental and economic objectives as having municipal drinking water supplies meeting Provincial standards by 2008 and developing a comprehensive water-resource management strategy by 2010.

The *Environment Act* permits the designation of protected water areas surrounding any municipal water supply source. The designation may include regulations intended to prevent impairment of water quality, such as watercourse setbacks, sediment and erosion controls and animal pasture restrictions. More than twenty areas in Nova Scotia have this designation and each has slightly different restrictions depending on the needs of the community and water supply objectives.

In 2002, the Province released A Drinking Water Strategy for Nova Scotia. The strategy is a comprehensive approach based in multi-barrier management. Multi-barrier management focuses on source protection, water treatment, and monitoring and reporting on a broad, watershed basis. Wellfield protection planning and Protected Water Area designations are key components of source water protection, and the provincial strategy recommends that municipalities undertake a source water protection plan to prevent drinking water problems from occurring.

In 2004 NSE provided municipalities with a guide for developing a source water protection plan. The guide includes five steps, which are being used to create the protection plan for Middleton:

- Form a source water protection advisory committee
- Delineate a source water protection area boundary
- Identify potential contaminants and assess risk
- Develop a source water protection management plan
- Develop a monitoring program to evaluate the effectiveness of protection

2.2. Regulations for Public Drinking Water & Wastewater

The requirements for water and wastewater treatment facilities and monitoring are set forth in the Water and Wastewater Facilities and Public Drinking Water Supplies Regulations made under the *Environment Act*. These regulations require facilities be operated by certified operators and classified according to size, population served and unit processes. Water and wastewater treatment facilities are classified from one through five, based on a point system outlined in the Facility Classification Standards.

Water quality monitoring and reporting is required for all public water supply systems in Nova Scotia. Regular testing must be conducted in accordance with the parameters set forth in the Guidelines for Monitoring Public Drinking Water Supplies. The microbiological, physical and chemical characteristics of a public drinking water supply cannot exceed the acceptable standards of the Guidelines for Canadian Drinking Water Quality. These guidelines are published by Health

Canada on behalf of an intergovernmental committee, based on research related to health effects, aesthetic effects and operational considerations of water quality and treatment.

2.3. On-site Sewage Disposal

The On-site Sewage Disposal System Regulations made under the *Environment Act* are to ensure the safe and clean operation of sewage systems not managed centrally by a municipality, generally for single unit residential systems. Approval from the province is required for the installation of a sewage disposal system, which must meet regulations for design, installation and distance from wells, watercourses and other features. Certification is required for both the system designer and installer. The owner of a system is responsible for its proper functioning, and must make repairs to any malfunction. The On-site Sewage Disposal Systems Technical Guidelines are in accordance with the regulations and are intended to facilitate proper planning, design, selection, installation, operation and maintenance of on-site systems.

2.4. Well Construction

The Well Construction Regulations made under the *Environment Act* provide guidelines for the proper construction of groundwater wells. Improperly constructed or abandoned wells can result in contaminated surface and shallow groundwater entering the well and impacting well water or aquifer water quality. A well may not be constructed closer than the minimum distances from potential sources of contamination, particularly sewage disposal systems. A well may not be constructed in manner or location that could allow surface water to enter the well or aquifer.

A well casing at least 6.1m long is required, as well as a well liner and well screen. A minimum annular space of 25 mm outside the well casing is required. Any remaining volume of the outer borehole annulus is filled in with grout, drill cuttings or impermeable soil to the ground surface and prevents surface water from entering the annular space.

The Well Construction Regulations require the proper abandonment of wells no longer in use. The well must be immediately decommissioned by sealing it to prevent the vertical movement of water in accordance with criteria set forth in the Water Well Decommissioning Guidelines.

2.5. Petroleum Storage

The *Petroleum Management Regulations* made under the *Environment Act* include guidelines pertaining to any structure designed for the underground or aboveground storage in excess of 4,000 litres of liquid petroleum of any kind, including gasoline, diesel and lubricants. The regulations include installation, monitoring and removal standards, and require certification of petroleum storage tank installers. In the event of a spill, the person responsible for the petroleum storage must follow the reporting procedures outlined in the *Emergency Spill Regulations* and take the necessary steps to stop the spill, clean up the affected area and rehabilitate the environment.

Domestic heating oil tanks are regulated under different legislation. NSE recommends the use of aboveground oil tanks that meet the national construction standards (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* & Laboratories of Canada's ULC/ORD C80, *Aboveground Non-metallic Tanks for Fuel Oil*). Insurance companies will sometimes recognize tanks constructed for longer lifespan or include containment features such as double-walled tanks. Under the Nova Scotia Fire Safety Regulations, domestic oil tanks must be installed according to national standards (Canadian Standards Association's CSA B-139, *Installation Code for Oil-Burning Equipment* (latest recognized edition and the *National Fire Code of Canada* (latest edition)). Domestic oil tanks must be installed by trained installers and be inspected regularly by a heating service professional. NSE recommends that tanks be installed indoors rather than outdoors to avoid corrosion and weathering that may damage the tank and potentially lead to a spill and environmental contamination.

2.6. Agricultural Practices

Agricultural practices include the use or management of fertilizer, livestock, manure and other wastes. The practices which affect water supply quality are regulated federally, provincially and municipally under various legislative statutes, regulations, and bylaws. The Environmental Regulations Handbook for Nova Scotia Agriculture, published by the Department of Agriculture, summarizes the role of each regulatory body affecting agricultural operations from an environmental standpoint.

Fertilizer storage and application, except in very large quantities, is not regulated. However, fertilizer contaminating surface or groundwater could trigger charges under four separate pieces of legislation, the *Canadian Environmental Protection Act*, the *Fisheries Act*, the *Health Act* or the *Environment Act*.

The bacteria and nutrients from the faeces and urine of livestock may cause a significant adverse effect to water quality. Although there is no legislation that specifically states livestock and manure are not permitted in streams, there are two laws which in effect say this. The *Fisheries Act* states that no person shall alter fish habitat without approval and "no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish" or where the substance may enter water frequented by fish. The provincial *Environment Act* also says that no one can release (knowingly or not) into the environment a substance that causes or may cause a significant adverse effect. These laws are significant because the wastes of livestock qualify as deleterious substances. Additionally, the uncontrolled trampling of cattle on the banks of streams and on stream bottoms can disturb soil and stream sediments leading to siltation. Silt is also deemed a deleterious substance under the *Fisheries Act*.

Manure Management Guidelines in Nova Scotia were developed by the Department of Agriculture in 2006. The guidelines outline manure management systems and practices that help to reduce the risk of pollution and minimize odours. Recommended actions include proper

manure storage facility siting, system design options, safety practices, ventilation and transportation methods. The National Farm Building Code specifies construction requirements for manure storage, and a permit is required.

The Environmental Farm Plan (EFP) Program was initiated in 1997 to help farmers identify and assess environmental risk by examining their farm operation from an environmental management perspective. It allows farmers to incorporate environmental considerations into business decisions, rather than addressing environmental issues as they arise. An EFP involves an environmental farm review which considers many factors, including effects to water quality. The program is led by the Nova Scotia Federation of Agriculture and NSAF, and is voluntary at this time, although it is recommended that all farmers participate.

2.7. Pesticides

The federal and provincial governments share the responsibility of pesticide regulation. Health Canada is responsible for the evaluation, registration and re-evaluation of pesticides used in Canada through the *Pest Control Products Act*. The enforcement and compliance of the import / export of pesticides or violations of label requirements are also under federal jurisdiction.

Through the Pesticide Regulations and the Activities Designation Regulations made under the *Environment Act*, NSE regulates the sale, use, storage and disposal of pesticides. These regulations also require certification of applicators and vendors of restricted or commercial class pesticides. In some cases, an approval permit is required from NSE to apply pesticides. A permit is also required for pesticide storage.

2.8. Forestry Practices

Forest harvesting on any woodland in Nova Scotia must take place according to the *Forests Act* and Wildlife Habitat and Watercourses Protection Regulations. Requirements pertaining to water protection include leaving buffer strips (special management zones) along water-courses. Under the *Environment Act*, NSE approval is required for the alteration of a water course by activities related to wood lot management.

2.9. Mineral Extraction

Mineral extraction in Nova Scotia falls under Provincial jurisdiction and must comply with all applicable legislation and regulations. The *Mineral Resources Act* prohibits detailed ground exploration without first obtaining all necessary approvals from the NSE.

3. Municipal Planning and Groundwater Protection

Municipalities have an important role to play in drinking water protection. Municipal land use planning is identified by NSE as an excellent tool in developing source water protection plans. The Nova Scotia *Municipal Government Act* (MGA) gives municipal councils authority to govern at the municipal level and sets out legislation related to municipalities. Within the MGA are several Statements of Provincial Interest that are intended to guide Provincial departments and municipalities in making land use decisions that respect the finite nature of Nova Scotia's land and water resources and lead towards sustainable development. Part VIII of the MGA focuses on planning and development and outlines legislation related to land use, ensuring consistency with Provincial interests and regulations.

3.1. Statement of Provincial Interest Regarding Drinking Water

The Statement of Provincial Interest Regarding Drinking Water in the MGA is intended to set the direction and provide guidance for how municipalities can ensure the protection of drinking water. The goal of this Statement of Provincial Interest is "To protect the quality of drinking water within municipal water supply watersheds". The Statement continues to emphasize that a "safe supply of drinking water is a basic requirement for all Nova Scotians" and that "inappropriate development in municipal water supply watersheds may threaten the quality of drinking water" (*Municipal Government Act*, 1998, Schedule B, Statements of Provincial Interest).

Decisions that Provincial departments and municipalities make about land use must be consistent with the Province's commitment to protect drinking water. The Statement requires that planning documents identify all municipal water supply watersheds within the planning area and address the protection of drinking water. It identifies land use and development restrictions as well as watershed management strategies as importation protection measures.

3.2. County and Town Land Use Planning Policies Related to Groundwater Protection

Figure 1.1 shows the location of the Town of Middleton production wells, which are outside the Town boundaries and within the Annapolis County East End Planning Area. In fact, of the total 115.27 hectares in the Middleton Wellfield Protection Area, approximately 101.87 hectares or 88% of the area is located outside of Middleton boundaries, and within the Annapolis County East End Planning Area. Planning for groundwater protection is relevant at both the County and the Town levels because of the location of the wells. Policies for groundwater protection established in the Middleton Wellfield Protection Management Plan will act together with the Town of Middleton Municipal Planning Strategy (MPS) and Land Use By-Law (LUB) as well as the Annapolis County East End Area MPS and LUB.

3.3. Town of Middleton Planning Policy and Groundwater Protection

The Town of Middleton MPS demonstrates the town's commitment to environmental protection and states it as the first goal for the town:

“To protect the existing natural environment from unnecessary disruption and to make environmental improvements, where possible, in order to enhance Middleton as a place to live” (Town of Middleton MPS 2007, 2.2.1 Environment, page 14).

In addition, the MPS discusses the importance of being sensitive to change in both the natural and built environments and the impact one can have on the other. The Middleton MPS, section 2.13 Water Policy outlines the town's policies about water protection and servicing including:

- Upgrading and maintaining the present water supply
- Investigating various methods of protection of the watershed area
- Co-operating with the County to ensure watershed protection

Table 3.3 summarizes the policies regarding water supply and protection in the Middleton MPS.

Table 3.3: Town of Middleton Municipal Planning Strategy Policies Related to Groundwater Protection

Policy	Section	Description
2.13 W1.	2.13 Water Policy	Council shall continue to upgrade and maintain the present water supply system of the Town.
2.13 W2	2.13 Water Policy	Council shall investigate various methods of protection of the watershed area. The Town shall co-operate with the County to ensure the most beneficial and expedient method of protection of the watershed area.
3.7 I16.av, bii, c	Criteria for Amendment to the Land Use By-law and Evaluation of Proposals for Development Agreements	<p>In considering amendments to the zoning in the by-law or, entering into development agreements, in addition to all other criteria as set out in various policies of this planning strategy, Council shall have regard for the following matters: That the proposal is in conformance with the intents of this Strategy and with the requirements of all other Town By-laws and regulations;</p> <p>(a) That the proposal is not premature or inappropriate by reason of:</p> <p>(v) the potential for the contamination of water courses or the creation of erosion or sedimentation;</p> <p>(b) That controls are contained in a Land Use By-Law or a development agreement so as to reduce conflict between the development and any other adjacent or nearby land use by reason of :</p> <p>(ii) emissions including air and water pollutants and noise; (c) Suitability and development costs of the proposed site in terms of steepness of grades, soil and geological conditions, marshes, swamps, or bogs and proximity of highway ramps, railway rights-of-way and other nuisance factors.</p>

3.4. Annapolis County Planning Policy and Groundwater Protection

The Annapolis County East End Area Municipal Planning Strategy highlights the importance of water resources right at the outset when explaining the purpose of regional planning documents:

“this plan and by-law seeks to guide development by way of providing planning documents designed to **achieve harmony** among agricultural, residential, commercial and industrial uses of land, **water** and resources, and to provide and preserve all that is best about living in the urban and rural areas of Annapolis County East” (Annapolis County East End Area MPS 2004 1.ii, page 1, emphasis added).

The Annapolis County East End Area MPS demonstrates commitment to protecting the Town of Middleton’s groundwater supply through Open Space zoning. Protective measures are intended to “promote and encourage low impact developments such as forestry uses, agricultural uses, parks and passive recreation uses” in order “to minimize the negative impact development may have on this sensitive municipal water supply wellhead area”. (Annapolis County East End Area MPS 2004, 1.vi.a., page 3 & MPS 6.1, page 22).

Section 6.0 Environmental Protection, of the Annapolis County East End Area MPS outlines policies and their rationale related to the protection of the Town of Middleton’s water supply. Table 2.1 includes these policies and others related to water protection in the Annapolis East End Area MPS. Part 19 of the Annapolis County East End Area LUB discusses the uses permitted in the Enviro Open Space (OS) zone intended to protect water sources.

Table 3.4: Annapolis County East End Area Municipal Planning Strategy Policies related to Land Use and Groundwater Protection

Policy	Section	Description
6.0.1 Annapolis MPS	6.0 Environmental Protection	It is the policy of Council to designate lands owned by the Town of Middleton and surrounding the water supply well field area as "Enviro Open Space" on the Future Land Use Map.
6.1.1 Annapolis MPS	6.1 Watershed Protection	It is the policy of Council to establish an Enviro Open Space (OS) Zone in the Land Use By-law and all lands designated as “Enviro Open Space” will be zoned OS. It is also the policy of Council to set out provisions in the Land Use By-law that prohibit structures, excepting water supply facilities, from being located/erected within 100 m. (328 ft.) of a municipal water supply wellhead
6.1.2 Annapolis MPS	6.1 Watershed Protection	Within this Enviro Open Space (OS) Zone, the permitted uses shall be limited in order to minimize the negative impacts of development on the sensitive Middleton water supply area and to protect the quality of the water supply. Permitted uses in the Enviro Open Space (OS) Zone shall include water supply and distribution uses, park or recreational uses, conservation related uses and structures, public utilities and forestry and agricultural uses but not including structures accessory to the forestry or agricultural use.
6.1.3 Annapolis MPS	6.1 Watershed Protection	It is the policy of Council to consider altering the boundaries of the "Enviro Open Space" designation and zone if deemed necessary, as a result of further study by a qualified professional to clearly define the extent of the recharge area and protection level zones and upon

		request of the Town of Middleton. The Annapolis County East End Area Municipal Planning Strategy and Land Use By-law shall therefore be amended to reflect any change required as a result of study and/or application. It shall further be the policy of Council to be involved (as part of a committee or being a party to be consulted) in the development of any study that would result in the development of a watershed plan for the well field area and/or result in the need to alter the boundaries of the "Enviro Open Space" designation.
6.1.2 Annapolis MPS	6.2 Watercourse Setback	It is the policy of Council to include a 7.6 m. (25 ft.) watercourse setback buffer strip in the Land Use By-law in which the erection of any building or structure, other than wharves, boat houses or launches, landscaping structures such as gazebos and fishery related uses within 7.6 m. (25 ft.) of any watercourse in the Annapolis County East End Planning Area shall be prohibited. For clarification, the separation distance or setback shall be measured from the edge, meaning the ordinary high water mark of the watercourse and the watercourse setback distance can be defined as being part of any side, rear or front yard, as the case may be, with the intention that the developer retain as much of the natural vegetation in the watercourse setback distance buffer strip as possible.
9.2.2vi, vii, ix Annapolis MPS	9.2 Land Use By- law and Amendments	In considering an application for an amendment to the Land Use By-law Council shall ensure that the amendment is in conformity with the intent and policies of this Plan and with the requirements of the Municipal Government Act and the Land Use By-law, and Council shall ensure that the proposal is not premature or inappropriate by reason of: <ul style="list-style-type: none"> vi. the potential for the contamination of watercourses, creation of erosion or sedimentation, or pollution; vii. the adequacy of storm water management and sewer and water services and utilities or if central piped services are not provided, the adequacy of physical site conditions for private onsite sewer and water systems and storm water management ix. the suitability of the proposed site in terms of steepness of grades, soil or geological conditions, and the relative location of watercourses, and wetlands (marshes, swamps and bogs).
9.3.1iv, ix, x	9.3 Development Agreements	In considering an application for a development agreement or an application for an amendment to a development agreement, Council shall ensure that the application for a development agreement or an application for an amendment to a development agreement is in conformity with the intent and policies of this Municipal Planning Strategy and with the requirements of the Municipal Government Act, and Council shall ensure that the proposal is not premature or inappropriate by reason of: <ul style="list-style-type: none"> iv. the adequacy of municipal services with particular regard to the demand the proposed development will have on the municipal storm water system, sanitary sewer system, water system, fire protection, refuse collection and police protection; ix. the suitability of the proposed site in terms of steepness of grades, soils and geological conditions, location of

		<p>watercourses, wetlands such as marshes, fens, swamps and bogs and other nuisance factors; and</p> <p>x. the potential for the contamination of watercourses, creation of erosion or sedimentation, or pollution.</p>
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Municipal planning strategy policies and land use by-laws in the Town of Middleton and Annapolis County East End Area planning documents demonstrate a commitment to source water protection. Annapolis East End Area MPS policy 6.13 allows for changes to policies in order to strengthen water protection and ensure the quality and quantity of Middleton's groundwater. Annapolis County policy states council's desire to be involved with the establishment of any future guidelines to increase the area of wellfield protection.

4. Establishing a Wellfield Protection Area

The establishment of a Wellfield Protection Area that would be comprised of four Wellfield Protection Zones was recommended in CBCL Limited's December 2007, Town of Middleton Capture Zone Modelling: Technical Report. Zones are delineated according to the level of risk posed by contaminants for entering the groundwater. The level of risk posed by a contaminant is dependent on the length of time it stays in the aquifer, and therefore groundwater travel time is an important consideration in protecting the wellfield from potential risk of contamination. Wellfield Protection Zones are useful for informing management plan decisions; they ensure that protection measures are appropriate based on the vulnerability of each zone.

It is recommended that the greatest protective measures are within Wellfield Protection Zone 1 and Wellfield Protection Zone 2 because they are closest to the wells. The recommended degree of protection decreases with distance from the wells in Zones 3 and 4. In zones closest to the wellheads a broad spectrum of contaminants poses a potential threat to the security of the water supply. These contaminants are of high risk even when released at low levels, or with poor mobility in groundwater. With increasing distance from the wellhead, the list of contaminants of concern becomes narrower, focusing on those materials which readily dissolve and are transported over long distances. Figure 4.0 illustrates the recommended Wellfield Protection Zones for the Town of Middleton water supply based on the groundwater flow model analysis summarized in the technical report. Following are descriptions, adapted from the Technical Report, of potential contamination risks associated with land uses in each zone.

4.1. Wellfield Protection Zone 1 (25 metre radius)

The zone of critical importance is the area immediately around each of the wells. This zone extends to a radius of 25 metres around each well, accounting for at least 15 days of travel time to the well heads. Activities in this zone would ideally be strictly limited to operation of the well field. Contaminants and land uses of concern in Zones 2, 3, and 4 are also of concern in Zone 1.

4.2. Wellfield Protection Zone 2 (Two Year Capture)

Wellfield Protection Zone 2 is defined by the 2-year capture zone. Contaminants of concern in Zone 2 have low mobility but pose a significant health risk to water users. The contaminants of greatest concern within this zone are bacteria (primarily E. Coli) and viruses found in municipal sewage and animal waste. Land uses associated with these contaminants include agriculture, and any type of chemical or fuel storage. Contaminants and land uses of concern in Zones 3 and 4 are also of concern in Zone 2

4.3. Wellfield Protection Zone 3 (Five Year Capture)

Wellfield Protection Zone 3 is defined by the 5-year capture zone, an area requiring restrictions on contaminants with moderate mobility and stability in the subsurface environment. Contaminants excluded from Zone 3 pose a health risk at moderate to low concentrations, and are subject to processes of adsorption and biodegradation. These materials are generally attenuated over periods of time of less than five years. Petroleum hydrocarbon users fall within this

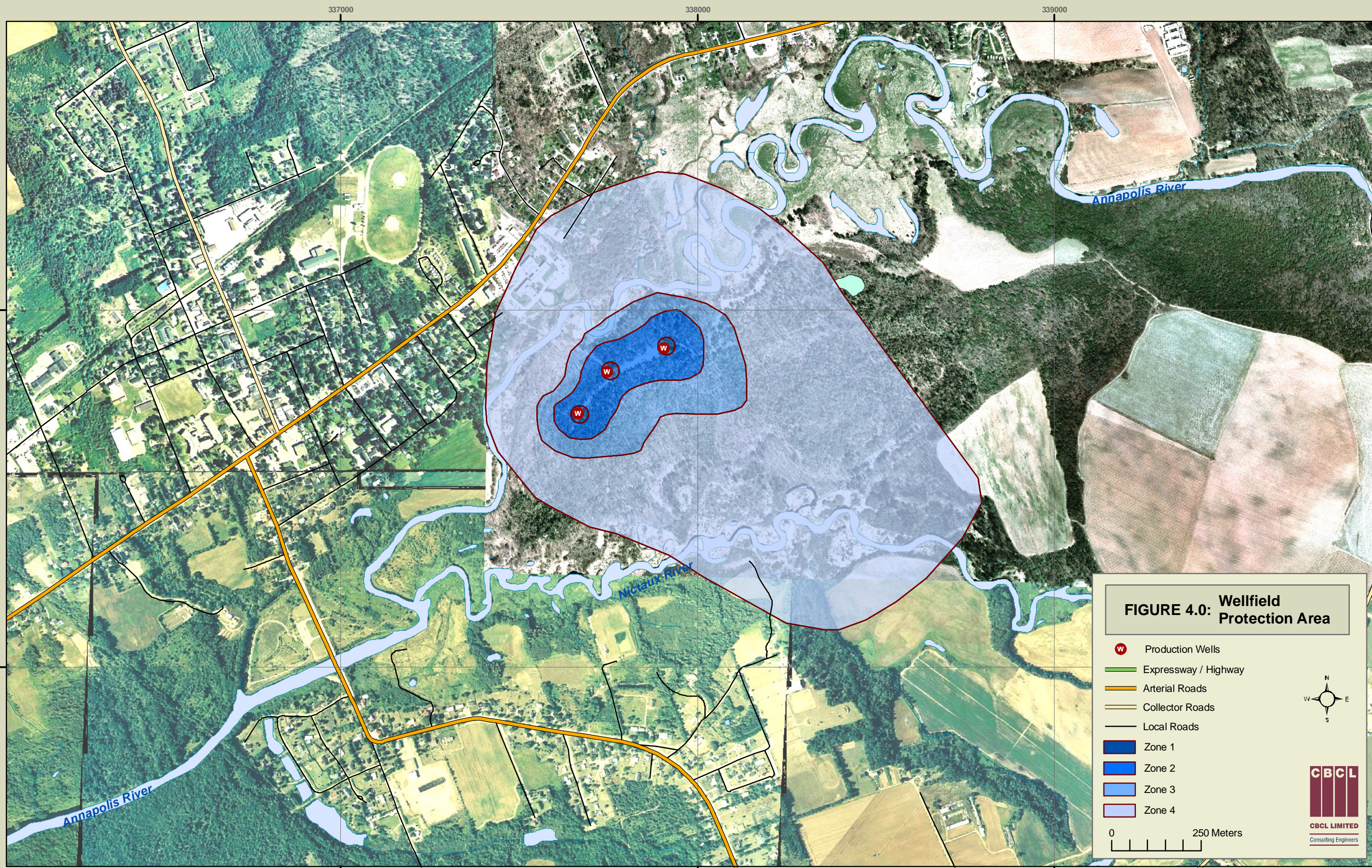


FIGURE 4.0: Wellfield Protection Area

- W Production Wells
- Expressway / Highway
- Arterial Roads
- Collector Roads
- Local Roads
- Zone 1
- Zone 2
- Zone 3
- Zone 4



0 250 Meters



category, including service stations, automotive painting and repair shops, fuel storage and transfer of any kind, and auto salvage operations. Contaminants and land uses of concern in Zone 4 are also of concern in Zone 3.

4.4. Wellfield Protection Zone 4 (Twenty-five Year Capture)

Wellfield Protection Zone 4 is defined by the 25-year capture zone, created to manage contaminants which pose a health risk at low concentrations, and which are readily transported over large distances and longer time frames. Zone 4 also represents the outer boundary of the Wellfield Protection Area as a whole. Dense non-aqueous phase liquids (DNAPLs) such as trichloroethylene and perchloroethylene, which are found in dry cleaning chemicals and degreasers, have the tendency to penetrate deep aquifers and are concerns in Zone 4. Chloride, nitrate, and some metals which are readily transported in the groundwater have the ability to arrive at the well head in high concentrations. Land use activities associated with these contaminants include landfills, dry cleaning facilities, metal shops, automobile service shops, sewage disposal facilities, bulk salt storage, bulk storage of fuels and chemicals including pesticides and fertilizers.

5. Current Land Uses in the Wellfield Protection Area & Potential Risks

A land use inventory was performed in the study area, which included a review of available zoning maps, and aerial photographs from the Town of Middleton and Annapolis County and a field survey of the study area. Land use zoning in the Wellfield Protection area is shown in Figure 5.0 (Town of Middleton zones are white, and Annapolis County zones are yellow). The majority of land within the Wellfield Protection Area falls within the Annapolis County zone Open Space (OS), followed by Agriculture (AG).

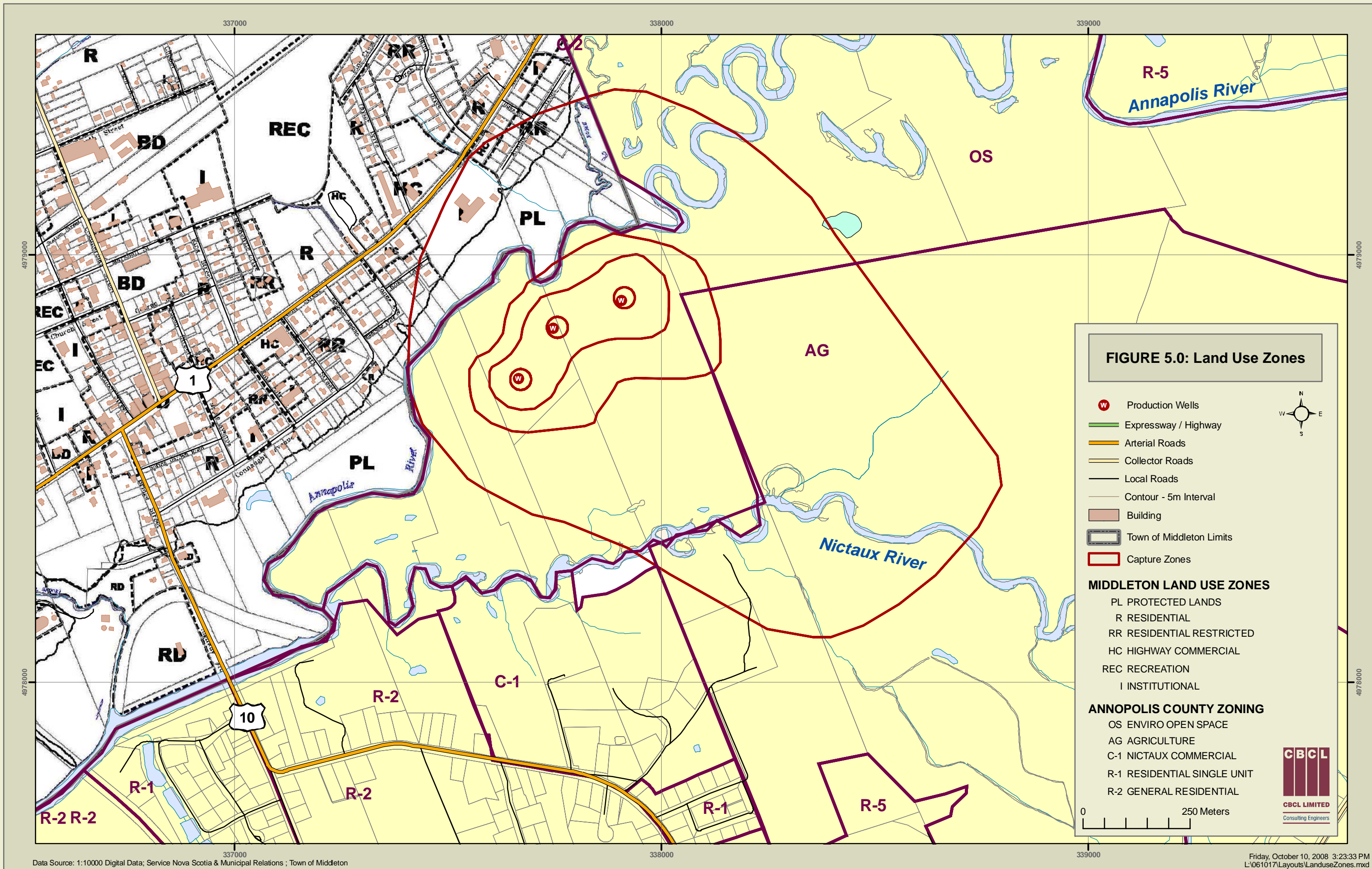
Figure 5.2 illustrates the potential sources of contamination within the Wellfield Protection Area, which are discussed in the following sections:

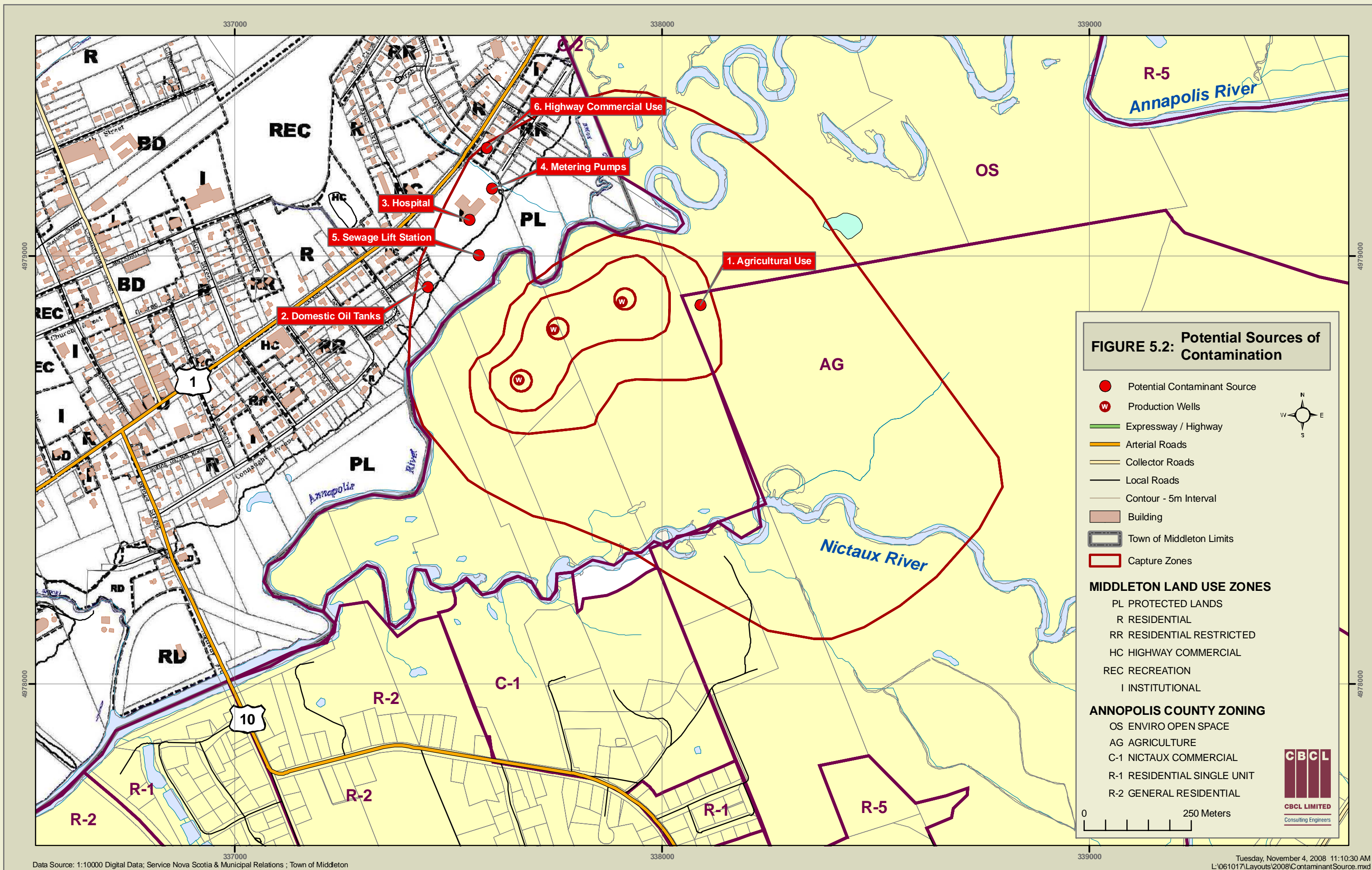
- Zone 3: - Potential Risk: Fuel and Chemical Storage on Land zoned Agriculture
 (See Section 5.2.1)
- Zone 4: - Potential Risk: Domestic Oil Tanks on Land zoned Residential Restricted
 (See Section 5.3.1)
- Potential Risk: Fuel and Chemical Storage on Land zoned Institutional
 (See Section 5.3.2)
- Potential Risk: Fuel and Chemical Storage on Land Zoned Highway Commercial
 (See Section 5.3.3)

5.1. Wellfield Protection Zone 1 & 2 Current Land Use

Land in Wellfield Protection Zones 1 and 2 are zoned by the Annapolis County East End Planning Area By-Law as Open Space (OS). This is a fairly restrictive zone which only permits

- Water Supply and Distribution Uses
- Park and Passive Recreational Uses





- Conservation Related Uses and Structures
- Forestry Uses (excluding buildings or structures accessory to the operation of the forestry use)
- Agricultural Uses (excluding buildings or structures accessory to the operation of the agricultural use)

(Annapolis East End Area Land Use By-Law 2004, 19.1, page 63)

Currently, these lands are forested or abandoned fields and undeveloped, with the exception of a dirt road providing access to the wells. Well PW1 is located at PID number 5182951. Wells PW2 and PW3 are located at PID number 5180187. Both land parcels are on land owned by the Town of Middleton. In fact, the Town of Middleton owns all of the land falling within Wellfield Protection Zones 1 and 2, as well as a significant amount of land in Zone 3. (Appendix A provides a complete list of property ownership, including PID, contact name and address information for each land parcel within the Wellfield Protection Area). The Town does not allow any other use on its lands other than wellfield protection significantly limiting contamination concerns in Zones 1 and 2.

5.2. Wellfield Protection Zone 3 Current Land Use & Potential Risk

The majority of land within Zone 3 is zoned as Open Space (OS) by the Annapolis County East End Planning Area By-Law. The northern boundary of Zone 3 incorporates a segment of the Annapolis River and a portion of land within the Town of Middleton boundaries that is zoned Protected Land (PL). The PL zone only permits:

- Agricultural uses not requiring permanent structures
- Existing residential uses.

(Town of Middleton Land Use By-Law 2007, 8.1, page 27)

Currently, land within Zone 3 is mainly forested, but also includes a dirt road providing access to the wells, abandoned fields and active pastures.

5.2.1. Potential Risk: Fuel and Chemical Storage on Land Zoned Agriculture (AG)

A potential risk in Zone 3 is a small area of land on the eastern boundary zoned AG - Agriculture by the Annapolis County East End Area Land Use By-law. The Agriculture zone permits:

- Agricultural Uses and Structures
- Farm Supportive Uses
- Existing Non-Farm Residential Uses
- Farm Markets
- Forestry Uses and Structures
- Golf Courses
- Existing Non-Farm Supportive Commercial or Industrial Uses
- Farm Residences accessory to Bona Fide Agricultural Farm Operations

- Bed and Breakfast Operations (in Existing Residential Dwellings Only)
- Home Occupations, subject to the requirements of Part 7, Section 20 (Annapolis East End Area Land Use By-Law 2004, Section 18.1, page 60)

Currently, this portion of the lot is covered by forest and not used for agriculture. However, since the zone allows agricultural use, the property owner could change the land use activities and pose a potential risk at this site. Not all agricultural uses would be of concern in Zone 3. The agricultural activities that would be of concern on this site include storage of fuel or chemicals, including pesticides and fertilizers.

5.3. Wellfield Protection Zone 4 Current Land Use & Potential Risks

The majority of land within Wellfield Protection Zone 4 falls within the Annapolis County East End Area zones Open Space and Agriculture. Most of the land is undeveloped forest, other areas are floodplains along the Annapolis and Nictaux Rivers or active crop fields. There are also some single detached houses within the rural area of Zone 4.

The northwestern extent of Wellfield Protection Zone 4 incorporates land within the Town of Middleton boundaries. Land in this area is zoned Protected Land (PL), Residential Restricted (RR), Institutional (I) and Highway Commercial (HC) according to the Town of Middleton Land Use By-Law. Land use associated with the Protected Land zone is not of concern for groundwater contamination in Zone 4.

5.3.1. Potential Risk: Domestic Oil Tanks on Land zoned Residential Restricted (RR)

The Town of Middleton Land Use By-Law Residential Restricted zone permits the following uses:

- Manses and rectories
 - Neighborhood parks and playgrounds
 - Single detached dwellings
- (Town of Middleton Land Use By-Law 2007, Section 11.1, page 34)

Domestic oil tanks in Zone 4 pose a risk to groundwater if they spill or leak. They are of concern because petroleum products can remain in the groundwater for long periods of time and can be transported over long distances.

5.3.2. Potential Risk: Fuel and Chemical Storage on Land zoned Institutional (I)

The Town of Middleton Land Use By-Law Institutional zone permits the following uses:

- cemeteries, memorial gardens and places of worship
- churches, chapels and religious institutions
- clinics

- clubs and judicial facilities
- government offices and public works facilities
- hospitals
- institutions
- jails
- judicial facilities and related professional and law offices
- libraries
- museums
- private clubs and fraternal organizations
- public health and rehabilitation centres
- residential structures accessory to permitted uses the above
- schools and educational establishment

(Town of Middleton Land Use By-Law 2007, Section 16.1, page 42)

Any institutional buildings with large chemical or fuel storage tanks (underground or above ground) or salt storage piles are potential risks to groundwater contamination in Wellfield Protection Zone 4 in the event of leaks or spills.

5.3.2.1. Soldiers Memorial Hospital

Currently, the one property (PID # 05077821, 462 Main Street) zoned Institutional in Wellfield Protection Zone 4 is the location of the Soldiers Memorial Hospital. It poses a potential risk in the event of a leak or spill from its heating oil tank. The hospital had a new tank installed in 2007 with secondary containment. Within the AVH District Emergency Response Plan there is the intent to develop contingency-specific responses based on a hazard assessment process. A Code Brown, Hazardous Materials Incident, is being developed. It will include facility protocols and protocols for containing and managing hazardous materials spills. The hospital maintains high standards for storage of medical waste and has regularly scheduled pick ups to dispose of those materials off-site. Since the hospital has a rooftop helicopter landing pad, the hospital also has an emergency response plan in the event of a helicopter collision on site.

5.3.2.2 Municipal Metering Pumps & Sewage Lift Station on Property owned by Hospital

There are small metering pumps on this property where liquid chlorine is injected into water pumped from the water supply wells. Approximately 20 gallons of liquid chlorine are stored on site. This amount of chlorine is not a concern in Wellfield Protection Zone 4. Only bulk quantities of chlorine (approximately 200 gallons or more) would be of concern for possible spills and contamination of the groundwater. It is therefore prudent for the Town of Middleton Water Utility to remain aware of the potential risk posed by bulk chemical storage and continue to refrain from storing large quantities of chlorine at this site.

There is also a sewage lift station on this property in Wellfield Protection Zone 4. The lift station is used to pump sewage uphill from a low-lying area. This station has the potential to overflow during periods of high rainfall. Although microbes are not considered a contaminant in Zone 4, it is prudent for the Town of Middleton Water Utility to remain aware of the lift station location and

ensure its proper functioning. The lift station would pose a risk to the groundwater if there was a severe flood event that carried microbial contaminants from the overflow into Wellfield Protection Zones 1 or 2. Due to potential dilution of the contaminants and the catastrophic nature of such flooding that could bring additional contaminants in contact with the wells, the risk of contamination from the lift station is considered small.

5.3.3. Potential Risk: Fuel and Chemical Storage on Land Zoned Highway Commercial (HC)

The Town of Middleton By-Law Highway Commercial zone permits the following uses:

- Amusement Arcades
- Animal kennels and grooming
- Automobile trade activities including, but not restricted to the following:
 - Automobile dealership
 - Carwashes
 - Department of Transportation Depot
 - Gasoline stations
 - Motorcycle and accessory dealers
 - Motor vehicle registry
 - Repair garages
 - School bus depot
 - Service stations
 - Transport garages
 - Vehicle weigh scales
- Bowling alleys
- Driver training schools
- Existing motels converted to apartment use
- Funeral parlours
- Grocery stores and supermarkets
- High density residential developments (greater than 10 dwelling units/gross acre) in the Highway Commercial designation on properties abutting the west side of Brooklyn Street by Development Agreement
- Hobby shops and craft stores
- Hotels, motels, youth hostels
- Laundromats
- Marine craft and accessories
- Mobile home and travel-trailer sales and service
- Non-motorized commercial recreation uses
- Public and private halls
- Recreational-trailer parks and laundromats and variety stores accessory thereto
- Restaurants
- Seed and agricultural merchants
- Service and utilities uses

- Single detached dwellings (1998 Civic Addressing Map, 157 Main Street, 151 Main Street, 147 Main Street, 145 Main Street, 139/141 Main Street, 115 Main Street, 111 Main Street, 43 Brooklyn Street, 33 Brooklyn Street, 9 Brooklyn Street, 16 Brooklyn Street)
- Take-out food outlets
- Taverns, beverage rooms and lounges
- Theatres
- Veterinary clinics

(Town of Middleton Land Use By-Law 2007, Section 13.1, page 37)

Currently the property zoned Highway Commercial in Zone 4 is the location of Chapel Creek Gallery and Picture Framing, (PID # 05267836, 474 Main Street). The current use poses no greater risk to the groundwater than residential uses in Zone 4. However, if the current or future property owners change the land use, there are uses permitted within the Highway Commercial zone that pose potential risk from chemicals leaching into the groundwater. Future potential land uses of concern in the HC zone include automobile trade activities, a laundromat/dry cleaner, mobile home and travel-trailer service, recreational-trailer parks and laundromats and variety stores accessory thereto, agricultural merchants, service and utilities uses, and any developments with large fuel or chemical storage.

6. Risk Assessment of Potential Sources of Contamination

Following the land use inventory, a risk analysis of identified potential sources of contamination was performed based on:

- Contaminant type
- Contaminant source
- Groundwater travel time (i.e. which zone is the potential contaminant within?)
- Short and long-term existing, potential and perceived consequences of impact.

The concerns identified in Table 6.0 are potential risks, and none of the sources pose an immediate threat to the Middleton Wellfield Protection Area. The identified potential risks will thus be addressed with equal priority in the Wellfield Protection Management Plan. Some of the potential sources of contamination currently exist, whereas others do not exist, but could in the future because they are currently allowed in the land use zoning. Strategies for managing the potential risk of groundwater contamination are discussed in detail in Section 7.

Table 6.0: Summary of Risk Analysis

**See Figure 5.2 for the location of the potential sources of contamination*

*Map Reference	Potential Sources of Contamination	WFPP Zone	Contamination Issue	Level of Risk Discussion
1	Agricultural use	3	Inorganic and organic chemical compounds	<ul style="list-style-type: none"> • Currently forested land • Concern is about future change to the land use because land is zoned agricultural. • In Zone 3, the concern about agricultural use is related to fuel storage and transfer as well as bulk storage of chemicals including pesticides and fertilizers. • Risk can be managed by restricting uses which pose a risk to groundwater. • The Town of Middleton purchasing the AG land in Zone 3 and requesting a rezoning of the purchased land to OS by the Annapolis County Council can provide a high level of protection.
2	Domestic Oil Tanks	4	Petroleum leaks and spills	<ul style="list-style-type: none"> • Concern is about management of potential risk from existing and future domestic oil tank leaks or spills in land zoned Residential Restricted. • Risk can be managed through public education.
3	Soldiers Memorial Hospital	4	Petroleum leaks and spills	<ul style="list-style-type: none"> • Concern is about management of potential risk from the hospital's existing large capacity oil tank leak or spill. • Soldiers Memorial Hospital is proactive about ensuring the tank meets all safety standards, has secondary containment and is currently improving

				<p>its Emergency Response Plan to include protocols for leaks or spills.</p> <ul style="list-style-type: none"> • Risk can be managed by continuing communication and cooperation between the Town of Middleton Water Utility and Soldiers Memorial Hospital.
4	Metering Pumps	4	Chlorine storage	<ul style="list-style-type: none"> • Currently the Town of Middleton Water Utility does not store bulk quantities of chlorine at this location. • Concern is about bulk storage of chemicals. • Risk can be managed by refraining from storing bulk quantities of chlorine at this location.
5	Sewage Lift Station	4	Microbial contaminants	<ul style="list-style-type: none"> • Concern is about management of potential risk associated with existing use. • Microbial contaminants are not a primary concern in Zone 4; however it is prudent for the Town of Middleton Water Utility to be aware of potential risk in the case of a severe flood event that would move contaminants into a zone closer to the wellheads. • Risk can be managed through monitoring overflow. If overflow ever poses a risk to the groundwater, additional steps must be taken to remediate the situation and eliminate the risk.
6	Highway Commercial use	4	Inorganic and organic chemical compounds	<ul style="list-style-type: none"> • Current use as an art gallery and framing show poses little risk. • Concern is about future change to the land use. • In Zone 4, the concern about the Highway Commercial use is the allowance of activities involving or storage of dense non-aqueous phase liquids, fuel, chemicals, road salt and metals that may enter the groundwater. • Risk can be managed by restricting uses which pose a risk to groundwater. • Restrictions can be specified in the land use by-law.

7. An Integrated Approach to Wellfield Protection Management

As discussed in Section 3, both the Town of Middleton and the County of Annapolis have been proactive about protecting the Town of Middleton Wellfield. The policies established and actions taken thus far provide a firm foundation to further strengthen groundwater protection. Land use planning is an important tool for protecting groundwater and balancing the development interests within the Middleton community, and will be used as part of the Town of Middleton's comprehensive Wellfield Protection Management Plan. Other tools, such as best management practices and public education, will be integrated alongside land use planning mechanisms.

Where risk analysis in Section 6 identified concern about future change to the land use, land use planning amendments will be the primary tool for reducing the risk of groundwater contamination. Where the identified concern is about management of potential risk associated with an existing use, other management tools will be the primary strategy for reducing the risk of groundwater contamination.

Strategy 7.1. Update Town of Middleton Municipal Planning Strategy Water Policy

Town of Middleton Council will update the Municipal Planning Strategy Water Policy in order to implement the land use planning recommendations in this management plan.

Town of Middleton Council Action Item 7.1.1

MPS Section 2.13 Water Policy states:

W2. Council shall investigate various methods or protection of the watershed area. The Town shall co-operate with the county to ensure the most beneficial and expedient method of protection of the watershed area.

Pursuant to policy W2, Town of Middleton Council will accept the recommendations made in this Middleton Wellfield Protection Management Plan. Council shall undertake, as necessary, additional amendments to the MPS and LUB in order to institute wellfield protection measures.

Town of Middleton Council Action Item 7.1.2

Town of Middleton Council will add the Wellfield Protection Zones to all relevant zoning and land use maps in the Town of Middleton Municipal Planning Strategies and Land Use By-laws. Town Council will request the Annapolis County Council to add the Wellfield Protection Zones to all relevant maps in Annapolis County East End Area MPS and LUB.

Strategy 7.2. Apply a Hierarchy of Land Use Restrictions within the Wellfield Protection Area

Both the Town of Middleton and the Annapolis County Land Use By-Laws have policies stating that where the provisions of the By-Laws conflict with any other Municipal by-law, Provincial or federal regulation, the higher or more stringent regulations shall prevail (Annapolis County East End Area Land Use By-Law Section 7.1, page 26 and Town of Middleton Land Use By-Law Section 4.4.2, page 13).

Town of Middleton Council Action Item 7.2.1

In conformance with the Town of Middleton Land Use By-Law Section 4.4.2, Town Council will recognize that properties falling within the Wellfield Protection Zones are subject to more stringent land use restrictions and those restrictions will prevail when making land use decisions.

Annapolis County Council Action Item 7.2.2

Middleton Town Council will request Annapolis County Council to make a similar recognition pursuant to the Annapolis County East End Area Land Use By-Law Section 7.1.

Strategy 7.3. Retain Town of Middleton Ownership of Land

Land acquisition within the wellfield area enables a very high level of protection because a municipality can control land use, offer surveillance, and enforce rules and regulations that protect groundwater. As discussed in section 5.1, the Town of Middleton owns all of the land in Zones 1 and 2, and a significant amount in Zones 3 and 4. It is recommended that the Town of Middleton retain ownership of the land in Zones 1 and 2 in order to continue control over land use within close proximity to the wellheads. The Town may also consider purchasing additional land in Zones 3 and 4 as it becomes available to further enhance groundwater protection.

Town of Middleton Council Action Item 7.3.1

The Town of Middleton Council will commit to protecting the wellfield through land ownership. The Town will retain ownership of land in the Wellfield Protection Area and consider purchasing additional land in the area as it becomes available.

Strategy 7.4. Retain Current Zoning

The current zones in the Town of Middleton By-Law and the Annapolis County East End Area By-Law are for the most part consistent with protecting the wellfield.

Town of Middleton Council Action Item 7.4.1

Town Council shall commit to retaining the current zoning in the Middleton Wellfield Protection Area. If a change in zoning or land use is proposed, Council will only consider those uses which have equal or less potential to contaminate the groundwater than current zoning.

Annapolis County Council Action Item 7.4.2

The Town of Middleton Council will request that the Annapolis County Council retain the current zoning in the Middleton Wellfield Protection Area. If a change in zoning or land use is proposed, Annapolis County Council shall only consider those uses which have equal or less potential to contaminate the groundwater than current zoning.

Strategy 7.5. Address Potential Risk from Agricultural Use in Zone 3 By Negotiating Land Purchase and Rezoning.

As discussed in Sections 5.2.1 and 6, there is a portion of land zoned Agricultural that falls within Wellfield Protection Zone 3. Potential agricultural uses, such as storage or transfer of fuel and storage of chemicals including pesticides and fertilizers, on this site could pose a risk to the groundwater. It is recommended that the Town of Middleton enter into negotiation with the property owner of PID# 05196746 (Highway 201, Nictaux) to purchase the portion of this property that falls within Zone 3. This portion of land will then be rezoned from Agriculture Use (AG) to Open Space (OS). These measures will provide a high level of groundwater protection in Zone 3.

Middleton Town Council Action Item 7.5.1

The Town of Middleton Council will enter into negotiation with the property owner of PID# 05196746 (Highway 201, Nictaux) to purchase the portion of this property that falls within Zone 3.

Annapolis County Council Action Item 7.5.2

Following the Town of Middleton's purchase this portion of PID# 05196746 (Highway 201, Nictaux), the Town of Middleton will request that the Annapolis County Council rezone this portion of land from Agriculture Use (AG) to Open Space (OS).

Strategy 7.6. Restrict Certain Highway Commercial Land Uses in Wellfield Protection Zone 4

As discussed in Sections 5.3.3 and 6, certain uses allowed in the Highway Commercial zone pose a potential risk to groundwater. The current use, a gallery and framing shop, poses no greater risk to the groundwater than the surrounding residential uses. Concern is therefore about the potential risk posed by a future change in use.

It is recommended that property (PID# 05267836, 474 Main Street) zoned HC be subject to more stringent restrictions due to its location within Wellfield Protection Zone 4. It is recommended that the Town of Middleton Council continue to permit certain HC uses as of right. Land uses other than those explicitly permitted will only be considered by development agreement. Gas stations, gas bars or any other facility offering service to automobiles, sales of gasoline, diesel fuel and lubricating oil will be explicitly prohibited and *not* considered by development

agreement within the Wellfield Protection Area, including property (PID# 05267836, 474 Main Street) currently zoned Highway Commercial.

Town of Middleton Council Action Item 7.6.1

The Town of Middleton Council shall consider Highway Commercial uses other than those explicitly permitted in Wellfield Protection Zone 4 only by development agreement. Gas stations are prohibited and will not be considered by development agreement. Council shall amend the Town of Middleton Municipal Planning Strategy to allow for this consideration in Section 3.6 Development Agreements, I13:

- (e): Change in use, to anything other than a permitted use listed, except gas stations, under Special Requirement 13.3.1 (a) in the Highway Commercial zone on property (PID# 05267836, 474 Main Street) which falls within the Middleton Wellfield Protection Zone 4.

Town of Middleton Council Action Item 7.6.2

Town of Middleton Council will amend the Land Use By-Law to include under Section 13.3 Special Requirements, a list of permitted HC uses for property (PID# 05267836, 474 Main Street), and a requirement that all other uses will only be considered by development agreement.

13.3.1 Special Requirement: Highway Commercial Uses in Wellfield Protection Zone 4

13.3.1 (a) The following uses are permitted as of right in the Highway Commercial zone on property (PID# 05267836, 474 Main Street) in Wellfield Protection Zone 4:

- Amusement Arcades
- Animal kennels and grooming
- Bowling Alleys
- Driver training schools
- Funeral parlours
- Grocery Stores and supermarkets
- Hobby shops and craft stores
- Hotels, motels and youth hostels
- Marine craft and accessories
- Non-motorized commercial recreation uses
- Private and public halls
- Recreational-trailer parks and variety stores accessory thereto
- Restaurants
- Take out food outlets
- Taverns, beverage rooms and lounges
- Theatres
- Veterinary clinics

(b) All other uses allowed in the Highway Commercial zone will only be considered by development agreement in the Highway Commercial zone on property (PID# 05267836, 474

Main Street) in Wellfield Protection Zone 4. Dry cleaners, gas stations, gas bars or any automotive trade or other facility offering service to automobiles, sales of gasoline, diesel fuel and lubricating oil are prohibited and shall *not* be considered by development agreement within the Wellfield Protection Area, including property (PID# 05267836, 474 Main Street) zoned Highway Commercial.

No development agreement proposal will be approved that would put the Town of Middleton's water supply at risk. When considering a development agreement proposal, Council shall have regard to the potential for increased risk of groundwater contamination through runoff containing toxic chemicals, including but not limited to detergents, solvents and petroleum products. Council may require the landowner to submit a management plan that includes details about the location, storage and/or handling of potential contaminants such as petroleum products and chemicals. Council will consider whether or not the landowner is carrying out best management practices regarding equipment maintenance, containment and clean up of spills, chemical/automotive parts disposal, waste water disposal, and minimizing use of toxic chemicals. Council may require the property owner to complete the Business Environmental Checklist in order to identify further opportunities for reducing pollutants that could impact the groundwater (https://www.gov.ns.ca/nse/pollutionprevention/docs/biz_checklist_factsheet.pdf).

Furthermore, Council may stipulate that the landowner have appropriate studies conducted by a qualified expert to assess the risk of impact on the quality and quantity of the groundwater before approving a development agreement.

Strategy 7.7. Cooperate with Soldiers Memorial Hospital to Ensure Protection of Groundwater in Zone 4

As discussed in sections 5.3.2.1 and 6, Soldiers Memorial Hospital has a large heating oil tank that poses a potential risk in the case of a leak or spill. The Hospital is being proactive about ensuring their tank has secondary containment and is developing specific protocols to deal with a potential spill or leak.

Town of Middleton Water Utility Action Item 7.7.1

The Town of Middleton Water Utility shall maintain a positive working relationship with the hospital to ensure that hospital administrators are aware of the hospital's proximity to the wellheads and its location within Zone 4 of the Wellfield Protection Area. The Town of Middleton Water Utility will continue to cooperate with the Annapolis Valley District Health Authority to ensure that their District Hazards Plan sufficiently considers groundwater protection in their policies and protocols regarding fuel and salt storage.

Strategy 7.8. Ensure that Sewage Lift Station Continues to Pose Little Risk to the Groundwater

As discussed in Sections 5.3.2.2 and 6, there is a sewage lift station that poses a low risk to groundwater contamination within Wellfield Protection Zone 4.

Town of Middleton Water Utility Action Item 7.8.1

The Town of Middleton Water Utility shall monitor the overflow from the Sewage Lift Station PS#4 located on the grounds of the Veteran's Memorial Hospital (PID # 05077821, 462 Main Street) and take necessary actions to remediate the situation if it ever poses a risk to groundwater in Wellfield Protection Zone 4. The Water Utility will consider the impact overflow from the sewage lift station would have on the quality of groundwater in the event of a severe flood that may carry sewage into the more sensitive Wellfield Protection Zones 1 or 2. These considerations will be incorporated into the Contingency Plan.

Strategy 7.9. Ensure Security and Proper Maintenance of the Wellhead Site

There is a need to balance discouraging potentially harmful access to the wellheads and ensuring that the wellheads can be easily accessed by authorized maintenance personnel. Gating entrance to the wellhead maintenance road and erecting a fence around the wellheads will add a level of security to the groundwater at the most sensitive sites, and indicate to the general public that they are approaching a sensitive area. Regular maintenance of the wellhead sites will ensure that maintenance personnel can access the wellheads.

Town of Middleton Water Utility Action Item 7.9.1

The Town of Middleton Water Utility will ensure that the wellhead site is secure and properly maintained. A gate will be installed at the entry to the wellhead access road and fences installed around the wellheads. Water Utility staff will keep the site properly maintained and clear of any natural growth that would impede access to the wellheads. The Water Utility will investigate other options for ensuring the security of the wellfield as they become necessary, including but not limited to installing waterproof shelter for the wellheads and considering a security alarm system.

Strategy 7.10. Educate the Public about the Wellfield Protection Area

It is recommended that the Town of Middleton make efforts to communicate to all local area residents about the Wellfield Protection Management Plan.

Signs can assist in educating the public about the boundaries of the Wellfield Protection Zones and raise awareness about groundwater protection in general. Signage will be erected at locations where Wellfield Protection Area boundaries intersect with roads, informing people they are entering an important and sensitive area. The Town of Middleton Public Works Department may also determine it is appropriate to erect similar signs on the banks of the Annapolis or Nictaux Rivers at the boundaries of the Wellfield Protection Area, if there is any concern about people, who are unaware of the area's sensitivity and importance, entering the area by water or riverbank. Signage will also be used to discourage entry to the wellhead site.

Town of Middleton Water Utility and Town Council Action Item 7.10.1

The Town shall make Middleton residents aware of the Wellfield Protection Management Plan, including the boundaries of the Wellfield Protection Area and the strategies being undertaken to protect groundwater. The Town shall consider informing the public through means including but not limited to:

- a public open house,
- semi-permanent displays and/or take-home printed fact sheets at grocery stores, churches and public facilities like the Middleton and District Arena and the Rosa M. Harvey Middleton & Area Library,
- mail out of information flyers or booklets,
- information posted on the Town's website,
- advertisement in the local newspaper.

Town of Middleton Council Action Item 7.10.2

Since the Middleton Wellfield Protection Management Plan necessitates certain amendments to the Town of Middleton MPS and LUB, Town Council will arrange a Public Hearing pursuant to MPS Section 3.5, Policy I12 and in accordance with the provisions of the *Municipal Government Act*.

Annapolis County Council Action Item 7.10.3

Since the Middleton Wellfield Protection Management Plan necessitates certain amendments to the County of Annapolis LUB, Annapolis County Council will inform the public according to County policies on public participation outlined in the Annapolis County East End Area MPS Section 9.8 Public Participation Program.

Town of Middleton Water Utility Action Item 7.10.4

The Town of Middleton Water Utility will erect signs at the entrance to the wellhead maintenance road indicating entry to a Wellfield Protection Area. The Public Works Department will also investigate other appropriate locations to erect signs in order to inform the public about the sensitivity and importance of the Wellfield Protection Area they are about to enter.

Strategy 7.11. Educate Residents within the Wellfield Protection Area about Potential Domestic Contaminants

Domestic oil tanks are a potential risk in Wellfield Zone 4, as identified in Sections 5.3.1 and 6. Residents within the Wellfield Protection Area can become groundwater stewards with assistance and information from the Town of Middleton. It is recommended that the Town inform residents within the Wellfield Protection Area about potential sources of risk to groundwater on their properties such as oil tanks, private wells, septic systems, pesticide use on home gardens, and storage of fuel and other chemicals.

Town of Middleton Water Utility Action Item 7.11.1

The Town of Middleton Water Utility will survey all existing functional, abandoned and closed wells within the Wellfield Protection Area. If any concerns arise from conducting this survey, such as storage of fuel near a functioning private well or an improperly closed well, the Utility will inform property owners and work with them to mitigate the risk to the groundwater resource.

Town of Middleton Water Utility Action Item 7.11.2

The Town of Middleton Water Utility will send a letter to all residents within the Wellfield Protection Area informing them of the Wellfield Protection Area boundaries, as shown on an easily discernable map. This letter will emphasize the importance of groundwater protection and the increased sensitivities of each Wellfield Protection Zone. Residents will be informed about the risk associated potential domestic contaminants and encouraged to implement best management practices.

Proper maintenance and monitoring of domestic oil tanks will be highlighted as something that property owners need to be aware of in order to protect the overall groundwater resource.

The Town of Middleton Water Utility will describe how private wells are direct conduits to the overall groundwater resource, and will recommend best practices to ensure that no contaminants are entering the groundwater via private wells. Residents will also be advised on the proper closure of wells no longer in use.

Residents will be directed to best management practices described in NSE publications including, but not limited to:

- On-site sewage disposal (septic systems)
- A Homeowners Guide to Oil Tank Safety
- Home Garden Pest Control
- Composting Yard Trimmings and Leaves (Waste Reduction Fact Sheet)
- Sustainable Gardening
- Pollution Prevention: At Work and at Home
- Before You Construct a Water Well
- A Guide for Private Well Owners

(These publications and others that may be useful for guiding residents towards best management practices can be found on the NSE website: <http://www.gov.ns.ca/nse/pubs/>)

The Town of Middleton Water Utility will make staff available to answer inquiries from homeowners working towards groundwater protection measures.

8. Contingency Plan

The Town of Middleton Water Utility must develop a full contingency plan for the town's water supply. The contingency plan will address operational issues, including equipment or power failure, as well as groundwater protection issues including procedures for the rapid mitigation of environmental accidents, such as a hazardous substance spill, that would constitute a water supply emergency. As part of developing the contingency plan, The Town of Middleton Water Utility will inform emergency responders about the Wellfield Protection Area and indicate that the Utility needs to be contacted immediately in the case of a hazardous substance spill within the area. The Town of Middleton Water Utility will also identify alternative sources of water and means of distributing safe drinking water to residents. Furthermore, the Utility needs to develop a plan for communicating with residents who rely on the public water source about a water emergency, including boil water advisories. According to NSE's guidelines for developing a source water protection management plan, the contingency plan will include:

- General procedures for routine emergencies or major emergencies within a water supply area
- A procedure for equipment becoming inoperable in a major emergency and/or due to power failure
- A procedure for dealing with spills or releases
- Identifying an alternative water source
- Creating a plan for isolating affected areas, and distributing water from unaffected areas.
- Communicating with residents about reducing water use and the provision of bottled water if that will be made available during an emergency.
- A boil water advisory procedure
- Facility-specific information on the hazardous material stored or transported in the source water area.
- Provision for annual review and update by the utility.

Town of Middleton Water Utility Action 8.1

The Town of Middleton Water Utility shall develop a full contingency plan that will address operational and emergency issues throughout the water supply system, including the Wellfield Protection Area.

9. Monitoring Program to Evaluate the Effectiveness of the Town of Middleton Wellfield Protection Plan

According to NSE's guidelines for developing a source water protection management plan, municipalities must develop a monitoring program to evaluate the effectiveness of the protection plan. The Town of Middleton Water Utility must develop a Monitoring Plan by December 2009 that will lay out a full monitoring program. The Monitoring Plan will help the Town of Middleton Water Utility determine how effectively the Town of Middleton Wellfield Protection Management Plan is being implemented as well as how effectively the quality and quantity of the groundwater is being protected.

At present, the Town of Middleton Water Utility conducts bacteriological tests and monitors chlorine levels at the extremities of the system once per week and daily at the hospital site. Twice per year a full chemical analysis is conducted within the water system. Once per year there are full chemical analyses conducted of the individual production wells.

Currently, the Town of Middleton Water Utility is developing a SCADA computer monitoring system, which will give the utility a sophisticated tool for monitoring the groundwater supply. This system will be in place during the fiscal year of 2009/2010, and should be integrated into the monitoring program established in the Monitoring Plan.

The Town of Middleton Water Utility must ensure that the new Monitoring Plan

- Confirms the parameters to be measured
- Confirms the locations and frequency of sampling
- Establishes baseline data
- Records results and determine if conditions are satisfactory and/or changing
- Uses water quantity measurements to aid in evaluation of the protection plan.
 - For example, if the water quantity in Middleton were to decrease dramatically, the risk of contamination could increase. Therefore, water quantity data can also inform the protection of water quality.

In addition to the SCADA computer monitoring system, The Town of Middleton Water Utility will conduct weekly visual inspections of the wellhead sites to ensure there are no potential contaminant sources. The Water Utility will also conduct once per month visual inspections of the potential sources of contaminants identified in Sections 5 & 6 to ensure that property owners are not compromising groundwater quality. The protocols for these inspections will be laid out in the Monitoring Plan developed by the Water Utility.

The Water Utility will use the water quality and quantity information provided by the new SCADA monitoring system and visual inspections to determine whether or not the Wellfield Protection Management Plan is effective at enabling satisfactory water quality results. The results of the water quality monitoring program and visual inspections may indicate poor quality, and that land use practices could be changed to increase water protection. In such a case, the Town of

Middleton Water Utility in conjunction with the Town of Middleton and Annapolis County councils will alter the Wellfield Protection Management Plan accordingly until results are satisfactory. Following any alteration of the Management Plan, the Water Utility will continue monitoring water quality and assessing whether or not the Management Plan is succeeding at protecting groundwater. In addition, the Town of Middleton Wellfield Protection Management Plan will be reviewed as part of the Town of Middleton and County of Annapolis East End Area municipal planning strategy periodic reviews. The Water Utility will provide input on whether or not the Plan is succeeding from a water quality and quantity perspective.

Town of Middleton Water Utility Action Item 9.1

The Town of Middleton Water Utility will develop a Monitoring Plan, incorporating data provided by the SCADA monitoring system as one tool to determine the effectiveness of Wellfield Protection Management Plan.

Town of Middleton Water Utility Action Item 9.2

As part of the monitoring program, the Town of Middleton Water Utility will conduct weekly visual inspections of the wellhead site and monthly inspections of the Wellfield Protection Area in order to identify any new sources of potential contamination or increased risk of contamination from known potential contaminant sources.

Town of Middleton Source Water Protection Advisory Committee Action Item 9.3

The Town of Middleton Water Utility will establish a Source Water Protection Advisory Committee. The Source Water Protection Advisory Committee will be established and will operate according to NSE's "Developing a Municipal Source Water Protection Plan: A Guide for Water Utilities and Municipalities, Step 1: Form a Source Water Protection Advisory Committee". The Committee will establish goals and objectives including providing advice to the Middleton Town Council and the Town of Middleton Water Utility on matters related to land use issues and water quality. The Committee will set out terms of reference in consultation with the municipality and the utility and be officially recognized by Middleton Town Council. As outlined by NSE, the committee will meet as necessary, but no less than three times per year. The committee must prepare an annual report of its activities to be distributed to all organizations and individuals represented on the committee and to other interested parties. The committee will conduct annual reviews of the Wellfield Protection Management Plan, Contingency Plan and Monitoring Plan to ensure that action items are being implemented and to recommend any changes to the plan as required.

Town of Middleton Council in conjunction with the Town of Middleton Water Utility and the Annapolis County Council Action Item 9.4

The Town of Middleton Wellfield Protection Management Plan will be reviewed as part of the periodic reviews of the Town and County Municipal Planning Strategy Reviews. The Town of Middleton reviews its MPS as needed, generally within 10 years from the date of its latest adoption. The Annapolis County East End Area Municipal Planning Strategy is reviewed as

needed, or within 5 years of its latest adoption. The Town of Middleton Water Utility and the Middleton Source Water Protection Advisory Committee will participate in the review of the Wellfield Protection Management Plan and all parties will work together to develop strategies to address new concerns that arise during the periodic reviews. If land use concerns arise prior to a periodic review, Councils will conduct an early review of the Wellfield Protection Management Plan and will work with the Water Utility and the Advisory Committee to develop solutions that will ensure the protection of the groundwater supply.

Town of Middleton Water Utility with the Middleton Source Water Protection Advisory Committee Action Item 9.5

The Town of Middleton Water Utility will conduct a full update of the Monitoring Program every 5 years. The Middleton Source Water Protection Advisory Committee will participate in the five year Monitoring Plan update. The five year updates of the Monitoring Plan will be timed to coincide with the reviews of the Wellfield Protection Management Plan, the Annapolis County East End Area MPS and LUB review. Changes in the Monitoring Plan, the Wellfield Protection Management Plan and any required MPS or LUB amendments can therefore all be made within the same review period.

10. Wellfield Protection Implementation Plan

Table 8.1: Implementation of the Town of Middleton Wellfield Protection Plan

Action Item	Management Strategy	Responsibility	Timeframe
7.1.1	Update Town of Middleton MPS Water Policy	Town of Middleton Council	By December 2009
7.1.2	Update Town of Middleton MPS Water Policy	Town of Middleton Council	By December 2009
7.2.1	Apply a Hierarchy of Land Use Restrictions within the Wellfield Protection Area	Town of Middleton Council	By December 2009
7.2.2	Apply a Hierarchy of Land Use Restrictions within the Wellfield Protection Area	Annapolis County Council	By December 2009
7.3.1	Retain Town of Middleton ownership of land	Town of Middleton	Ongoing
7.4.1	Retain Current Zoning	Town of Middleton	Ongoing
7.4.2	Retain Current Zoning	Annapolis County Council	Ongoing
7.5.1	Enter into negotiation with owner of PID# 05196746 (Highway 201, Nictaux) to purchase the portion of this property that falls within Wellfield Protection Zone 3.	Town of Middleton	2009/2010 fiscal year
7.5.2	Rezone the portion of PID# 05196746 (Highway 201, Nictaux) purchased by the Town of Middleton to Open Space (OS)	Annapolis County Council	By December 2010
7.6.1	Amend MPS to consider by development agreement proposals for a change in use to anything other than the list of permitted uses on PID# 05267836, 474 Main Street, in the Highway Commercial zone that falls within Wellfield Protection Zone 4.	Town of Middleton Council	By December 2009
7.6.2	Amend LUB to permit listed uses and only consider by development agreement all other uses on PID# 05267836, 474 Main Street, in the Highway Commercial zone that falls within Wellfield Protection Zone 4.	Town of Middleton Council	By December 2009
7.7.1	Cooperate with Soldiers Memorial Hospital to Ensure Protection of groundwater in Zone 4	Town of Middleton Council	Ongoing
7.8.1	Ensure that Sewage Lift Station poses little risk to the groundwater	Town of Middleton Water Utility	Ongoing
7.9.1	Ensure Security and Proper Maintenance of the Wellhead site	Town of Middleton Water Utility	2009/2010 fiscal year & Ongoing
7.10.1	Educate the Public about the Wellfield Protection Area – <i>Meetings & Information</i>	Town of Middleton Council & Water Utility	By March 2009
7.10.2	Educate the Public about the Wellfield Protection Area – <i>Public Hearing</i>	Town of Middleton Council	By December 2009
7.10.3	Educate the Public about the Wellfield	Annapolis County	By December 2009

Action Item	Management Strategy	Responsibility	Timeframe
	Protection Area - <i>Public Hearing</i>	Council	
7.10.4	Educate the Public about the Wellfield Protection Area – <i>Signage</i>	Town of Middleton Water Utility	2009/2010 fiscal year
7.11.1	Survey all existing functional, abandoned and closed wells	Town of Middleton Water Utility	2009/2010 fiscal year
7.11.2	Educate Residents within the Wellfield Protection Area about Potential Domestic Contaminants	Town of Middleton Water Utility	2009/2010 fiscal year
8.1	Develop a full contingency plan for the wellfield area	Town of Middleton Water Utility	2009/2010 fiscal year
9.1	Monitoring Program: Develop Monitoring Plan to monitor water quality and assess Wellfield Protection Management Plan	Town of Middleton Water Utility	Developed by December 2009. Ongoing assessment of Management Plan
9.2	Monitoring Program: Visual Inspection of wellheads and Wellfield Protection Area	Town of Middleton Water Utility	Ongoing, weekly/monthly
9.3	Monitoring Program: Establish a Middleton Source Water Protection Advisory Committee, which provides recommendations, and an annual review of the Wellfield Protection Management Plan, Contingency Plan, and Monitoring Plan.	Middleton Source Water Protection Advisory Committee	Ongoing. Meet 3 times/ year. Conduct Annual Reviews.
9.4	Monitoring Program: Review of Wellfield Protection Management Plan at the same time as the Town and County MPS periodic reviews	Town of Middleton, Annapolis County Council, Town of Middleton Water Utility & Middleton Source Water Protection Advisory Committee	At periodic reviews of Town and County East End Area Municipal Planning Strategies
9.5	Monitoring Program: Update Monitoring Plan	Town of Middleton Water Utility & Middleton Source Water Protection Advisory Committee	Every 5 years from the adoption of the Monitoring Plan. Timed to coincide with the periodic reviews of County and Town MPSs and LUBs, and the review of the Wellfield Protection Management Plan

Appendix A

Property Owners in the Middleton Wellfield Protection Area

Property Owner	PID	Address
Gordon Brown, Donna Noble-Brown	05030440	Highway 1, Wilmot
Phyllis MacMurtry	05077995	22 Acadia Street
John and Janice Fournier	05078019	30 Acadia Street
Thomas and Susan Meers	05078001	26 Acadia Street
Annapolis County	05077987	Acadia Street
James and Cornelia Schoonhoven	05077979	16 Acadia Street
Nancy Vandommelen	05077961	12 Acadia Street
Elmer and Kathleen Hooper	05077953	8 Acadia Street
Coreen Mercer, Sherri Blackburn	05077946	6 Acadia Street
Elvira, Thomas, Peter and Stacey Symonds	05077938	4 Acadia Street
Noel and Betty Harrington	05077920	2 Acadia Street
Earl Johnson	05077870	15 Acadia Street
Kathryn Cox	05077896	9 Acadia Street
Kendall Atwater	05267844	1 Acadia Street
James and Roxanne Lasko	05267851	3 Acadia Street
Frances Fitzgerald	05077904	5 Acadia Street
Roy and Marjorie Keast	05267836	474 Main Street
Malcom Mattinson	05077847	476 Main Street
Soldiers Memorial Hospital	05077821	462 Main Street
Charles and Rosa Harvey	05079611, 05181698	8 Ross Lane
John and Rosemary Brigley	05270442, 05077813	Ross Lane
R. Bryson and Ingrid Crowell	05079603	2 Ross Lane
R. Bryson and Ingrid Crowell	05213509	Jones Avenue
Avis Crowell	05079488	Riverside Drive
Kenneth Crowell	05079470	6 Riverside Drive
Kenneth and Avis Crowell	05075809	Riverside Drive, Nictaux
Heidrun Walsh, Frederick Roch	05196746	Highway 201, Nictaux
Frederick and Anna Roch	05216098	Oakhurst Road, Nictaux
Town of Middleton	05187836	Highway 1, Nictaux
Town of Middleton	05182951 * PW1	Highway 1, Nictaux
Town of Middleton	05180187 * PW2 & PW3	Highway 10, Nictaux
Lee and David Armstrong	05075791	Highway 10, Nictaux
James and Heike Landry	05075668	Highway 10, Nictaux
James and Heike Landry	05185863	85 Greenhouse Road, Nictaux

