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REGIONAL MUNICIPALITY

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Regional Watershed Advisory Board
November 13, 2013

TO: Chair and Members of Regional Watershed Advisory Committee

SUBMITTED BY: Original signed

Jane Fraser, Director Planning and Infrastructure

DATE: October 21, 2013

SUBJECT: **Tantallon Watershed Servicing Study Report**

ORIGIN

Study commissioned to carry out a watershed study as background for future community planning for the Tantallon and Tantallon Crossroads Rural Growth Centres.

LEGISLATIVE AUTHORITY

Section 229 (1)(g) of the Halifax Charter enables a Municipal Planning Strategy to require studies to be carried out prior to undertaking specified developments or developments in specified areas. This Study was initiated pursuant to Policy E-17 of the Regional Plan.

RECOMMENDATION

It is recommended that the Regional Watershed Advisory Board recommend to the Harbour East and Marine Drive Community Council, that the Tantallon Watershed Servicing Study Report be accepted as background for future community planning.

BACKGROUND

CBCL was awarded the contract to prepare the Tantallon Watershed Servicing Study (Attachment 1). An excerpt of the RFP outlining the study objectives and tasks is presented as Attachment 2.

This watershed study has been undertaken to provide background information for future community planning in the Tantallon and Tantallon Crossroads Rural Growth Centres. This Study is required pursuant to Policy E-17 of the Regional Plan. Policy E-17 requires the preparation of these studies to determine the carrying capacity of the watershed, as background for future secondary planning processes.

DISCUSSION

The Tantallon Watershed Servicing Study Report has been reviewed by the HRM and HW Steering Committee and deemed to have met the terms of reference of the RFP.

The main findings and recommendations are summarized in the executive summary of the study, which is reproduced as Attachment 3. The full report can be found at http://www.halifax.ca/planhrm/index.html (under project updates).

It is recommended that this study be recommended to the Halifax and West Community Council as a background study for future community planning.

FINANCIAL IMPLICATIONS

There are no direct financial implications arising from this report. The Study has been prepared as background information for future community planning.

COMMUNITY ENGAGEMENT

The Consultants have undertaken three community forums at the beginning of the study, to engage the Tantallon Community to provide feedback into the development of this Study. The first meeting was held in 2010, to obtain feedback from community and business leaders on the research and potential future development centres within the community. A second meeting was then held with the St. Margret's Bay Stewardship Association, to provide an overview of the initial findings of the environmental assessment. The third meeting was held at the Tantallon Public Library, to share the results of the servicing study assessment, in Fall 2012. An on-line survey was also undertaken, to determine the preferences of individuals for desired future water quality objectives for selected water bodies in the study area.

ENVIRONMENTAL IMPLICATIONS

This Study is required to determine the impact of development on Tantallon, as background for the preparation of future secondary municipal planning strategies for the growth centres. Matters concerning the environment will be assessed during the process to prepare the Secondary Plan.

ALTERNATIVES

There are no alternatives recommended.

ATTACHMENTS

Attachment 1 – Study Area
Attachment 2 – Excerpt from RFP
Attachment 3 – Executive Summary of Tantallon Watershed Servicing Study Report

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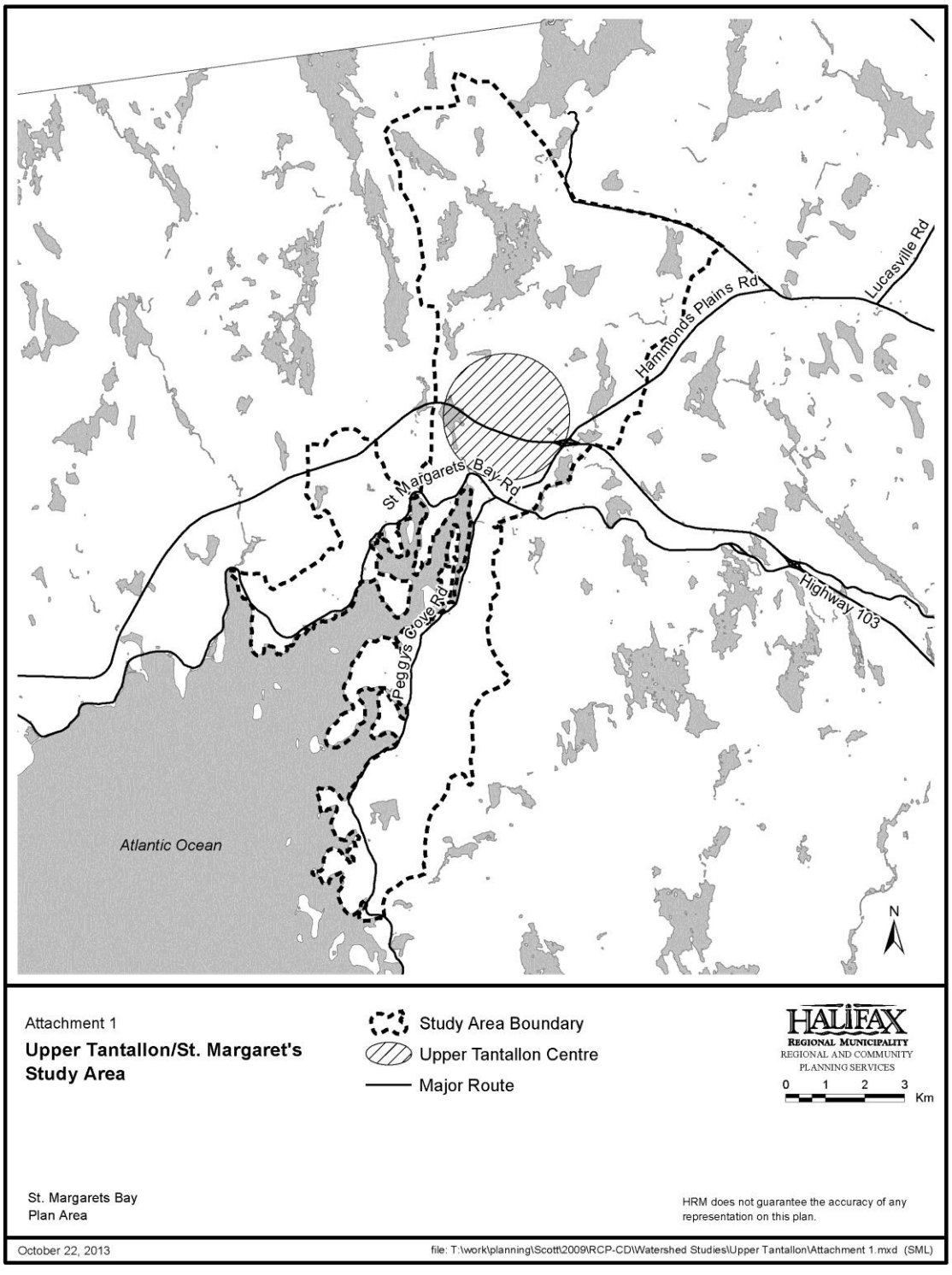
A copy of this report can be obtained online at http://www.halifax.ca/commcoun/cc.html then choose the appropriate Community Council and meeting date, or by contacting the Office of the Municipal Clerk at 490-4210, or Fax 490-4208.

Report Prepared by: Maureen Ryan, Senior Planner, Planning and Infrastructure, 490-4799

Original signed

Report Approved by: Austin French, Manager, Planning and Infrastructure, 490-6717

Attachment 1
Upper Tantallon/St. Margaret's Study Area



Attachment 2
Study Objectives and Tasks from the RFP for the Tantallon Watershed Servicing Study

3.0 PROJECT OBJECTIVES AND DETAILED SCOPE OF CONSULTING SERVICES

3.1 Project Background

3.1.1. NEED :

HRM's Regional Plan provides a region-wide Municipal Planning Strategy. It sets out a number of policies relating to environmental and water resource protection. Development of land is one of the major activities which impact the natural environment. The Regional Plan requires that, prior to conducting a process to prepare a secondary municipal planning strategy or amendment to an existing secondary municipal planning strategy to carry out a community vision, HRM must complete watershed studies which investigate a range of environmental issues within the watershed(s) or sub-watersheds (study areas) affected by the plan. These studies must provide solutions to existing issues or issues arising from the anticipated form and degree of development in relation to the environmental opportunities and constraints identified through the study. Recommendations must balance development versus environmental protection, and provide specific solutions appropriate to the watershed issues.

The aim is to identify those lands most suitable for development through a land and receiving water capacity analysis and analysis of options for the provision of cost efficient and sustainable water and wastewater services. The degree of effort within each (sub) watershed will need to be appropriately adjusted to the degree of development planned. All past studies, development plans and applicable municipal planning strategies within each (sub) watershed must be considered in developing recommendations. Bidders are referred to the HRM Regional Plan (August, 2006): http://www.halifax.ca/regionalplanning/index.html) http://www.halifax.ca/regionalplanning/index.htmlfor further information. Relevant studies are listed in Appendix B.

3.1.2 GOAL :

In response to the Regional Plan requirements and future initiation of a community visioning and planning process for the Lake Echo Centre, Porters Lake Centre and the Tantallon Centre, HRM requires the services of a qualified consultant to conduct two watershed studies for the watershed study areas shown on Appendices C and D.

3.1.3 OBJECTIVES / CRITICAL PATH

The objective of the Studies is to determine the opportunities for future development within the Lake Echo/Porters Lake Watershed Study Area (Appendix C) and the Tantallon/St Margaret Bay Area (Appendix D) within the environmental capacity of land and receiving waters. It will identify those lands most suitable for development within the Study Areas and determine environmentally sustainable/low impact development solutions for anticipated growth. A range of wastewater management options shall be examined for each centre as well as areas for the distribution of central water within the Porters Lake, Lake Echo and Tantallon centres.

The Studies will establish community water quality objectives for surface receiving waters and determine the amount of development that maybe undertaken in accordance with those objectives. HRM will provide data on recent subdivision and building permits, current applications and long-term Regional Plan growth allocations that were modelled under the Regional Plan. The consultants shall work with HRM, Halifax Water and the communities of Tantallon, Lake Echo, and Porters Lake to determine a range of realistic and achievable population and density targets and servicing scenarios to use as assumptions in determining carrying capacity and assessment of servicing options. Servicing assumptions to be

examined include the provision of central water and on-site and/or cluster septic systems to the Tantallon and Lake Echo centres, and the provision of central water and sewer to the Porters Lake Centre.

3.2 Detailed Scope of Work

3.2.1 REQUIREMENTS : Watershed Studies - General

As required by the Regional Plan (Policy E-17), the studies shall be designed to:

a) recommend measures to protect and manage quantity and quality of groundwater resources- at a broad scale, the study should identify and provide recommendations on development opportunities, constraints and appropriate mitigations in relation to groundwater resources. The study shall identify preferred locations for development and appropriate densities for development based on groundwater recharge potential and the potential for yield and quality to sustain development.
b) undertake a survey to determine and recommend desired water quality objectives for key receiving water bodies by the affected communities.
c) determine the maximum amount of development and maximum inputs (phosphorous, bacteria, suspended solids) that receiving lakes, rivers and ocean inlets can assimilate without exceeding the water quality objectives recommended for the lakes and rivers within the watershed.
d) It is intended that future growth within the Porters Lake Centre will be accommodated through central water and sewer services, and individual and /or communal septic systems in the surrounding area. Stormwater from individual properties shall be conveyed via a Clearwater Sewer. Stormwater from the street may be managed via a system of ditches, swales and other stormwater management devices in a rural cross section. Future growth within the Tantallon Centre and surrounding study area will be accommodated through central water and communal and/or individual wastewater management systems. The consultant must identify key lakes, rivers, ocean inlets within the study areas for which water quality objectives have been set (as per clause b above) and determine the maximum amount of inputs these water bodies can assimilate without exceeding those water quality objectives.
e) Water quality samples should be taken from area lakes and any ocean inlet identified for discharge for a minimum of three seasons beginning with the Spring turnover to determine baseline conditions. For key freshwater bodies in both study areas, use standard methods such as lake phosphorus modeling to assess assimilative capacity for the key lakes and recommend objectives for Total Phosphorus (in accordance with CCME Framework for Phosphorus Management), bacteria and other parameters considered problematic within the watershed, and recommend maximum densities of development that may be accommodated within the area of freshwater bodies that is likely to contribute significantly to phosphorus loading. For the Porters Lake Centre assimilative capacity analysis, the consultant must identify a potential service area boundary for the Porters Lake Centre and a location for the discharge of treated effluent in accordance with the NSDE requirements (Atlantic Canada Wastewater Guidelines Manual for Collection, Treatment, and Disposal 2006). Parameters to be tested in marine waters shall include standard water chemistry parameters, bacteria, phosphorus, ammonia and total nitrogen. The consultants shall also test for metals that may undermine desired water quality objectives recommended under this study for all key receiving waters. Low limit detection methods shall be used. The consultant shall also determine the depth of water to sediment at Whynacht's Cove to determine the degree of change in sediment deposits from the levels documented in the Whynacht's Cove Environmental Assessment and Enhancement Study (Griffiths – Muecke Associates 1981).

f) undertake well sampling and analysis for a representative sample of households throughout the study areas on private wells per bedrock area. Samples should be analysed for those parameters identified by the consultant as important to public health.
g) identify sources of contamination within the watershed study areas; identify and catalog existing known or suspected sources of contamination including malfunctioning septic systems based upon all available information.
h) recommend strategies to adapt HRM's stormwater management guidelines to achieve the water quality objectives set out under the watershed studies; HRM has completed a set of Stormwater Management Guidelines including appropriate Best Management Practices; strategies are needed to adapt and implement these Guidelines within each watershed (the Guidelines will be made available). Specific mechanisms are needed within each (sub) watershed related to the anticipated type and form of development within that (sub) watershed which will put the Guidelines into action. The Regional Plan provides a general indication of the types of development anticipated within defined areas of HRM. Stormwater strategies should conform to the provincial Storm Drainage Works Approval Policy (http://www.gov.ns.ca/enla/water/docs/Storm_Drainage_Works_Approval_Policy.pdf) and Halifax Water Policy for the conveyance of individual lot drainage in sewer serviced areas via Clearwater Sewers.
i) recommend methods to reduce and mitigate loss of permeable surfaces, native plants and native soils, groundwater recharge areas, and other important environmental functions within the watershed.
j) recommend methods to reduce cut and fill and overall grading of development sites.
k) identify and recommend measures to protect and manage natural corridors and critical habitats for terrestrial and aquatic species, including species at risk.
l) identify appropriate riparian buffers for the watershed recommend site-specific riparian buffers in areas which require a higher degree of protection than provided in the Regional Plan; recommend other appropriate methods for protection of identified critical terrestrial or aquatic habitats within the (sub) watersheds
m) identify areas that are suitable and not suitable for development within the watershed study areas based upon water quality objectives, receiving waters constraints, critical habitats, groundwater resources and potential central water supply, floodplains, or other constraints identified within the watershed study area and the opportunities for the provision of water and wastewater services, provide details and recommendations on land capacity for development and identify which areas are suitable for development of specific types, not suitable, or suitable with specific conditions, providing supporting reasons and analysis; identify the maximum population densities and form that development may take in those areas that are deemed suitable for development and identify appropriate water and wastewater management systems that may be used to facilitate the identified form of development.
n) recommend potential regulatory controls and management strategies to achieve the desired objectives for small scale wastewater management. considering the jurisdiction and scope of municipal authority under the Halifax Regional Municipality Charter and other relevant legislation, and scope for action under the Regional Plan and secondary municipal planning strategies, identify areas that should be included within a Wastewater Management District for those areas that may be serviced by shared septic systems within the study areas and recommend best available technology for shared septic systems.
o) recommend a monitoring plan to assess if the specific water quality objectives for the watershed are being met. HRM under the Regional Plan has instituted a general water quality monitoring program, as well as developer-funded site-specific water quality monitoring in relation to specific development proposals; monitoring within the watershed as recommended by this study will be considered for incorporation in the design of the described monitoring programs.

3.2. REQUIREMENTS: Lake Echo and Porters Lake Centres Servicing Component Study

The objective of the Lake Echo and Porters Lake Centres Servicing Component Study will also be to assess, in greater detail, options for servicing the lands within the Porters Lake Centre with central water and sewer and options for the servicing of land within the Lake Echo Centre and surrounding area with on-site and/or cluster septic systems (Appendix C). If the analysis reveals that there is a significant problem with water quality and/or quantity in the Lake Echo Centre, the consultant shall examine options for the provision of central water to the Lake Echo Centre. This Component Study shall also determine, for Porters Lake Centre, whether estimated sewage flows can be assimilated by receiving waters without exceeding water quality objectives. It will also determine how central water service, if recommended for the Lake Echo Centre might affect existing on-site septic systems and stormwater. The consultant shall also design a conceptual level network distribution system, and determine order of magnitude life-cycle costs (capital, maintenance and operating) for the provision of services. In addition, this component of the study shall be designed to undertake the following:

a) A house-to-house survey shall be completed and will consist of (a minimum) asking questions to property owners related to the type, age and performance of their current on-site septic systems and wells. For septic systems, the consultant shall include a dye test for each system to confirm system performance and discharge location. For wells, the consultant shall include testing for bacteria, basic chemical parameters and the additional recommended parameters (arsenic, uranium, radon, lead and fluoride).
    a. A minimum of 40 properties within the area indicated on the attached map shall be surveyed and included in the base scope of work. The consultant shall provide a unit price (per single survey) to survey an additional 20 properties either inside or outside the area indicated.
    b. The locations of the house-to-house survey, well testing and the survey questions shall be determined in consultation with HRM staff. Suggested questions for the survey are provided in Appendix E.
    c. The results of this survey shall be plotted on a map or series of maps designed to clearly communicate the nature and extent of malfunctioning on-site septic systems and the condition of well water supplies within the study area. The maps shall be submitted to the HRM project manager along with the raw surveys and a summary of the results of the survey in text and table form.
b) Through consultation with HRM staff and others, the consultant shall develop a preliminary service boundary for the Porters Lake Centre. This boundary shall be developed using information from a number of sources (1) the results of the door-to-door survey, (2) the location of existing development, (3) some allowance for future development, based in part on input community received through Section 3.1.3 of this RFP, and (4) soil conditions and other appropriate factors. The primary purpose of this boundary will be to assist in developing suitable locations for critical infrastructure like pumping stations, and treatment plants (centralized or decentralized), sewage outfall location and the sizing of other water and sewer infrastructure. The Consultant shall also identify areas that should be included within the boundaries of a Wastewater Management District for those areas that would continue to be serviced by individual on-site or communal wastewater management systems.
    a. The consultant must clearly state the criteria used to develop sewage flows and water requirements, and provide existing, future and ultimate flows at various nodes within the proposed systems. The consultant must also provide the criteria for designing and locating treatment facilities.
    b. Based on typical local conditions, the consultant shall provide the approximate cost to construct individual on-site systems (septic and well) and the land area required
c) Within the Preliminary Service Boundary for Porters Lake Centre, Preliminary Wastewater Management Service Boundary for Porters Lake and Lake Echo, and Preliminary Boundary for Water Service to the Lake Echo Centre, the consultant shall discuss the various servicing

solutions that could be utilized. The options considered shall include a discussion of the issues related to:

a. replacing or upgrading existing malfunctioning on-site well and septic systems and maintaining these systems as the future long term servicing solution,
b. decentralized solutions - such as communal or cluster systems.
c. Conventional solutions with piped water and sewer infrastructure and centralized treatment solutions shall also be examined only within the preliminary Service Boundary for Porters Lake.
d. For each servicing solution being considered the report shall include a general summary discussion of how each servicing solution works, technical issues, land requirements, regulatory and operator requirements, ability to be integrated with existing terrain, advantages / disadvantages, the estimated capital costs, operating costs, expected service life and other factors. For treatment facilities, in addition to the above, the consultant shall provide the process design criteria, and review and document a number of potential sites.
e. For each solution considered, the consultant shall develop separate conceptual drawings. These drawings shall include property lines, dwellings, roads, water bodies, contours, system layout, facility locations, outfall / intake locations, pipe sizing and potential phasing of construction. For treatment facilities, separate conceptual level design drawings, including phasing shall be provided. The drawings shall be at a minimum 24" by 36" at an appropriate scale. A schedule of quantities and a detailed cost estimate for each phase of implementation shall be included.

d) The consultant shall be prepared to present the results of the study to the Community, respond to the resulting questions, and incorporate appropriate comments in a confidential manner, from this meeting into the final report.

Attachment 3

Executive Summary from CBCL Tantallon Watershed Servicing Report

A copy of the main conclusions and recommendations from the Executive Summary of the Study is presented below. A full copy of the Final Report may be reviewed on-line at http://www.halifax.ca/planhrm/index.html

EXECUTIVE SUMMARY

Introduction

The community of Tantallon is located in the Halifax Regional Municipality (HRM) south of Halifax as shown in Figure ES1.1. The existing community comprises:

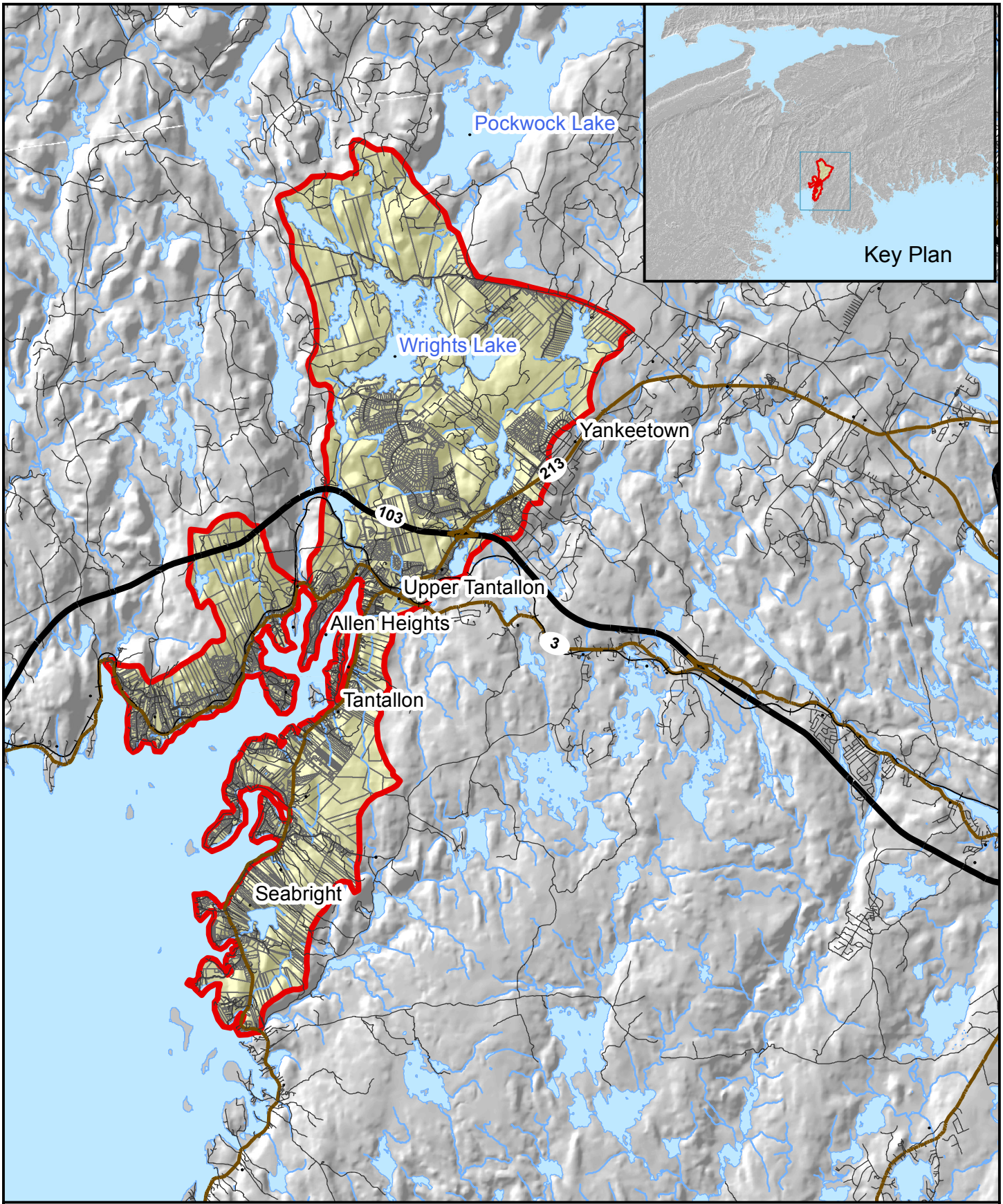
- 3,000 to 3,500 residences in strip developments adjacent the main roads and in several subdivisions;
- Commercial development and small businesses centred:
  - Near the intersection of Hammonds Plains Road (Highway 213) and Peggy's Cove Road (Highway 333) with St. Margaret's Bay Road (Highway 3) locally known as "The Crossroads";
  - At Exit 5 on Highway 103; and
- Three schools.

In the Halifax Regional Municipality's Regional Municipal Planning Strategy (HRM Regional MPS), Tantallon is designated as a Rural Commuter Centre, which is defined as a low to medium density residential development with open space design subdivisions and a mix of convenience commercial, institutional and recreational uses. The MPS envisioned the provision of express bus facilities connected to downtown Halifax and shared parking facilities for park and ride and commercial uses. These facilities have been constructed at Exit 5.

This study provides a means to evaluate opportunities for the provision of services required for planned development including: wastewater treatment and disposal, stormwater management and potable water supply, while minimizing negative impacts on the natural environment. In order that HRM may promote and direct development that best suits requirements for developable land and minimizes negative impacts on the environment, the objectives of this study are to:

- Identify opportunities for development within the Tantallon Study Area (identified in Figure ES1.1);
- Provide a range of servicing schemes for wastewater collection, treatment and dispersal, stormwater management and drinking water for those lands;
- Assess the "level of development" that various servicing schemes will support and their potential impacts on the surrounding environment; and
- Develop a site specific plan showing all land suitable for development complete with potential development densities and the services required to allow these densities to be realized.

Objectives for this study are established by policy E-17 in the HRM Regional MPS.



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Tantallon Watershed/Servicing Study
Figure ES1.1 Study Area Location
May 2012

0 1,500 3,000 6,000 Meters

Study Area

CBCL Project # 101015
Data Sources: HRM, NSDNR
Coordinate System: NAD 1983 UTM Zone 20N
Projection: Transverse Mercator
Datum: North American 1983
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: -63.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter

CBCL LIMITED
Consulting Engineers

File Path: L:\101015 Lake Echo\101015_Layout\101015 - Tantallon\101015 Tantallon - Study Area.mxd Last Saved: 03/05/2012 4:56:39 PM

Opportunities for Development

Several component studies were undertaken to address the study objectives as established by HRM Policy E-17. Some of these were used to establish existing conditions in the Study Area as well as to:

- Determine the factors restricting further development; and
- Identify opportunities for further development.

The results of these component studies are outlined below.

Wastewater Collection and Treatment

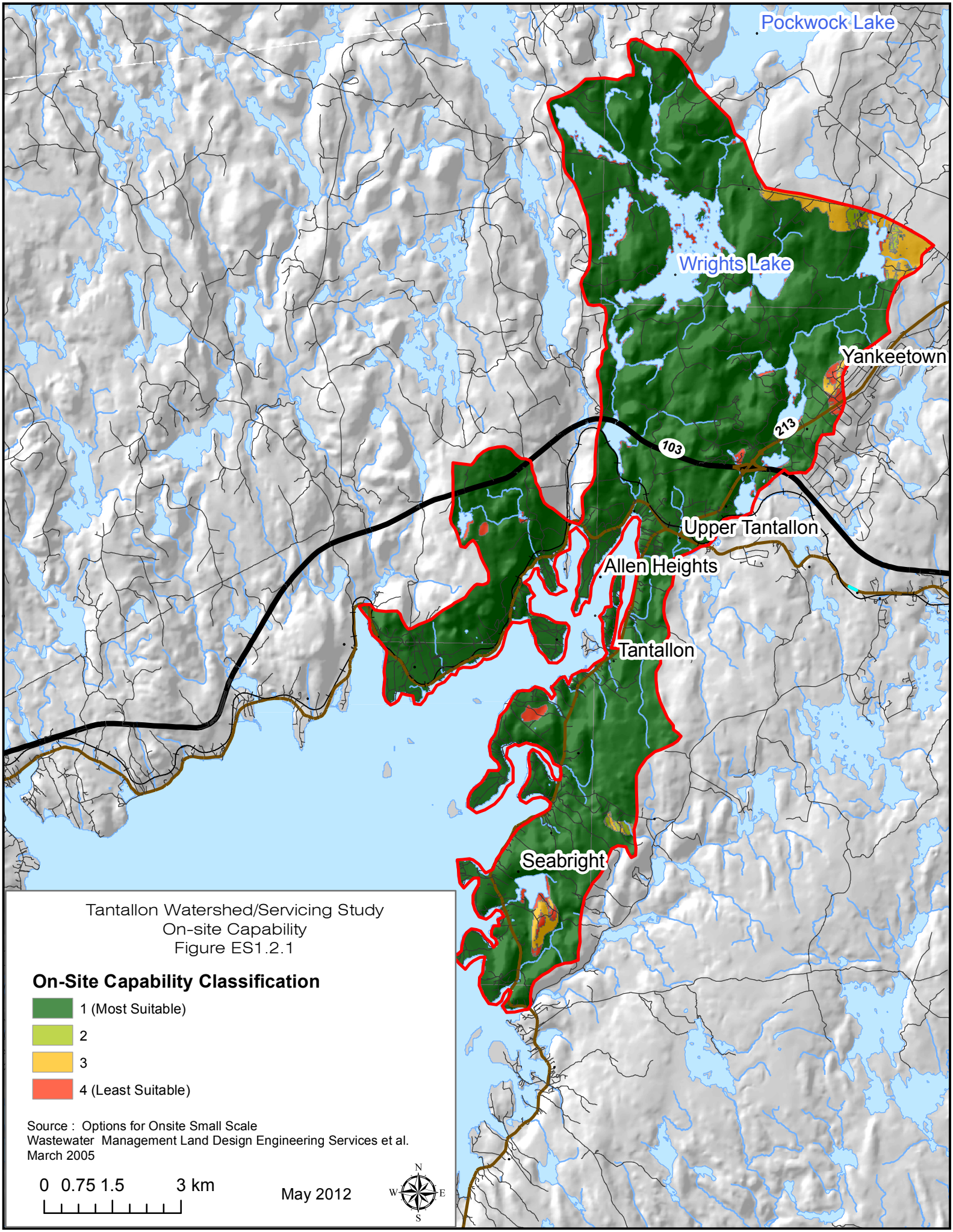
Existing wastewater collection and dispersal systems in the Study Area are predominantly onsite wastewater systems comprised of:

- A septic tank for solids removal; and
- An effluent dispersal system such as an area bed or contour system. Some original systems have failed and have been replaced with various alternatives including peat filters.

Figure ES 1.2.1, reproduced from the onsite study completed by Land Design Engineering in 2005[1], indicates that in general the soils in the Study Area are considered most suited for onsite systems. Discussions with local installers indicate that the failed systems have been in pockets of unsuitable soils and on lots that do not meet current Nova Scotia Environment (NSE) standards for the design of onsite wastewater systems.

A sanitary survey of limited scope was completed in the Study Area. Areas tributary to water bodies with the poorest water quality and the areas with the smallest lots and least suitable soils were targeted for the survey. Two hundred and twenty five (225) properties were visited and eighty-eight (88) surveys were completed. Sixteen (16) of the eighty-eight (88) homes that completed the survey allowed a dye test of their wastewater system. None of the sixteen (16) onsite systems showed signs of dye, so none failed the dye test.

[1] Land Design Engineering Services et al. March 2005. Options for Onsite & Small Scale Wastewater Management.


Pockwock Lake
Wrights Lake
Yankeetown
213
103
Upper Tantallon
Allen Heights
Tantallon
Seabright
Tantallon Watershed/Servicing Study
On-site Capability
Figure ES1.2.1
On-Site Capability Classification
1 (Most Suitable)
2
3
4 (Least Suitable)
Source : Options for Onsite Small Scale Wastewater Management Land Design Engineering Services et al. March 2005
0 0.75 1.5 3 km
May 2012
N
W
E
S

Water Supply, Treatment, and Distribution

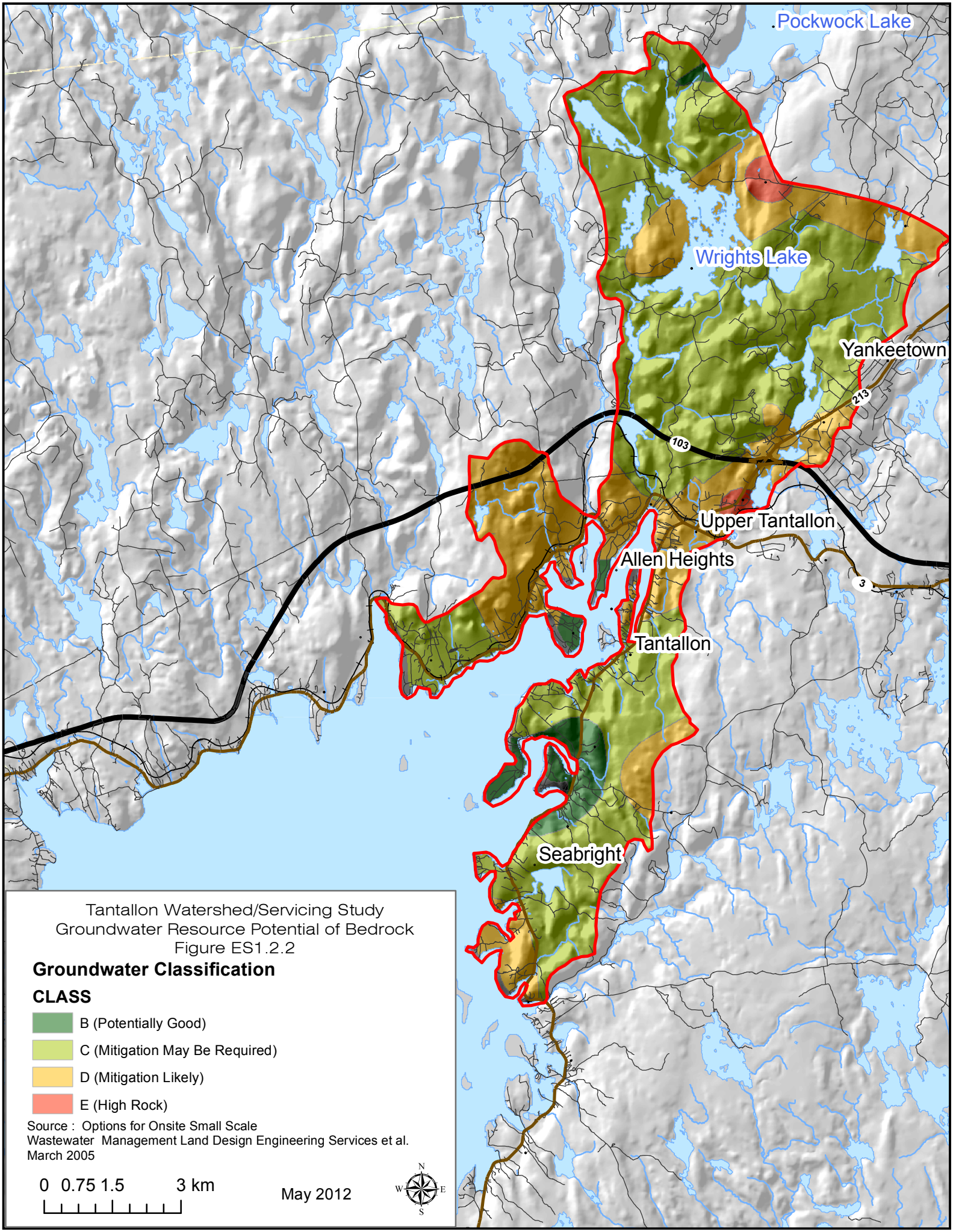
Figure ES 1.2.2, also reproduced from the onsite study completed by Land Design Engineering[2], indicates that in general the bedrock in the Study Area can supply well water of suitable quantity, but that treatment to remove common contaminants is required or is likely required in most of the Study Area.

Water is typically supplied to individual properties by onsite wells dug or drilled into locally recharged surficial aquifers, deeper wells that are drilled into the granite bedrock, supplied by regional aquifers or trucked water transported to individual properties. Water balance calculations were completed for the Study Area to determine, at a screening level typical groundwater recharge rates in the community. Water demands for existing development were estimated based on typical average daily demands. These account for 12 percent of the overall recharge to local aquifers. It is estimated that the potential increase in demand, generated by the high growth scenario in the community, could account for up to 29 percent of the local area recharge and potentially stress these aquifers.

The infiltration area required to supply groundwater to meet water demands for a single family from existing as well as potential future development is estimated to be 5,931 square metres. This is based on typical groundwater infiltration rates for the area and the assumptions that all permeable areas contribute equally to groundwater recharge throughout the Study Area.

The greatest risk to using groundwater from local surficial aquifers for potable water is the potential for groundwater contamination from local sources. Of the 16 participants in the sanitary survey, 15 allowed well water samples to be taken and analysed. Wells drilled into bedrock had elevated concentrations of iron and manganese; some also had arsenic and uranium just below the maximum acceptable concentration. Tested water from wells in the surficial (above the bedrock) aquifers showed iron and manganese as well as chloride and in some cases E. coli. The location of potential sources of contamination are investigated and documented in the main report and appendices.

[2] Ibid.


Pockwock Lake
Wrights Lake
Yankeetown
213
103
Upper Tantallon
Allen Heights
3
Tantallon
Seabright
Tantallon Watershed/Servicing Study
Groundwater Resource Potential of Bedrock
Figure ES1.2.2
Groundwater Classification
CLASS
B (Potentially Good)
C (Mitigation May Be Required)
D (Mitigation Likely)
E (High Rock)
Source : Options for Onsite Small Scale Wastewater Management Land Design Engineering Services et al. March 2005
0 0.75 1.5 3 km
May 2012
N
W
E
S

Water Quality Objectives

An online survey of interested stakeholders was completed to assess the importance of water quality in local water bodies and to determine the desired uses of them. A questionnaire was developed and made available online from September 20 to November 10, 2010. There were 57 surveys completed. In response to the question, **"Are you concerned about the water quality of the water bodies?"** more than 90 percent of the respondents were concerned with the water quality in the lakes in the watershed and adjacent areas of St. Margaret's Bay.

When asked: **"At what level would you be satisfied with future water quality?"** more than 80 percent of those responding indicated that the lakes should at least be suitable as fish and wildlife habitat and 90 percent indicated that the waters in St. Margaret's Bay should be suitable for shellfish harvesting.

To meet these water quality objectives for water bodies in the Study Area it is recommended that:

- Water quality in the lakes should meet the CCME Guidelines for human consumption of fish; and
- Water quality in St. Margaret's Bay should meet the CCME Guidelines for human consumption of shellfish.

Receiving Water Quality

A receiving water sampling program was completed for the study based on the following parameters:

- Water samples were collected in spring, summer and fall of 2010, during dry conditions as well as following rain events; and
- Samples were analysed for evidence of sewage (E coli, BOD5 and Total Suspended Solids) and typical indicators of trophic status (nitrogen (in various forms), total phosphorous and Chlorophyll A).

Results of sampling and modelling indicate:

- On an annual basis the trophic status of the lakes is mesotrophic or better, meaning that there is generally plenty of oxygen and that biological oxygen demand is low;
- Hubley Mill Lake and Flat Lake experience incidents of high concentrations of nutrients (nitrogen and phosphorous) and chlorophyll A, indicating eutrophic conditions during the summer;
- Water quality deteriorates towards the seaward end of the watershed, as it passes through the heavily developed areas. E. Coli bacteria concentrations indicate the water bodies examined are suitable for recreational contact, but not for shellfish harvesting;
- In parts of St. Margaret's Bay where there is flushing in and out from the ocean, water quality improves; and
- Sedimentation in Whynachts Cove has averaged 3 cm per year based on comparison of sediment depth measurements taken in 1981 and in 2010.

Water quality in many of the water bodies in the study area near existing development and downstream of these areas does not meet the stated objectives. These conditions can vary with changes in climate and land use in the tributary areas.

Meetings with Focus Group of Community Representatives

Several Tantallon community and business leaders were contacted and asked to meet with the study team to discuss their vision for the community. A number of those invited are involved in an ongoing

community-based visioning program that created a conceptual plan for future development in the community centre

Two meetings were held with the Focus Group. Population forecasts, existing water quality in receiving waters, water use objectives and associated water quality objectives from the survey were discussed as well as options for servicing future development in the community. The representatives listened to the presentations provided by the study team and then reviewed their vision for the community, summarized by the following points:

- A village-like centre serviced by onsite systems as well as systems to service clusters of properties. During the discussions, a copy of a plan showing the locations of the community centre, generated by the visioning group, was provided to the study team (see Figure 2.3.1(a)). This area is locally known as “the Crossroads” and is referred to as such throughout the report; and
- Development in the surrounding areas would be in Open Space Subdivisions to protect natural resources.

Focus group participants requested guidance on minimum lot sizes. Most participants were familiar with the minimum lot sizes prescribed by NSE for the design of onsite wastewater systems, but had concerns that, in some instances, groundwater supply from lots sized based only on wastewater treatment design criteria may be insufficient. Focus group participants asked that a screening level assessment of minimum lot size required to supply groundwater be made.

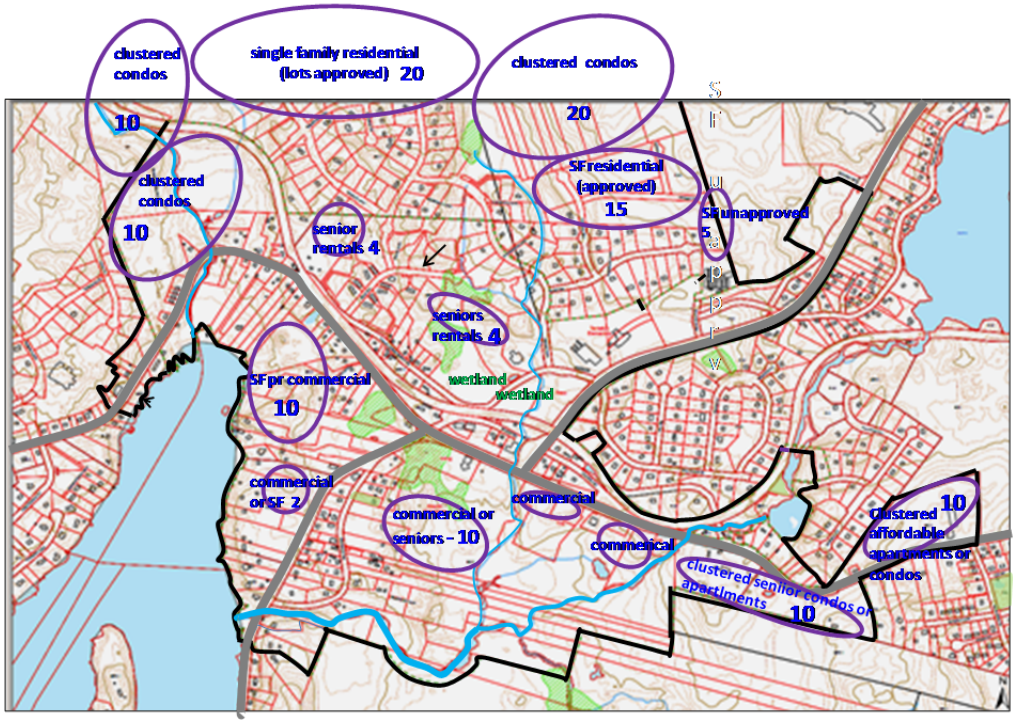


Figure ES1.2.3: Visioning Committee’s Plan for Future Infilling Development at the Crossroads

Following the meeting, the community visioning group provided a plan to the study team (see Figure ES1.2.3 above), showing the locations of potential infilling in the community centre (the “Crossroads”).

Expected infilling in the Crossroads is 132 units, comprising single family units, condos, apartments, senior residents and/or commercial units.

Desirability for Residential Development

Figure ES1.2.4 shows the relative desirability of the land in the Study Area for residential development. Desirability does not imply it is technically feasible to develop the lands. Factors such as slopes could make building difficult. Factors used to determine desirability are explained in the main report.

Certain areas within the Study Area are considered unsuitable for development on the basis of their capability, regulatory restrictions or their environmental sensitivity. These are considered "No Go" areas, where development should not occur. All areas outside these "No Go" areas are considered available for development, with the exception of areas that drain to water bodies with no assimilative capacity.

Demographics and Potential Development Densities

Population allocations prepared for the HRM Regional Plan for the period up to 2030 allow for a population decrease of 100 people within the community of Tantallon. However, because of downward trends in household size from 2.87 people per unit in 2001 to 2.37 people per unit in 2026 (generalized across HRM's rural commuter-shed), it is expected that there would be at least 500 new housing units created in the community. This is considered the low growth scenario. A high growth scenario was developed based on the provincial Community Counts data. A mid-range growth scenario was created by calculating the average between the high and low growth scenarios. Potential changes in population and housing units for each growth scenario are summarized in Table ES1.2.7).

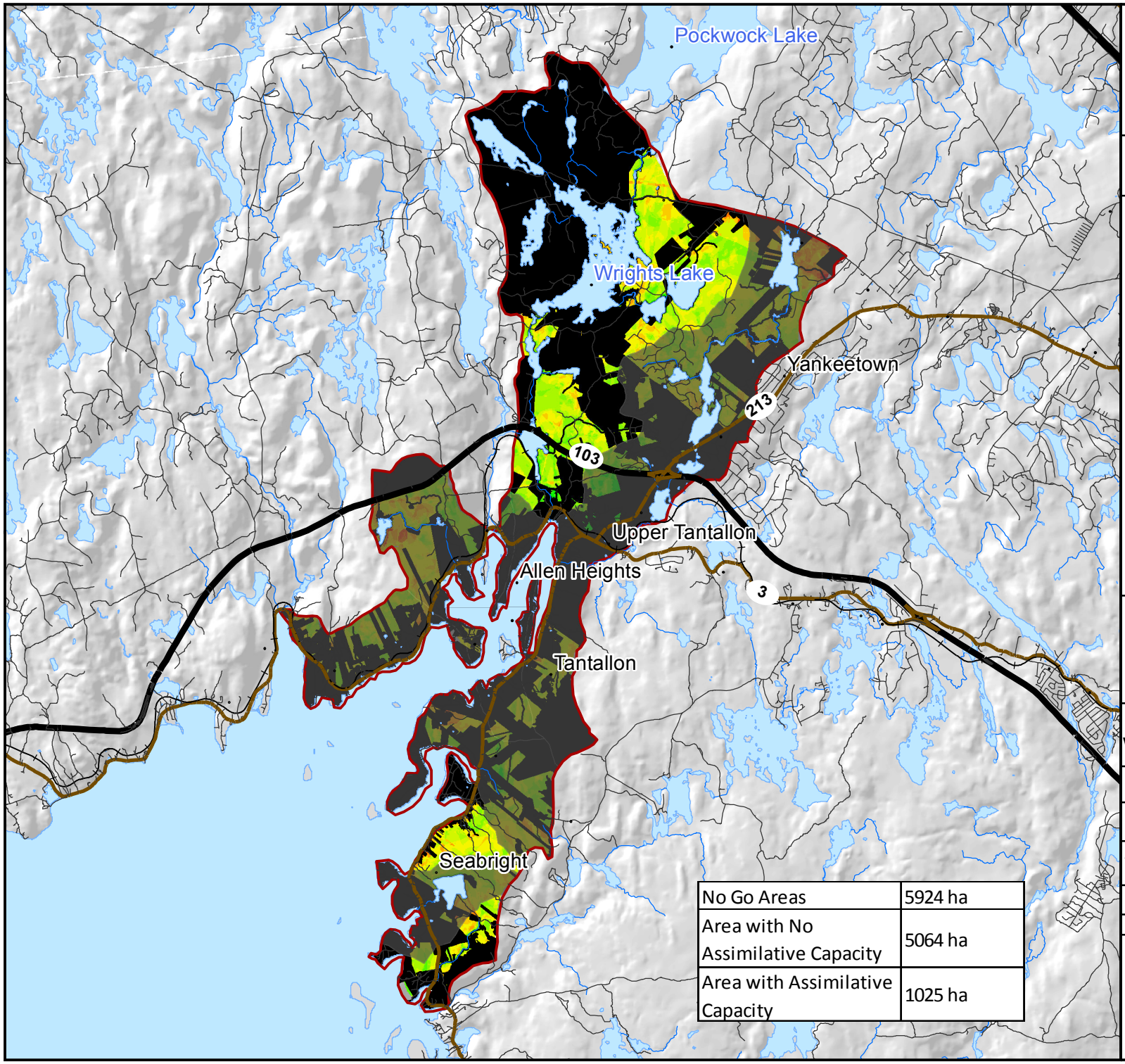
Table ES1.2.7: Demographic Projections and Potential Development Densities

Year	Low (Regional Plan)	High (Community Counts)	Mid-Range (between Regional Plan and Community Counts)
2010 pop	8,100	9,400	
2010 units	3,000	3,500	
2030 pop.	8,000	19,700	13,800
2030 Units	3,500	8,600	6,000
Pop growth 2010-2030	-100	10,300	5,100
Unit growth 2010-2030	500	5,100	2,800

Based on discussions with community representatives at the Focus Group meetings, the community expects that some growth will occur in the Crossroads (132 units), and the remainder planned for the Study Area (from a low of 368 to a high of 4,968 units) will be in the outlying areas.

Conclusions and Recommendations

Conclusions about the state of existing development and its impacts on the environment as well as recommendations to improve existing conditions and to reduce the risks of additional negative impacts on the environment from potential future development are summarized as follows:



No Go Areas	5924 ha
Area with No Assimilative Capacity	5064 ha
Area with Assimilative Capacity	1025 ha

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Tantallon Watershed/Servicing Study

Assimilative Capacity Available

Best Suitability and Desirability

Worst Suitability and Desirability

No Assimilative Capacity Available

Best Suitability and Desirability

Worst Best Suitability and Desirability

- Study Area
- NoGo Areas
- Streets
- Trunk Highway
- Divided Highway
- Arterial
- Collector
- Railroad

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Lands Available for Development with Existing Assimilative Capacity

Drawn: YO	Date: May 2012
Checked: GS	CBCL Project # 101015.00
Approved: MD	

Figure ES1.2.4

Notes:

Map Parameters

Projected Coordinate System: NAD_1983_UTM_Zone_20N
Projection: Transverse_Mercator
False Easting: 500000.00000000
False Northing: 0.00000000
Central Meridian: -63.00000000
Scale Factor: 0.99960000
Latitude Of Origin: 0.00000000
Linear Unit: Meter

N W E S

0 900 1,800 3,600 Meters

File Path: L:\101015 Lake Echo\101015_Layout\101015 - Tantallon\101015 Tantallon - Lands Available for Development with Existing Assimilative Capacity.mxd Last Saved: 22/04/2013 2:02:24 PM

Water Quality

- Lake water quality and the quality of water in St. Margaret's Bay (particularly in the prominent lakes and the sheltered inlets such as Whynachts Cove) is a concern to the majority of the 57 respondents to a survey of water quality. Any additional development in the Study Area should address potential impacts on water quality in these water bodies in particular;
- Some participants in the Community Focus Group meetings indicated that they felt that failed onsite wastewater systems were the primary sources of the pollutants. Participation in the testing of sample onsite wastewater treatment systems was low. None of the tests completed provided direct evidence that failed on-site systems were the sources of pollutants. Other potential sources such as stormwater including lawn care products, pet wastes etc. should be investigated;
- Minimum water use objectives for the water bodies in the Study Area include:
  - All lakes should be suitable for fish and wildlife habitat; and
  - The Bay should be suitable for shellfish harvesting and human consumption.
- Existing water quality makes:
  - The upstream lakes suitable for habitat but the downstream lakes (in the community) unsuitable, at least under some conditions; and
  - Sheltered coves in St. Margaret's Bay are not suitable for shellfish harvesting for human consumption.
- Based on comparisons of the water quality necessary to allow for these uses to measured water quality in these water bodies, there is no assimilative capacity at times in Flat Lake, Hubley Mill Lake or the head of St Margaret's Bay (including Whynachts Cove). Estimated water quality in Elbow Lake and Round Lake indicate there is no assimilative capacity at times in these lakes.

For the water bodies in the Study Area to be used as desired by the majority of respondents to the water quality survey, measures must be taken to improve existing water quality in the lower lakes in the watersheds as well as in the sheltered coves of St. Margaret's Bay. Future development in the Study Area should minimize the risk of generating additional sources of pollutants and improve existing water quality where feasible. To allow additional development in any of the areas tributary to the water bodies with no assimilative capacity requires implementing measures to reduce current pollutant loads to these water bodies in an amount at least equivalent to:

- The existing loads in excess of the amount required to meet water quality objectives set by current guidelines for the desired water uses established through the survey; and
- Pollutant loads expected from additional development in the watersheds tributary to each waterbody.

Recommended measures to reduce pollutant loads from existing development and minimize potential loads from future development to improve existing water quality in the Study Area include:

- Implement public education programs relating property owners' actions to water quality to reduce pollutant loads from individual properties;
- Encourage and assist with the development of stewardship programs for the lakes in the community as well as the adjacent shoreline;
- Identify deficiencies with existing wastewater and stormwater systems and design and construct retrofits to these systems;

- Design, construct, operate and maintain wastewater and stormwater collection and treatment systems to minimize potential pollutant loads generated by these systems; and
- Continue monitoring water quality in each lake on a quarterly basis to establish baseline conditions in the Study Area and to follow development progress and its impacts. Assessment of the ongoing data should be used to verify that the plan is achieving the desired reduction in pollutant loads and to modify development plans in response to unpredicted impacts.

Servicing

Specific recommendations for changes to traditional servicing to reduce potential pollutant loads to the water bodies in the Study Area are provided in Chapter 4. Generalized recommendations are listed below:

WASTEWATER COLLECTION, TREATMENT AND DISPERSAL

- Ensure routine maintenance and monitoring of onsite wastewater treatment systems. It is currently the responsibility of homeowners to maintain on-site systems. While NSE regulates the design and construction of all wastewater treatment systems in the province and certifies operators and routinely reviews the effluent quality of larger system, it has no program for routine maintenance and inspection for individual onsite systems. An alternative approach to ensure proper maintenance and monitoring of all onsite wastewater treatment, is to form a wastewater management district. There are none currently in operation in the community. The District, if formed, should include all onsite wastewater treatment systems on individual properties in the watershed areas tributary to Whynachts Cove as a minimum. Typically in Nova Scotia the Municipality (HRM) takes the role of forming the district and managing its operation to ensure the systems are operating as required to maintain desired water quality in the lakes and to provide assimilative capacity for future development in the community; and
- Routine maintenance and monitoring of cluster wastewater treatment systems. This is already required under current provincial regulations.

STORMWATER COLLECTION, TREATMENT AND DISPERSAL

Objectives for Stormwater Management Plans to rectify existing water quality issues and limit the risks of creating new risks should include:

- Minimize changes in runoff at source, including each building;
- Maintain peak runoff flows at or below existing flows from all areas;
- Promote infiltration of the cleanest runoff (from rooftops, etc.) for groundwater recharge; and
- Provide treatment of all other runoff and infiltration facilities.

Low impact development should be considered for all new developments and modifications of existing development. In any servicing situation, to achieve stormwater water quality objectives, the following should be considered:

- Low impact site development, minimizing the affected footprint and providing measures to minimize the collection of stormwater. Where it is necessary to collect stormwater, decrease the efficiency of the collection systems, particularly on private properties;
- Decrease the efficiency of local collection systems using swales with flow limiting culverts between them to encourage detention and infiltration. Filling of ditches is not permitted; and

- Treatment of remaining runoff in centralized wet ponds and constructed wetlands with built in detention capacity. Co-use of detention storage with other land-uses such as parking, lawns or gardens will lower the overall costs of this requirement as the costs of land can be significant.

WATER

- Groundwater supplies to service individual properties as well as cluster systems to service up to ten (10) properties are feasible. Wells in bedrock are the most suitable for this purpose to protect against surface contamination. Treatment of these supplies may be required for removal of naturally occurring arsenic, uranium, iron and/or manganese. Testing of individual wells is required to determine treatment requirements;
- Groundwater supplies for central systems to service some portion of existing development plus future development may be achievable but given the uncertainties with locating individual wells and minimizing interference between them, alternate sources should be investigated;
- Potential surface water supplies investigated in the Study Area included the East River system including Hubley Mill Lake; and
- Connection to the regional water supply system at Pockwock was also investigated. This may be a cost effective option for providing water services to the clustered developments in the Crossroads but is less cost effective for individual services on lots sized to accommodate onsite wastewater treatment systems, again due to the extensive distribution systems.

GENERAL

- Monitoring of construction activities with particular attention paid to assuring that erosion prevention and sediment control plans are implemented and components are maintained during construction and properly retired at the end of construction activities;
- Condominium associations are required for ongoing responsibility of clustered water and wastewater services where these are considered; and
- To ensure proper operation and maintenance of onsite wastewater systems, a wastewater management district that encompasses all areas tributary to Whynachts Cove is recommended. This will need to be formed as there are none currently in operation in the community.

Future Development

AREAS SUITABLE FOR DEVELOPMENT

Generally development should avoid the following “No Go” areas:

- Water bodies, watercourses and designated wetlands;
- Coastal buffers;
- Provincial parks, reserves, and provincial crown lands;
- Cemeteries;
- All lands below elevation 2.5 m;
- Significant wildlife and endangered species habitat as per map 5 of the Regional Municipal Planning Strategy;
- Areas of elevated archaeological potential as per map 11 of the Regional Municipal Planning Strategy; and
- Lands of high cultural significance as per category 5 on map 10 in the Regional Municipal Planning Strategy.

All areas outside the "No Go" areas are considered available for development. However, some areas within the Study Area are considered unsuitable for development on the basis of the lack of assimilative capability in their receiving waters:

- All areas directly tributary to the head of St. Margaret's Bay (including Whynachts Cove) and the East River system (downstream of Stillwater Lake based on E. coli concentrations above the objective of 14 counts;
- All lands tributary to Hubley Mill Lake, Land of Laziness Lake, Elbow Lake and Round Lake as the existing trophic status of these lakes are meso-eutrophic or euthrophic; and
- All land tributary to Whynachts Cove due to phosphorous concentrations greater than the objective of 0.020 mg/L.

Figure ES1.2.5 illustrates:

- The locations of all of the "No-Go" areas in the Study Area;
- The relative suitability and desirability of lands for residential development; and
- Whether or not there is assimilative capacity in the receiving waters for all areas within the Study Area.

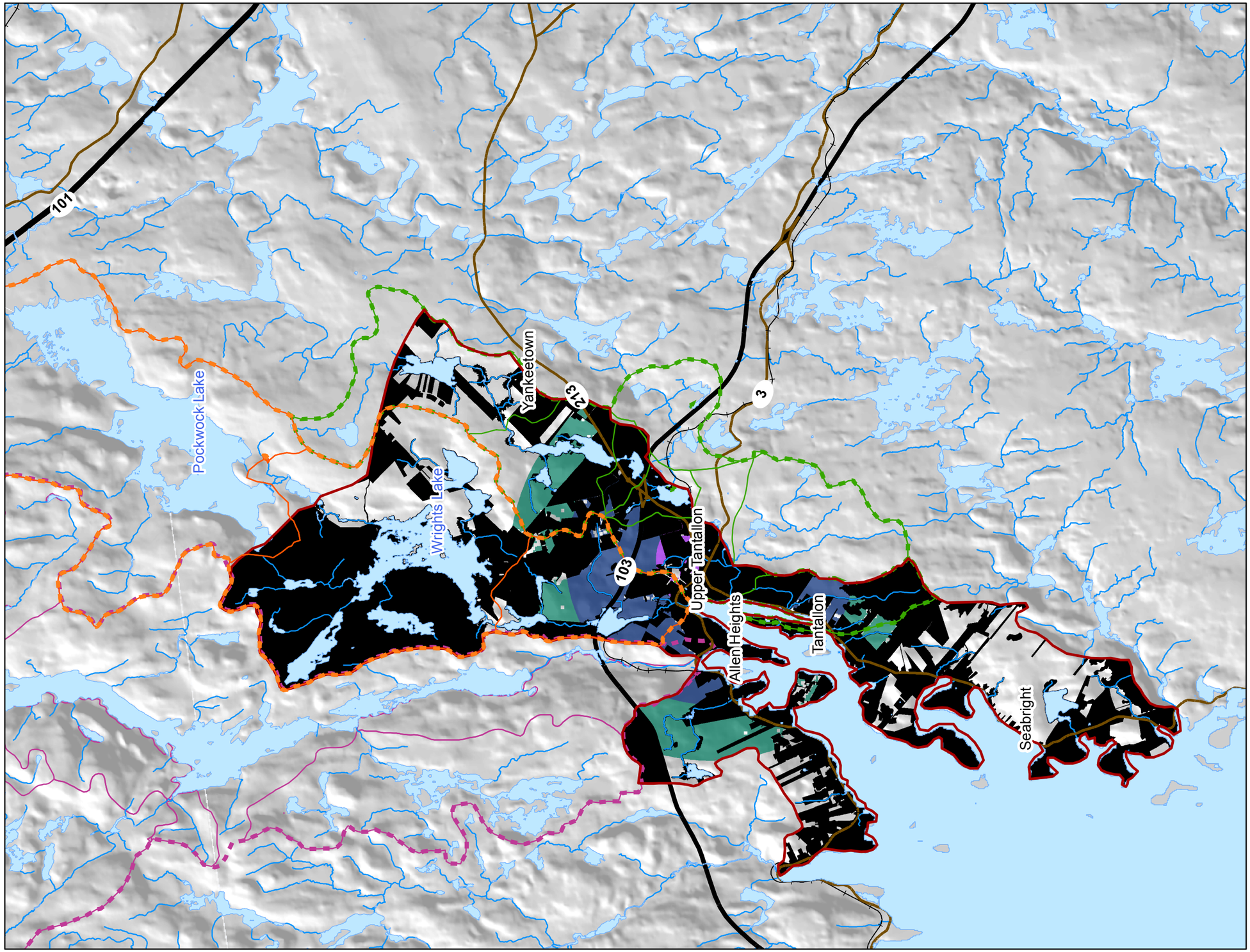
Development may proceed in areas where assimilative capacity is currently available, provided the additional development does not compromise accepted water quality objectives (based on accepted water uses for each receiving water body). If development is desired on lands tributary to waterbodies with no assimilative capacity (or with insufficient capacity to support the entire development) measures to reduce pollutant loads to the receiving waters should be undertaken before the development proceeds.

LOCATION OF DEVELOPMENT

The low growth scenario requires approximately 233 hectares to accommodate the projected new development. The medium growth scenario requires approximately 1,689 hectares (28% of the area within the Study Area) and the high growth requires approximately 3,145 hectares (52% of the area within the Study Area).

The assumption that growth in the area will be based on the use of cluster servicing systems creates a large degree of flexibility in the location of future development. Unlike central systems that require a certain level of density to be concentrated in one area to make the systems cost effective, cluster systems can be cost-effectively developed separately in a variety of areas allowing developments throughout the Study Area to come on-line as desired.

Formation of a Wastewater Management District is recommended to improve the effectiveness of onsite wastewater treatment systems servicing single properties, particularly those in areas tributary to waterbodies with no assimilative capacity. This will be achieved by providing monitoring and reporting, and potentially maintenance and replacement when necessary of existing onsite systems in the study area. Rather than individual operators providing these services for the cluster systems, the District could include all onsite systems servicing cluster treatment systems. It is expected that the District could provide these services much more efficiently than multiple providers.



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Tantallon Watershed/Servicing Study

Growth Scenarios: Onsite

- Low: 1206m
- Mid: 3220m
- High: 4471m
- No Go Areas
- Study Area
- Rivers
- Trunk Highway
- Divided Highway
- Arterial
- Collector
- Railroad

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Areas Required for Growth Using Onsite Systems

Drawn: YO	Date: May 2012
Checked: GS	CBCL Project # 101015.00
Approved: MD	

Figure ES1.2.5

Notes:

Map Parameters

Projected Coordinate System: NAD_1983_UTM_Zone_20N
Projection: Transverse_Mercator
False Easting: 500000.00000000
False Northing: 0.00000000
Central Meridian: -63.00000000
Scale Factor: 0.99960000
Latitude Of Origin: 0.00000000
Linear Unit: Meter

0 750 1,500 3,000 Meters

In all cases property owners (or condominium associations) will build and own the infrastructure. The owners of all of the onsite systems included in the District will compensate the Wastewater Management District for the services provided in much the same manner as any other utility.

Expansion of the Wastewater Management District to include all new onsite systems is relatively straight forward, the Wastewater Management District will only need to add additional staff and their supporting equipment for overseeing and analysing additional information from the additional systems.

Form of Development

Any additional development should ensure minimal degradation of stormwater or preferably, improved stormwater quality in an effort to improve receiving water quality. Improving the design and construction as well as maintenance and monitoring of onsite wastewater and stormwater systems will produce improvements in water quality. Additional improvements may be made by improving the process of locating and laying out development and selecting appropriate types of development.

In keeping with the proposal developed by area residents, a village like-centre, serviced by individual onsite wastewater and water systems as well as cluster systems servicing multiple properties, is envisioned at the Crossroads. Area residents also envisioned the rest of the Study Area being developed as open space subdivisions.

It is recommended that classic open space subdivision designs be used to keep a significant portion of the Study Area free of development. Based on the *Conservation Design (CSD) Workshop Discussion Paper* distributed at a session hosted by HRM on 5 November 2010, classic open space design allows an overall density of one lot per 0.4 hectares (one lot per acre) with the requirement that the landowner preserves culturally and environmentally significant lands by retaining at least 60% of the parcel as open space. Within an overall development parcel, development may occur in the areas outside the “No Go” areas defined above.

Within individual house lots, responsible site planning, design and construction should be encouraged to mitigate the creation of impermeable surfaces (such as paved driveways, rooftops) through a variety of approaches such as the provision of multiuse land areas for recharge. Lawn areas, for example, can be designed to act as surface runoff detention areas, as well as aesthetic and recreational areas. Driveways can be designed to be more permeable through the use of unit pavers, and roof drains can be designed to discharge into soft landscaped areas or “rain gardens”. In other cases, it may be more desirable to have impermeable surfaces directing runoff to recharge areas depending on the situation. The point is that in each case the question of stormwater runoff and recharge needs to be addressed at the community level as well as on each property in the community. Responsible design also incorporates the use of native landscape, topography and native vegetation into the site development. Rather than stripping a site bare and completely reforming the topography, buildings should be placed in the landscape and the areas disturbed for construction should be limited to the smallest reasonable footprint.

Minimum Lot Size

Based on the screening level assessment for water supply by wells, the minimum lot size for residential development should generally be based on a requirement for a minimum of 5,931 square metres of

permeable surface for each 1 cubic metre per day of demand, which is approximately equivalent to the demand for one dwelling unit. This should be added to the area taken by all impermeable surfaces on the property and the total compared to the minimum lot size required for the onsite wastewater treatment and dispersal system. The larger size should be used to establish a minimum property size on a site by site basis.

This minimum area of 5,931 square metres of permeable surface plus impermeable surfaces is for areas with a soil depth exceeding 300 mm. In locations with soil depths of 150 to 299 mm, the minimum lot size should be 6,800 square metres and in locations with soil depths less than 149 mm, the minimum lot size should be 9,000 square metres to meet NSE technical guidelines for onsite sewage disposal systems[3].

Costs of Services

Table ES1.4 provides a cost summary for provision of services in the Study Area, including the Crossroads area (the community core as defined by the residents' Focus Group). Without a significant increase in density, it is much more expensive to provide central services than onsite services. Even if the population density in the area increases to six persons per hectare as envisioned by the St. Margaret's Bay Stewardship Association, the provision of central services within the Crossroads area will still cost significantly more than the cost of onsite services on a per service cost basis. An increase in residential development, however, cannot be achieved at the Crossroads without providing some form of central or cluster services. It is interesting to note that the cost per service of clustered services may be similar to the costs of onsite systems to service a single unit in cases. Clustered systems may allow some increase in population density to be achieved while still addressing environmental concerns.

[3] Nova Scotia Environment, April 2009. *On-Site Sewage Disposal Systems Technical Guideline: Minimum Lot Size requirements For Development Utilizing On-Site Sewage Disposal Systems.* Table 2.4.

Table ES1.4: Cost Summary for Provision of Services in the Study Area

Component		System Cost					Cost per Service	
		Capital Cost (1)	Initial Cost (2)	Annual Operating and Maintenance Costs (3)	Replacement Costs (4)	Present Worth of 100 Year Life Cycle(5)	Capital Cost	Present Worth of 100 Year Life Cycle(5)
On-site		$27,500	$27,500	$502		$58,110	$27,500	$58,110
	Wastewater (a)	$12,000	$12,000	$199	$17,550	$27,191	$12,000	$27,191
	Stormwater (b)	$2,500	$2,500	$138	$2,500	$8,100	$2,500	$8,100
	Water (c)	$13,000	$13,000	$165	$12,200	$22,819	$13,000	$22,819
10 Unit Cluster		$478,257	$478,257	$13,444		$965,051	$47,826	$96,505
	Wastewater (a)	$253,829	$253,829	$10,419	$222,750	$603,116	$25,383	$60,312
	Stormwater (b)	$ 25,000	$ 25,000	$1,375	$25,000	$81,004	$2,500	$8,100
	Water (c)	$199,429	$199,429	$1,650	$165,100	$280,931	$19,943	$28,093
20 Unit Cluster		$955,214	$955,214	$19,464		$1,751,336	$ 47,761	$87,567
	Wastewater (a)	$506,357	$506,357	$14,150	$122,400	$1,063,714	$25,318	$53,186
	Stormwater (b)	$50,000	$ 50,000	$2,014	$2,750	$124,732	$2,500	$6,237
	Water (c)	$398,857	$398,857	$3,300	$33,800	$562,890	$19,943	$28,144
Water Service Area		$17,136,279	$17,136,279	$432,267	$17,136,279	$28,096,082	$19,358	$31,740
	Transmission	$6,352,928	$6,352,928	$19,500	$6,352,928	$6,373,835	$7,177	$7,200
	Distribution (6)	$8,410,825	$8,410,825	$22,250	$8,410,825	$8,336,078	$9,502	$9,417
	Services	$2,372,526	$2,372,526	$4,426	$2,372,526	$2,298,306	$2,680	$2,596
	Pockwock Water	$ -	$ -	$386,091	$ -	$11,087,864	$ -	$12,526

Notes
(1) Costs are based on 2011 construction rates
(2) Assumes no higher level government funding
(3) Based on discussions with operators of existing similar sized systems in HRM
(4) Assumes contours are replaced with RTF systems after 25 years
(5) 100 year life cycle
  (a) Assumes on-site systems are C2 contour systems
  (b) Assumes rain gardens, one per unit
  (c) Assumes wells are into bedrock and water treatment is at point of use
(6) Design cost is based on service without fire flows