TABLE OF CONTENTS

LIST OF MAPS

LIST OF TABLES

6.0 HALDIMAND COUNTY WATER QUALITY RISK ASSESSMENT

6.1 Nanticoke Water Treatment Plant and Trunk Mains Waterworks System

The Nanticoke Water Treatment Plant (WTP) is an existing large municipal drinking water system, and as such is a Type I system as defined by the Technical Rules (November 2009).

Table 6-1: Haldimand County Municipal Residential Drinking Water Systems

DWS Number	DWS Name	Operating Authority	GW or SW	System Classification[1]	Number of Users Served
210001558	Nanticoke Water Treatment Plant & Trunk Mains Waterworks System	OCWA	SW	Large municipal residential	10,000

[1] as defined by O. Reg. 170/03 (Drinking Water Systems) made under the *Safe Drinking Water Act, 2002.*

The Nanticoke WTP is located in Haldimand County, on the north shore of Lake Erie. The Nanticoke WTP services approximately 10,000 people in the towns of Hagersville, Jarvis, Townsend, New Credit Reserve, as well as the Lake Erie Industrial Park (**Map 6-1**). Separate raw water lines supply the steel facility and the petroleum refinery. The water treatment plant has a rated capacity of 13,636 cubic metres per day and a Permit to Take Water rated at 1,818,000 cubic metres per day. **Table 6-2** provides a summary of the 2016 annual and monthly average flows for the Nanticoke WTP in cubic metres per day.

Table 6-2: Annual and Monthly Average Pumping Rates for the Nanticoke WTP (m^3/day)

Annual Avg.	Jan Avg.	Feb Avg	Mar Avg	Apr Avg	May Avg	June Avg	July Avg	Aug Avg	Sept Avg	Oct Avg	Nov Avg	Dec Avg
7225	6212	6801	6531	6744	7563	7893	8097	8004	7622	7172	6774	7290

[1] Source: 2016 data from Nanticoke Industrial Pumping Station

The Nanticoke WTP has two Type A (Great Lakes) intakes located approximately 465 m apart in Lake Erie and one Type D intake located at the Industrial Pumping Station (IPS). The west and east in-lake intake cribs for the Nanticoke WTP are located approximately 500 and 520 m offshore, respectively. The depth of both in-lake intakes is approximately 6.3 m.

The Great Lakes intakes are shared with a power generation facility. Water flows via gravity from Lake Erie to the power generation facility forebay. A channel located in the west bank of the forebay connects to the industrial pumping stations (IPS) wet well. The IPS has its own forebay structure with sluice gates separating the forebay wet well and the submersible low lift pumps. This system acts as the control point for the Nanticoke WTP and was considered as a Type D intake control structure for the purposes of source protection planning.

The Nanticoke WTP is a conventional treatment plant (package plant) that receives raw water from Lake Erie via the industrial forebay of the power generation facility. The treatment process

consists of pre-screening and chlorination, coagulation, flocculation, sedimentation, filtration, and disinfection. Powder activated carbon is added for taste and odour control when necessary.

The vulnerability assessment, threats assessment and Issues identification is based on the following reports

- Stantec. 2010. Phase I Update. Surface Water Vulnerability Assessment Study Update for the Dunnville and Nanticoke Water Treatment Plants.
- Stantec. 2010. Phase II Update. Issues Evaluation, Threats Inventory and Threat Level Assessment for the Nanticoke Water Treatment Plant.
- Stantec. 2011. Surface Water Vulnerability Assessment for the Nanticoke Water Treatment Plant – Industrial Pump Station Intake.
- Stantec. 2011 Revision to Delineation and Vulnerability Scoring of the East and West Intake for the Nanticoke WTP

6.1.1 Intake Protection Zone - 1

Intake protection zones (IPZ) 1 and 2 were delineated for the in-lake intakes using Part VI of the Technical Rules set by the Ministry of the Environment (November 2008). The in-lake intakes were each given a circular IPZ-1 with a radius of 1 km centred on the crib of each intake (**Map 6-2** and **Map 6-3**). Although the IPZ-1's delineated for the two in-lake intakes for the Nanticoke WTP overlap, they were not merged into a combined delineation, and were assessed as independent zones. A 120 m setback was included where the IPZ-1 intersected with land. See **Map 6-2** and **Map 6-3** for the IPZ-1 for the east and west in-lake intakes.

Given that the industrial pumping station (IPS) sits 150m inland from Lake Erie with an open forebay where water flows via gravity from the power generating facility forebay through an intake supply tunnel, an IPZ-1 was delineated around the wet-well and forebay structure based on professional engineering judgment, in accordance with the Technical Rules and acknowledgement of local drainage characteristics. Therefore, the IPZ-1 for the industrial pumping station (IPS) consisted of the IPS forebay with a 120 m setback with adjustments made to address localized drainage characteristics (**Map 6-4**).

6.1.2 Intake Protection Zone - 2

An IPZ-2 was delineated for the Nanticoke WTP intakes using a time of travel of 2 hours. The 2 hour time of travel was deemed appropriate by County staff for sufficient operator response. Operators stated in interviews that the intake could be shut down within 2 hours without negative impact to ongoing plant operations upon notification or awareness of an imminent threat that could impair the quality of water supply at the intake or negatively affect the water treatment plant's ability to produce safe water.

An IPZ-2 is defined as an area surrounding the intake that takes into account characteristics of the local area including local water currents, shoreline features and local tributaries. An IPZ-2 accommodates the following:

- The area within each surface water body that may contribute water to the intake where the time of travel to the intake is sufficient for operator response to an adverse condition;
- A 2 hour time of travel response time;
- Areas within storm sewer sheds and other drainages that drain toward the intake; and

- A setback of not more than 120 m inland or the Conservation Authority regulated area, whichever is greater if the area abuts land.

The in-water modeling for the Nanticoke west and east intakes was undertaken as a cluster using the 3-D MIKE3 model to simulate the hydrodynamic conditions of the Lake Erie shoreline area. Developed by the Danish Hydraulic Institute, MIKE3 can simulate un-steady 3D flows in lakes, rivers and oceans taking into consideration density variations, bathymetry and external forcing functions including meteorology, tides, current velocity and surface elevation. The model has the ability to define several levels of nesting to provide the resolution necessary at specific locations within the computational domain. The model was run to simulate a 10-year wind condition from eight compass point directions, and a 2-year flow in gauged tributaries.

The in-water hydrodynamic modeling for the Nanticoke West and East intakes was undertaken as a cluster. A single in-water IPZ-2 was delineated to represent both of the Type A intakes given the close proximity of the two intakes relative to hydrodynamic variability in a large Great Lake. The IPZ-2 extended approximately 3,355m east of the east intake, 4,673 m west of the west intake and 2,600 m offshore, at its furthest extent.

The upland IPZ-2s for the west and east intakes were not initially merged. However, the upland extents of the IPZ-2 for both in-lake intakes differ only slightly, therefore one IPZ-2 for both in-lake intakes was created. The IPZ-2 was extended up-tributary along Nanticoke Creek, Hickory Creek and an unnamed watercourse to the extent of a 2 hour travel time. Within the 120 m setback of the unnamed watercourse is an engineered wetland that is hydraulically connected to the watercourse during high water events, so it was also included as part of the IPZ-2. Part of the IPZ-2 consists of a forebay and condenser cooling water channel that are part of a power generation facility and that are within a 2 hour travel time of the lake intakes during specific operating conditions. Therefore all discharges within a 2 hour travel time to the forebay and condenser cooling water channel were included in the IPZ-2. These included the local storm sewer network and an ash setting lagoon that is connected via a pipe to the condenser cooling water channel.

The Great Lakes intakes are shared with a power generation facility. Water flows via gravity from Lake Erie to the power generation facility forebay. A channel located in the west bank of the forebay connects to the industrial pump station (IPS) where water is withdrawn for municipal supply. Given this connection to Lake Erie, the IPS intake was classified as a Type D intake.

The IPZ-2 for the IPS includes the power generation facility forebay and the storm sewer network that drains to it. The hydraulic retention time of the forebay was determined to be less than 2 hours therefore the entire forebay was included. In the absence of knowledge of water flow velocities through the storm sewer network to the forebay it was assumed that the entire storm sewer network, including the drainage network for the power generation facility and an adjoining switchyard, would contribute to a 2 hour travel time. All pathways contributing water to the forebay were included in the IPZ-2.

6.1.3 Intake Protection Zone - 3

At this stage, it was determined that an IPZ-3 is not needed for the Type A intakes (East and West).

The delineation extent of an IPZ-3 for a Type D intake is the total water contributing areas. Through an analysis of available information relating to storm sewer networks, water courses and drainage, it was determined that all pathways contributing water to the forebay (IPS intake) are included in their entirety in IPZ-2.

6.1.4 Vulnerability Assessment

Vulnerability analysis of the IPZ-1 and IPZ-2 includes consideration for both the area and the source as described in the Technical Rules. The area vulnerability factor for an IPZ-1 is prescribed to be 10 while the area vulnerability factor for an IPZ-2 can range from 7 to 9. The area vulnerability for an IPZ 2 takes into account the percentage of the IPZ-2 area that is land, land cover, soil type, soil permeability and transport pathways.

The in-lake IPZ-2 zones have a low percentage of land (e.g. approximately 14%), most of which is forested, green space or agricultural. The soil type is predominantly clay and the slope is between 2 to 5%, which indicates a high potential for runoff generation and movement of contaminants to the lake. In addition, there were some transport pathways identified that could convey contaminants to the intake protection zone. The overall assessment was that the in-lake IPZ-2 zones were moderately vulnerable, therefore, the area vulnerability factor for the IPZ-2 for both of the in-lake intakes was scored as a 8.0.

IPZ-2 for the intake at the Industrial Pump Station was given the highest score possible, 9.0, based on the fact that 94% of the IPZ is land that is largely developed and has high potential for runoff generation based on soil type and slope, and that the land area is drained with storm sewers with outfalls within the IPZ-2 that can act as transport pathways.

The source vulnerability factor for a Great Lake Type A intake can range from 0.5 to 0.7. Source vulnerability scoring takes into account the intake characteristics, such as the depth of the intake, the distance the intake is offshore and whether there have been any identified water quality concerns at the intake. The source vulnerability for the in-lake intakes was determined to be 0.5 considering that the intakes in the lake are quite deep (6.3 m); extends 500m+ from shore; and there have been few water quality concerns identified at the intake. The source vulnerability factor for the Industrial Pump Station however, was scored a 1.0 considering that it is located entirely inland and consists of an open forebay with the intake in a shallow wet well.

The vulnerability scores for the Nanticoke east, west and IPS IPZ-1 and -2 are summarized in **Table 6-3**.

Table 6-3: Vulnerability Score Summary for the Nanticoke Water Treatment Plant Intakes

WTP Intake	Area Vulnerability Factor		Source Vulnerability Factor	Vulnerability Score	
	IPZ-1	IPZ-2		IPZ-1	IPZ-2
Nanticoke – East	10	8	0.5	5.0	4.0
Nanticoke – West	10	8	0.5	5.0	4.0
Nanticoke IPS Intake Control Structure	10	9	1.0	10	9.0

6.1.5 Managed Lands and Livestock Density within Intake Protection Zones

The percent managed lands for the Nanticoke Water Treatment Plant is shown on **Map 6-5** and **Map 6-6**. The livestock density is shown on **Map 6-7** and **Map 6-8.**

6.1.6 Percent Impervious Surfaces within Intake Protection Zones

To calculate the percent impervious surface, information on land cover classification from the Southern Ontario Land Resource Information system (SOLRIS) was used. This provided land use information, including road and highway transportation routes, as continuous 15x15 metre

grid cells across the entire Source Protection Area. All the cells that represent highways and other impervious surfaces used for vehicular traffic were re-coded with a cell value of 1 and all other land cover classifications were given a value of 0, to identify impervious surface areas.

Then, a focal sum moving window average was applied using the Spatial Analyst module of the ArcGIS software. For each 15x15 metre cell, the total number of neighbouring grid cells coded as impervious, within a 1x1 kilometre search area, was calculated. This total was then converted into the percentage of impervious surface by land area, using the area of each cell (225 sq. m) and the area of the moving window (1 sq. km). This provides a 1x1 kilometre moving window calculation of percent impervious surface, represented in 15x15 metre spatial increments. This dataset was calculated for the entire Source Protection Area, but was clipped to show those results only in the Wellhead Protection Areas and Intake Protection Zones. The analysis is more representative of road density and is better than the method described in the Technical Rules. As per Technical Rule 15.1, the Director has confirmed their agreement with the departure. The Director‘s letter of confirmation can be found in **Appendix B**.

The percent impervious surface for all Nanticoke Intake Protection Zones ranges from 0% - <8%, except for the IPS IPZ-1 which ranges from 1 to <8%. (**Map 6-8**, **Map 6-9**)

6.1.7 Information Sources for Vulnerability Assessment

The most up-to-date information was used for determining the area and source vulnerability scores. **Table 6-4** outlines the data sources and the purposes for which the data were used.

Table 6-4: Summary of Data Sources Used in the Delineation of the Vulnerable Areas and the Vulnerability Assessment

Data Type	Source	Purpose
Lake Erie bathymetry	Raw depth sounding released by US National Oceanic and Atmospheric Administration (NOAA) in 2007	Development of hydrodynamic model to determine in-water extent of IPZ 2
Location of Lake Erie shoreline GIS dataset	Ontario Ministry of Natural Resources (MNR) Ontario Base Map theme	Development of hydrodynamic model to determine in-water extent of IPZ 2
Wind speed and direction	Atmospheric Environment Service station at Long Point, the Marine Environmental Data Service buoy located in Lake Erie off Port Colborne and the Lake Erie Operational Forecast System, which uses the Princeton Ocean Model to forecast winds over the entire lake	Development of hydrodynamic model to determine in-water extent of IPZ 2
Lake current data	Ministry of the Environment data for the period between May and October 2004	Development of hydrodynamic model to determine in-water extent of IPZ 2
Water levels for Lake Erie	Canadian Hydrographic Service and NOAA	Development of hydrodynamic model to determine in-water extent of IPZ 2
Digital elevation model v2.0 with 10 m resolution	MNR Land Information Ontario (LIO) dataset	Infer stormsewer catchments and determine land slope for overland

Table 6-4: Summary of Data Sources Used in the Delineation of the Vulnerable Areas and the Vulnerability Assessment

Data Type	Source	Purpose
		flow analysis
Stormsewer GIS dataset	Haldimand County	Identify stormsewer systems that may impact IPZ
Watercourse mapping using Water Virtual Flow and Water Poly Segment GIS datasets	MNR	Identify watercourses/transport pathways that may impact IPZ
Constructed drain and tile drainage GIS dataset	Ontario Ministry of Agriculture, Food and Rural Affairs	Identify transport pathways that may impact IPZ
Conservation Area Regulation Limit GIS dataset	Long Point Region Conservation Authority	Determine land area to be included in IPZ
2006 orthoimagery with 30 cm resolution	Haldimand County	General mapping and identification of surface features
Water treatment plant operator interviews	Water treatment plant operator	Identify operational concerns and obtain local knowledge
Raw water quality	MOE Drinking Water Surveillance Program, MOE Drinking Water Information System, Ontario Clean Water Agency *E. coli* process data, Haldimand County turbidity process data	Assess vulnerability of intake and identify concerns
SOLRIS Land cover and soil permeability GIS dataset	MNR	Assess vulnerability of intake
Power Generating Station site and drainage drawings	Power Generating Facility	Identify pathways and drainage to the IPZ

6.1.8 Uncertainty

Uncertainty was assessed by the Consultant for the delineation of the IPZs and the vulnerability scoring for the Nanticoke WTP intakes. Uncertainty was considered for the (1) data that was used in the analysis; (2) modeling; (3) quality assurance and quality control; (4) calibration and validation; and (5) accuracy of the vulnerability factors.

There was a high level of confidence in the datasets used to delineate the in-lake IPZ-1s; however, the IPZ-1 around the Industrial Pump Station required professional engineering judgment with guidance from the Technical Rules. Regardless, a low level of uncertainty was assigned to the IPZ-1's and no limitations were identified.

Hydrodynamic modeling was used for the delineation of the in-lake IPZ-2 and the following limitations were noted:

- The numerical model did not account for wave-induced currents, which are more important in shallow water and may impact the IPZ-2;

- Hydrodynamic modeling provided a general understanding of currents and the resultant in-water IPZ-2 for a range of conditions, however it did not provide a detailed analysis of the physical processes at the site such as upwelling or the dispersion of contaminant plumes through natural diffusion transport processes as a result of density currents;

- A 10-year return period wind speed was used in the matrix runs. The model was run at a constant wind speed until the model reached steady state. This is not realistic as this constant wind speed would not be sustained in reality, so it is not possible to associate a return period duration with the event;

- Only gauged tributaries were defined in the model; and

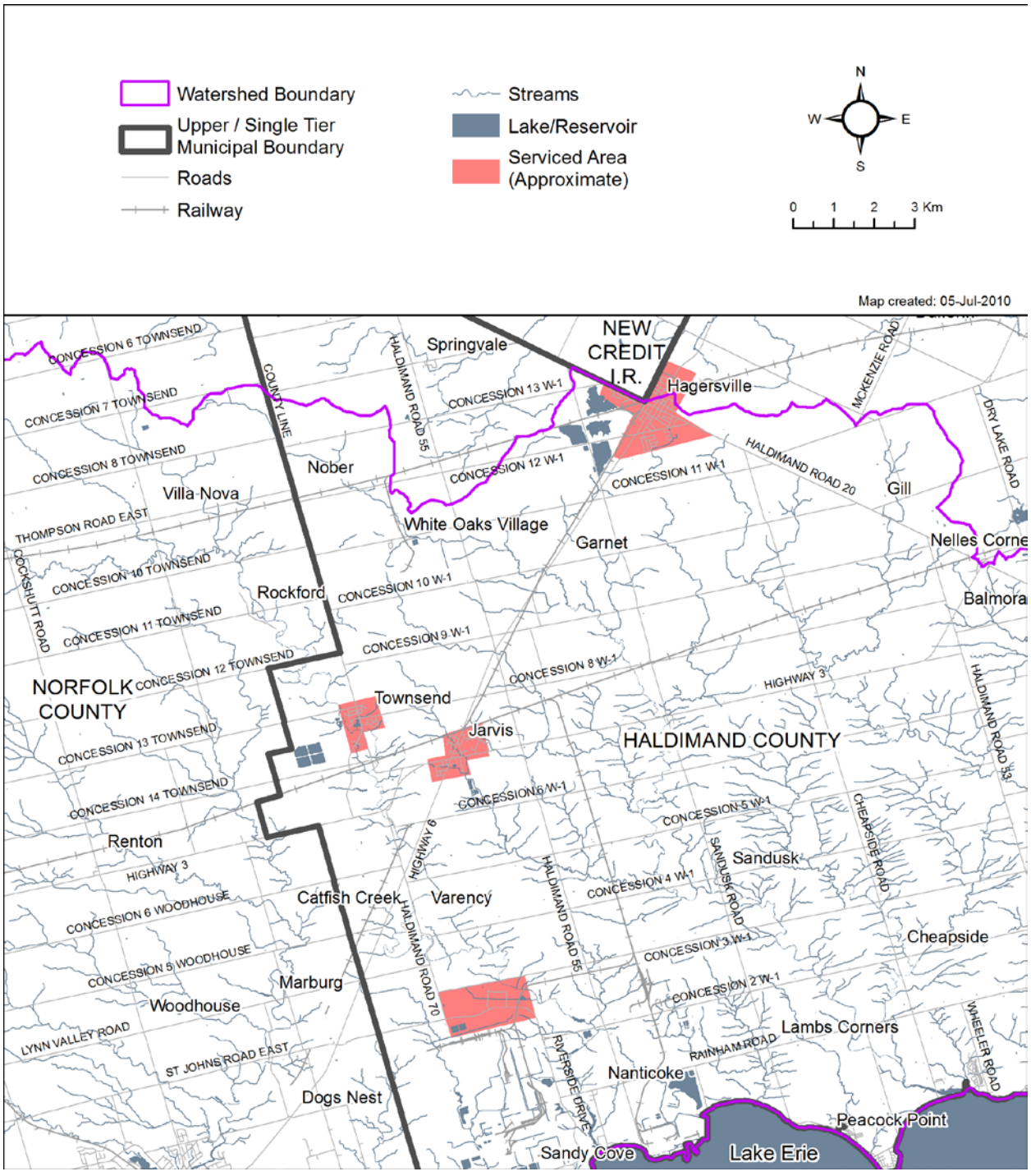
- A conservative approach was taken in the reverse particle tracking. Particles were released at the surface where currents are stronger. Particles were also released near the lakebed for comparison; however the particles released at the surface were used to delineate the IPZ 2s.

Although large, in-lake hydrodymanic modelling is inherently uncertain, the study team felt that the IPZ-2 delineation was sufficient for the purposes of source protection planning and an overall uncertainty for IPZ-2's for the in-lake intakes was considered low.

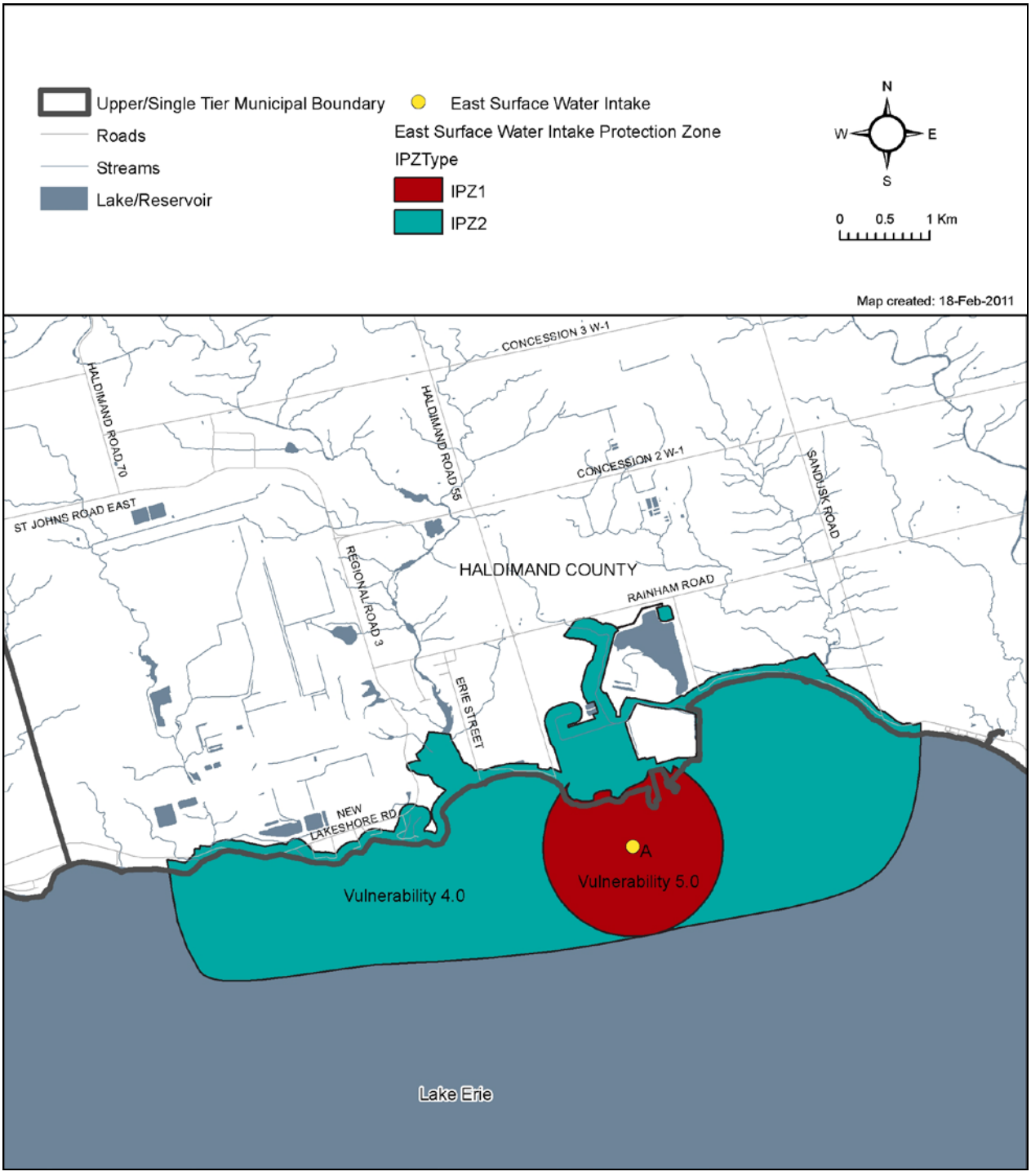
A high level of uncertainty was given to the delineation of the IPZ-2 for the IPS given the lack of information and data for this area. Cross section data for the forebay was estimated by aerial photography leading to high uncertainty in the volume of the forebay and therefore the hydraulic retention time. Storm sewer networks outfalling to the forebay were available, but water velocities in those networks were not and assumptions were made as to the extent those networks contributed to the IPZ-2.

Sufficient data and information was gathered to assign a low level of uncertainty for the vulnerability score for IPZ-1s and for the IPZ-2 for the East and West intakes. Vulnerability scoring for IPZ-2 for the IPS was determined by the Consultant to have high uncertainty based on the limited number of sources of data used in determining the vulnerability score.

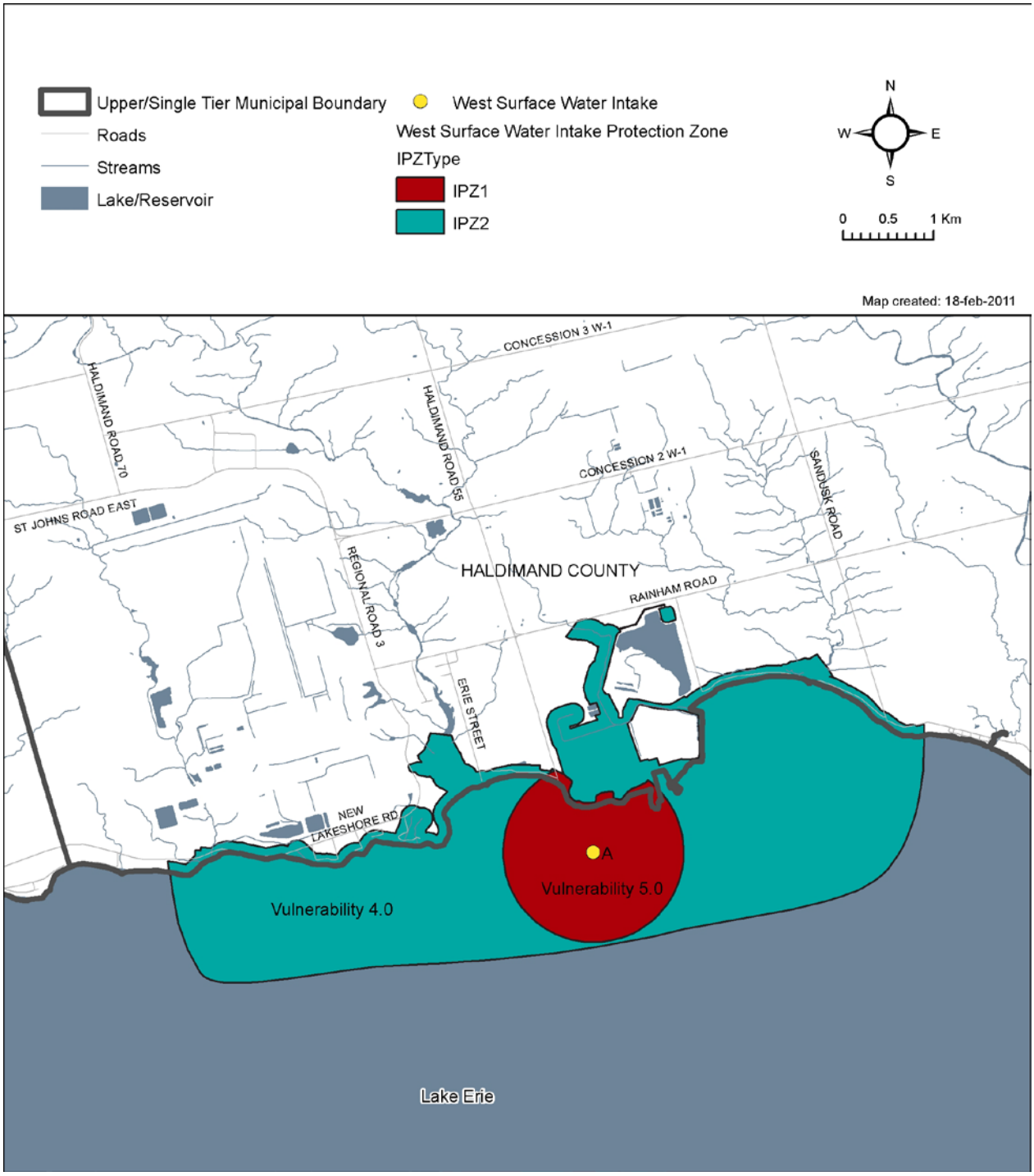
Map 6-1: Nanticoke Water Treatment Plant Service Area



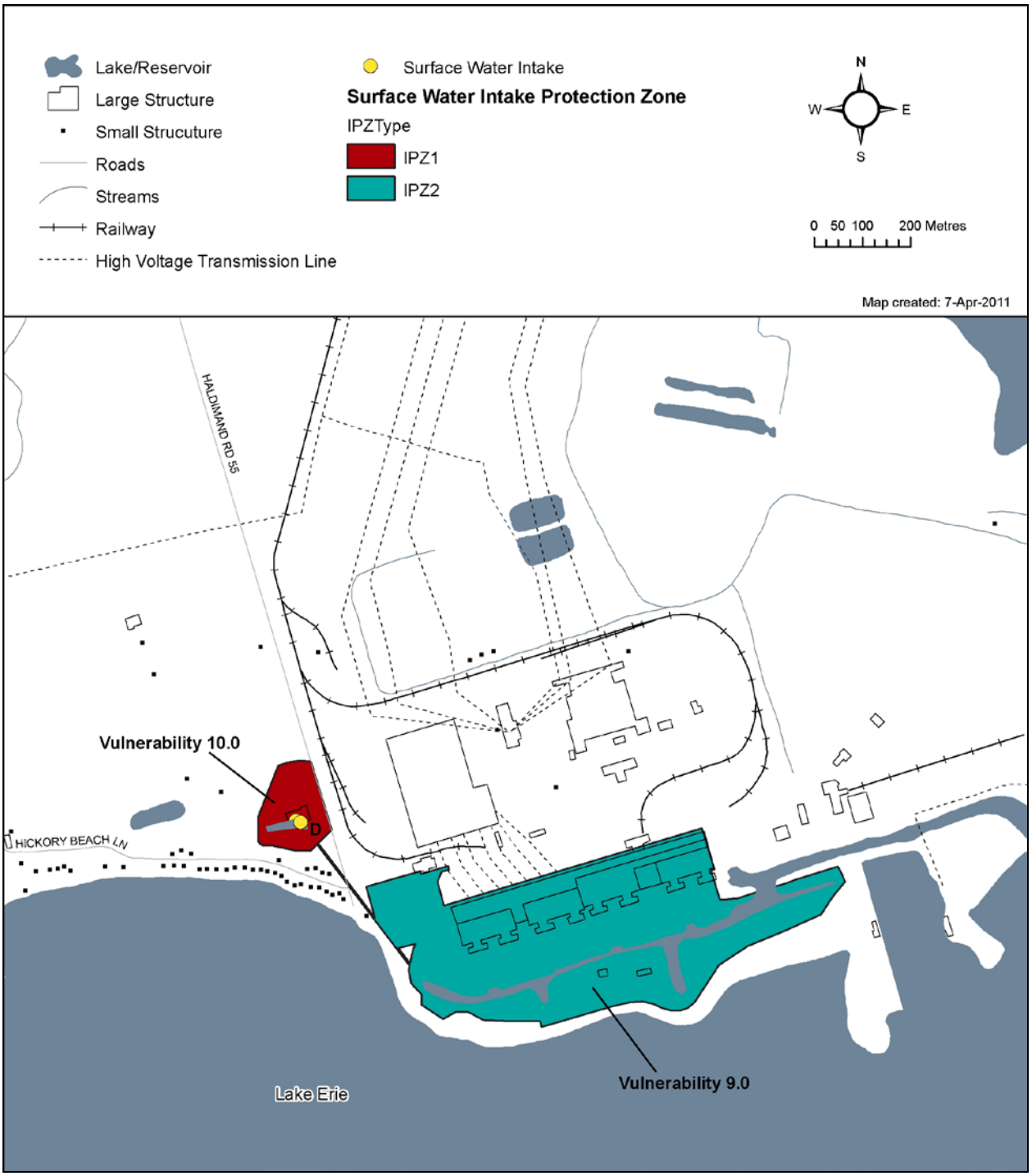
Map 6-2: Nanticoke Water Treatment Plant East Surface Intake Protection Zone



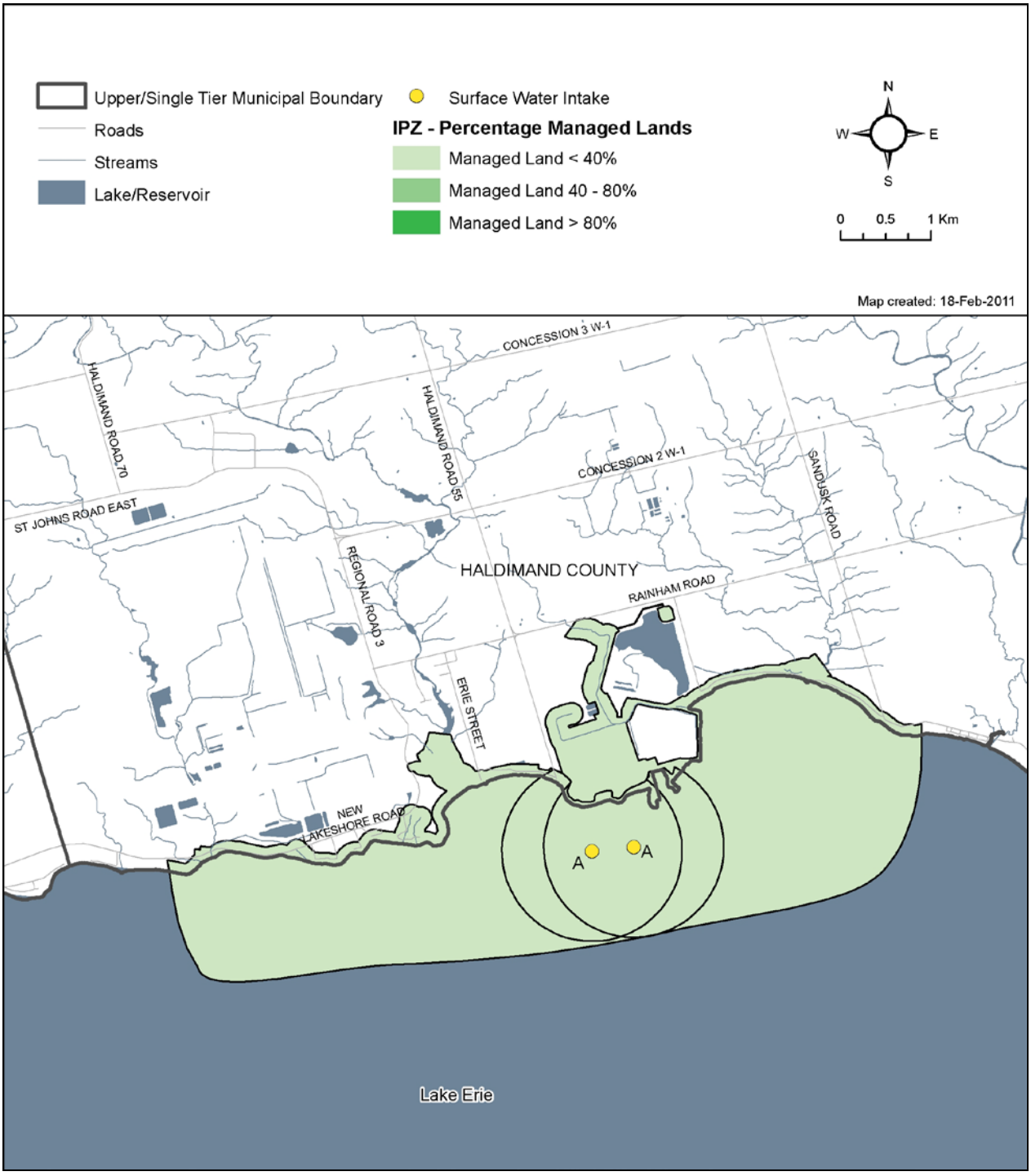
Map 6-3: Nanticoke Water Treatment Plant West Surface Intake Protection Zone



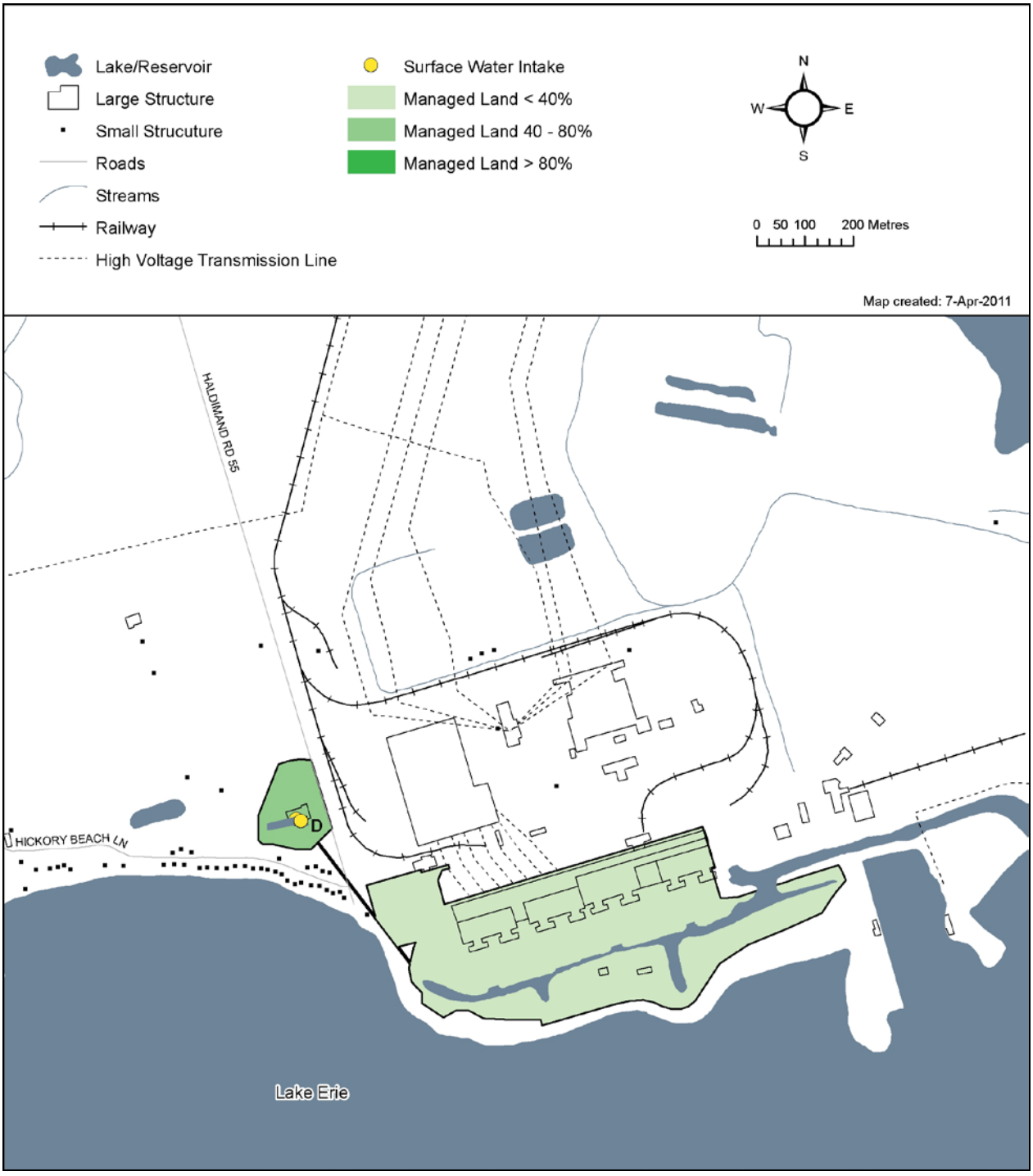
Map 6-4: Nanticoke Industrial Pumping Station Intake Protection Zone



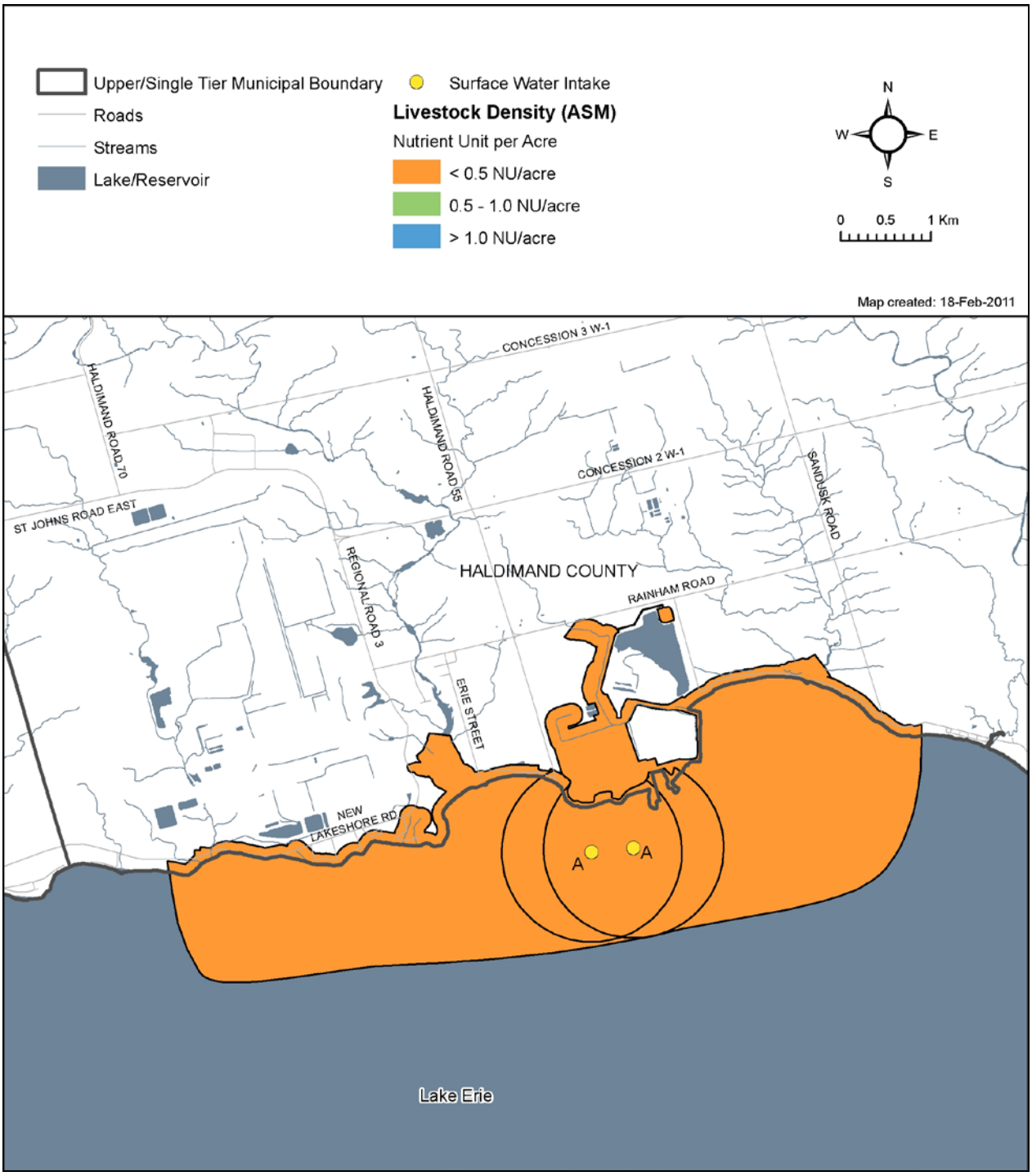
Map 6-5: Percent Managed Lands within the Nanticoke WTP Intake Protection Zone



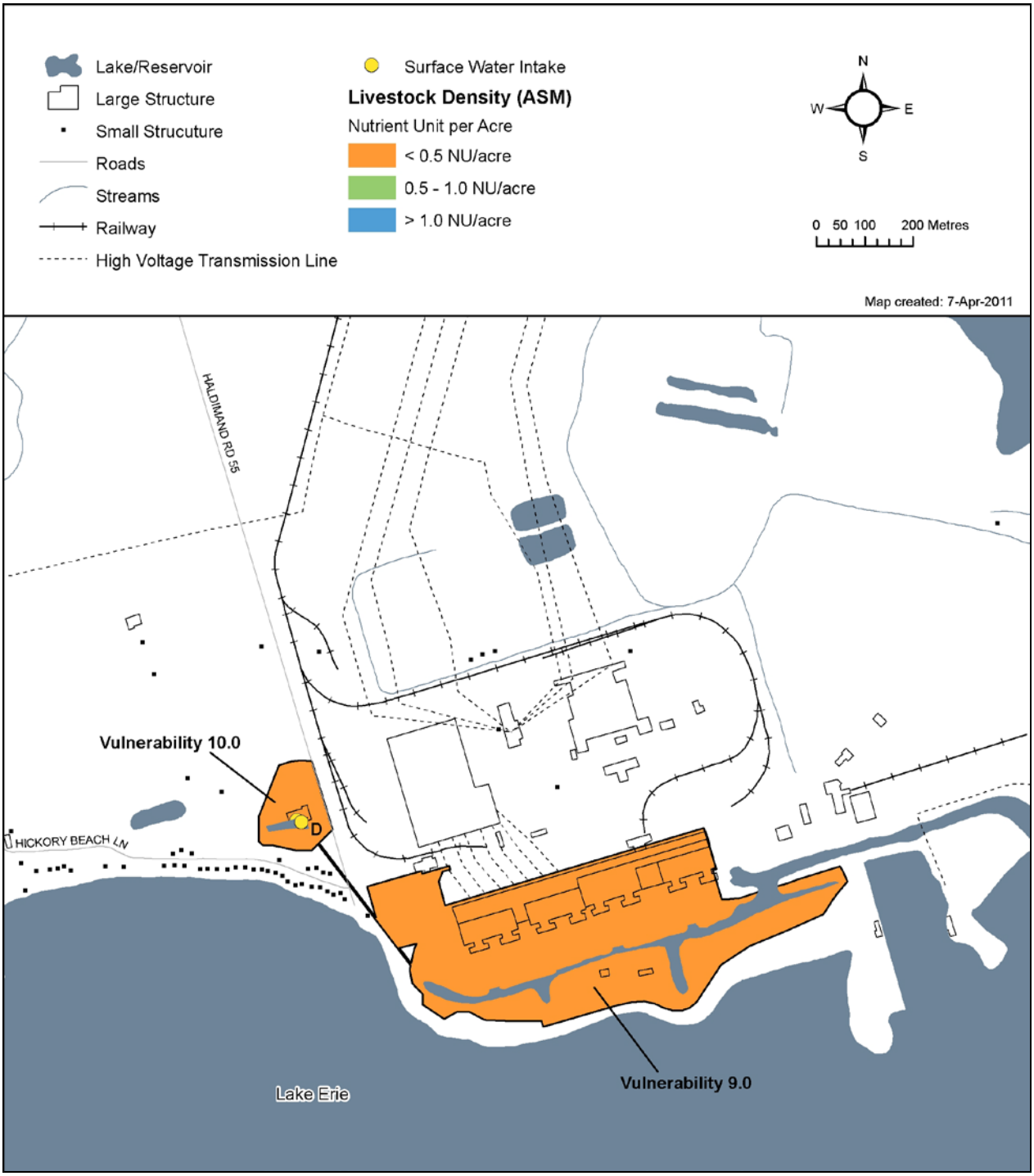
Map 6-6: Percent Managed Lands within the Nanticoke IPS Intake Protection Zone



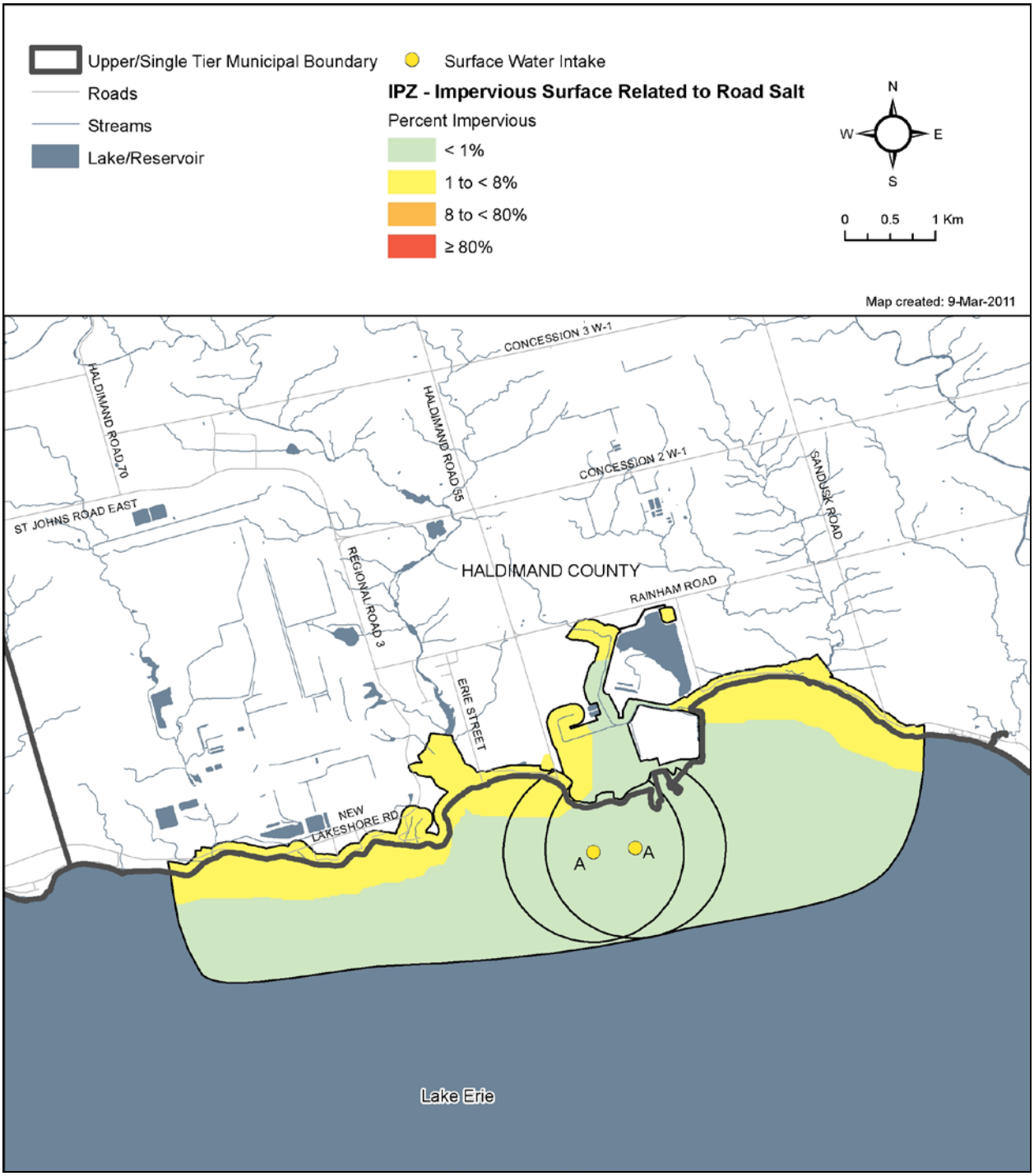
Map 6-7: Livestock Density within the Nanticoke WTP Intake Protection Zone



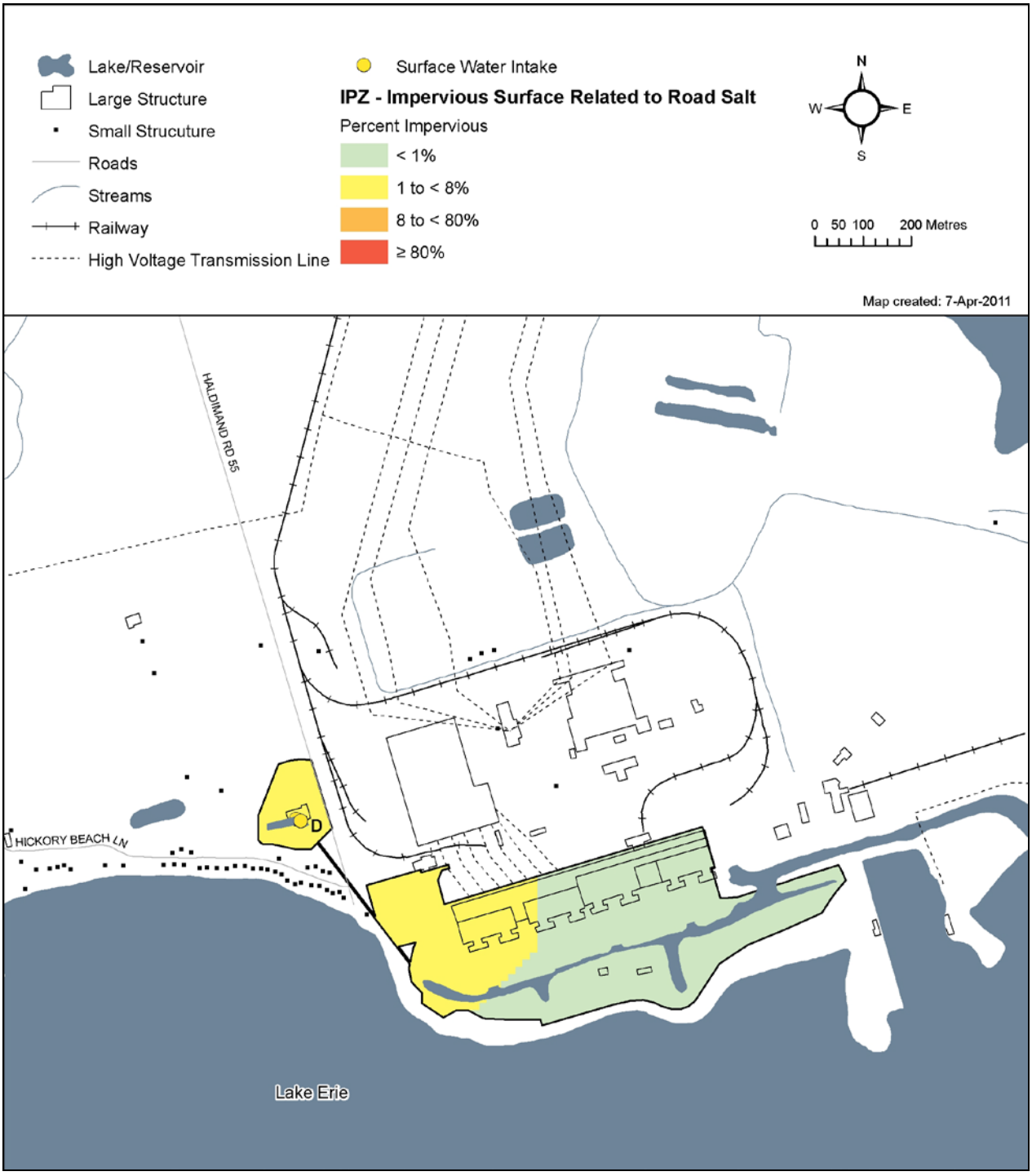
Map 6-8: Livestock Density within the Nanticoke IPS Intake Protection Zone



Map 6-9: Impervious Surfaces within the Nanticoke WTP Intake Protection Zone



Map 6-10: Impervious Surfaces within the Nanticoke IPS Intake Protection Zone



6.1.9 Threats Assessment

The Ontario *Clean Water Act, 2006* defines a Drinking Water Threat as "an activity or condition that adversely affects or has the potential to adversely affect the quality or quantity of any water that is or may be used as a source of drinking water, and includes an activity or condition that is prescribed by the regulation as a drinking water threat."

The Technical Rules (MOE, 2009a) list five ways in which to identify a drinking water threat:

a) Through an activity prescribed by the Act as a Prescribed Drinking Water Threat;
b) Through an activity identified by the Source Water Protection Committee as an activity that may be a threat and (in the opinion of the Director) a hazard assessment confirms that the activity is a threat;
c) Through a condition that has resulted from past activities that could affect the quality of drinking water;
d) Through an activity associated with a drinking water issue; and
e) Through an activity identified through the events based approach (this approach has not been used in this Assessment Report).

Threats can fall into one of the following four categories:

- Chemical threats can include toxic metals, pesticides, fertilizers, petroleum products and industrial solvents;
- Pathogenic threats are microorganisms that could cause illness; and
- Dense non-aqueous phase liquids (DNAPLs) are chemicals which are denser than water and do not dissolve in water, such as chlorinated solvents.
- Through a condition that has resulted from past activities that could affect the quality of drinking water.

Significant threats to the Nanticoke water supply were assessed through the development of a desktop land use inventory.

The identification of a land use activity as a significant, moderate, or low drinking water threat depends on its risk score, determined by considering the circumstances of the activity and the type and vulnerability score of any underlying protection zones, as set out in the Tables of Drinking Water Threats available through www.sourcewater.ca. Information on drinking water threats is also accessible through the Source Water Protection Threats Tool: http://swpip.ca. The information above can be used with the vulnerability scores shown in **Map 6-2**, **Map 6-3** and **Map 6-4** to help the public determine where certain activities are or would be significant, moderate and low drinking water threats.

Table 6-5 and **Table 6-6** provide a summary of the threat levels possible in the Nanticoke Intake Protection Zones for Chemical, Dense Non-Aqueous Phase Liquid (DNAPL), and Pathogens. A checkmark indicates that the threat classification level is possible for the indicated threat type under the corresponding vulnerable area / vulnerable score; a blank cell indicates that it is not. The colours shown for each vulnerability score correspond to those shown in the map.

Table 6-5: Identification of Drinking Water Threats in the Nanticoke Lake Intake Protection Zones

Threat Type	Vulnerable Area	Vulnerability Score	Threat Classification Level		
			Significant 80+	Moderate 60 to <80	Low >40 to <60
Chemicals / Handling & Storage of DNAPLs	IPZ-1	5			✔
	IPZ-2	4			
Pathogens	IPZ-1	5			✔
	IPZ-2	4			

Table 6-6: Identification of Drinking Water Threats in the Nanticoke Industrial Pump Station Intake Protection Zones

Threat Type	Vulnerable Area	Vulnerability Score	Threat Classification Level		
			Significant 80+	Moderate 60 to <80	Low >40 to <60
Chemicals	IPZ-1	10	✔	✔	✔
	IPZ-2	9	✔	✔	✔
Handling / Storage of DNAPLs	IPZ-1	10	✔	✔	
	IPZ-2	9		✔	
Pathogens	IPZ-1	10	✔	✔	✔
	IPZ-2	9	✔	✔	✔

No significant threats are possible for the Nanticoke Lake Intake protection zones, because their vulnerability scores are 5 and 4. For the Industrial Pump Station protection zones, however, the scores are 10 and 9, and significant threats are possible there. A list of the significant threat types enumerated as of September 2017 for the Industrial Pump Station zones is shown in **Table 6-7**.

Table 6-7: Significant Drinking Water Quality Threats in the Industrial Pump Station WTP Intake Protection Zones

PDWT #[1]	Threat Subcategory[2]	Number of Activities	Vulnerable Area
2	Sewage System Or Sewage Works - Industrial Effluent Discharges	3	IPZ-2
15	Handling and Storage Of Fuel	1	IPZ-1
n/a	Contaminated sediment (Condition as per Technical Rule 126)	n/a	IPZ-1
Total Number of Properties		**2**	
Total Number of Activities		**4**	
Total Number of Conditions		**1**	

1: Prescribed Drinking Water Threat Number refers to the prescribed drinking water threat listed in O.Reg 287/07 s.1.1.(1).

2: Where applicable, waste, sewage, and livestock threat numbers are reported by sub-threat; fuel and DNAPL by Prescribed

Table 6-7: Significant Drinking Water Quality Threats in the Industrial Pump Station WTP Intake Protection Zones			
PDWT #[1]	**Threat Subcategory[2]**	**Number of Activities**	**Vulnerable Area**
Drinking Water Threat category.			
Note: Certain types of activities on residential properties that are incidental in nature and that are significant drinking water threats are not enumerated. These threats include the application of commercial fertilizer on residential properties, the storage of organic solvents (dense non-aqueous phase liquids) on residential properties, and the storage of fuel (e.g., heating fuel tanks) on residential properties in natural gas serviced areas.			
Note: Storm sewer piping is not considered to be part of a storm water management facilty.			

Discussion of Significant Threats

The significant threats identified for the Industrial Pump Station IPZ-1 and IPZ-2 occur on two properties. In the IPS IPZ-1, it was assumed that liquid fuel is handled and stored on the property in quantities that exceed 2,500L to ensure the operation of a back up generator. In the IPZ-2, the land use activity that was identified as a possible significant threat was the potential operation of a system that discharges to surface water and has as its primary function the collection, transmission or treatment of industrial sewage. It was assumed that the facility is required to report to the National Pollution Release Inventory (NPRI) on its discharges to surface water. Further on-site investigation is required to confirm or refute these significant threats.

Information Sources for Threat Assessment

The following data and information sources were queried to identify significant threats for the Nanticoke WTP:

- Canadian Water and Wastewater Association Directory of contaminants;
- Federal Contaminated Sites Inventory;
- North American Industry Classification System (NAICS);
- National Pollutant Release Inventory (NPRI);
- Drinking Water Information System (DWIS);
- Environmental Compliance Reports;
- Hazardous Waste Inventory Network;
- Municipal Industrial Strategy for Abatement (MISA);
- Ontario Drinking Water Quality Standards;
- Tables of Drinking Water Threats (November 2009);
- Brownfield Redevelopment Strategy for the City of Niagara Falls (reference report); and
- Municipal Parcel Information from the Municipal Property Assessment Corporation

Limitations, Data Gaps, and Uncertainty in the Threats Assessment

In general, the available data were of sufficient quality and quantity to complete an initial threats assessment and issue identification. However, soil quality data were not available for the study area and is considered a data gap.

Raw water quality data were provided for the years of 1990-2008 which was sufficient for a general characterization of the raw water; however, more frequent and consistent sampling is required to complete a statistical analysis with associated confidence.

The following details additional data gaps identified through this assessment:

- Storm and sanitary sewersheds for the industrial park;
- Chemical associated with industrial outfalls located within the IPZ-1 and IPZ-2; and
- Some raw water quality parameters from Schedule 2 and 3 in the ODWS

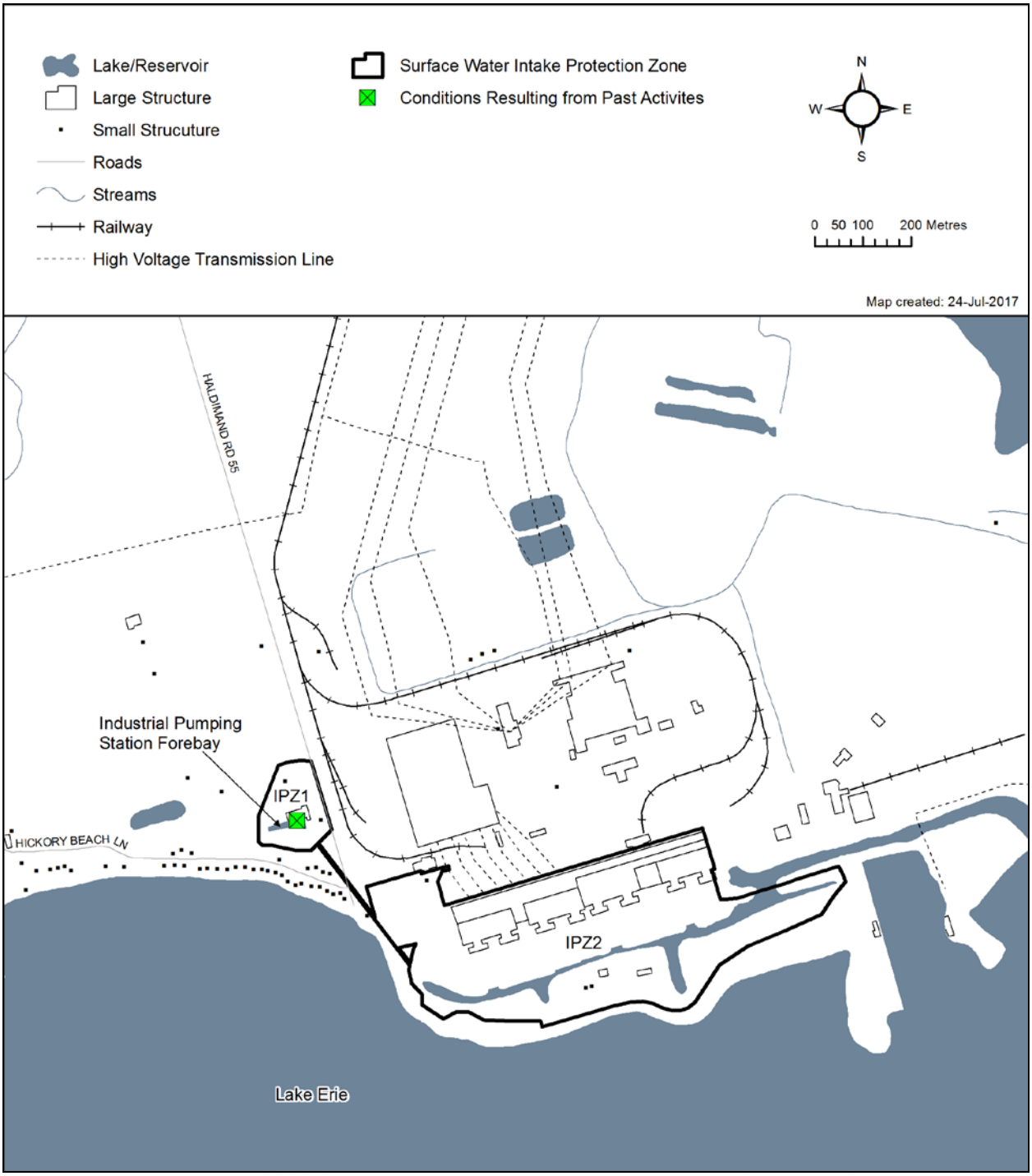
6.1.10 Conditions Evaluation

Information from two reports was used to evaluate conditions in the study area: soil and sediment data/information in an Environment Canada report on sediment quality in tributaries draining to Lake Erie (Dove et al. 2002); and a report completed by Stantec (2010b) that summarized sediment quality data collected by Riggs Engineering for the purposes of characterizing sediments in the study area.

Although elevated levels of arsenic, nickel and silver were found in the sediment of local tributaries (Dove et al. 2002) within the IPZ-2s of the in-lake intakes, and the levels exceeded the sediment standards described in Table 1 of the Soil, Ground Water and Sediment Standards, these threats are not considered significant due to the low vulnerability scores for these vulnerability areas. The vulnerability score of the Nanticoke WTP west and east intakes' IPZ-2 produces a calculated risk score below the threshold established in the Technical Rules, which means that the conditions present within the IPZ-2 vulnerable area of the west and east intake do not pose a threat. However, contaminated sediment in the IPZ-1 for the Industrial Pump Station highlighted elevated sediment concentrations of chromium (total), copper, nickel and zinc, which exceeded the sediment standards described in Table 1 of the Soil, Ground Water and Sediment Standards. The hazard score for contaminated sediment in the Industrial Pump Station IPZ-1 is 10 per Technical Rule 139(2), as the sediment is present on the same property as the intake.

The resulting risk score for contaminated sediment in the Industrial Pump Station forebay, as determined based on the Industrial Pump Station IPZ-1 vulnerability score (10) and hazard score (10) is 100. Therefore, these conditions are considered a significant drinking water threat under the Technical Rules. **Map 6-11** illustrates the location of the contaminated sediment which characterizes a condition within the IPS IPZ-1.

Map 6-11: Conditions Resulting from Past Activities within the Nanticoke IPS Intake Protection Zone



6.1.11 Preliminary Issues Identification and Parameters of Concern

The analysis to determine water quality Issues for the Nanticoke WTP consisted of comparing available raw water sampling data to established Issues benchmarks. Three preliminary Issues were identified for the Nanticoke WTP vulnerable areas:

- temperature
- hardness
- organic nitrogen

The three identified preliminary Issues are parameters listed in Table 4 of the Technical support Document for Ontario Drinking Water Standards and Objectives (MOE 2006) and are therefore aesthetic objectives and operational guidelines. Aesthetic objectives are set to guard against the impairment of odour, taste and colour in finished water. Operational guidelines are set to ensure water treatment operations are effective and efficient for treated and distributed water. The three identified preliminary Issues are not directly related to human health considerations and the preliminary Issues of hardness and temperature have been attributed to naturally occurring processes and characteristics. Therefore, these parameters are not considered drinking water Issues.

The identification of potential contributors for the preliminary issue of organic nitrogen requires additional investigation before it can be decided to identify it as an issue under Technical Rule 114 as it may not be solely contributed to by naturally occurring processes. Additional raw water monitoring is recommended to characterize organic nitrogen levels in the raw water and confirm or refute it as an issue. Given that organic nitrogen may be contributed by the prescribed drinking water threat – the establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage, further investigation is required to ascertain information to confirm or refute the linkage between this land use activity and the preliminary issue of elevated organic nitrogen.

This page left blank intentionally.