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Item No. 10.1.1
North West Community Council
February 23, 2015

TO: Chair and Members of North West Community Council

Original signed

SUBMITTED BY:

Bob Bjerke, Chief Planner and Director, Planning and Development

DATE: January 5, 2015

SUBJECT: Sandy Lake Watershed Study

ORIGIN

Project commissioned to carry out a watershed study as background for community planning for the Sandy Lake Urban Settlement growth centre, as designated under the Regional Municipal Planning Strategy (2006).

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 (2006).

RECOMMENDATION

It is recommended that the Sandy Lake Watershed Study Final Report be accepted as background information for future community planning.

BACKGROUND

AECOM was awarded the contract to prepare the Sandy Lake Watershed Study (Attachment 1). An excerpt of the RFP outlining the study objectives and tasks is presented as Attachment 2. The scope of the project was adjusted through an approved scope change document (Attachment 3).

This watershed study has been undertaken to provide background information for future community planning in Sandy Lake, designated as "Urban Settlement" in the Regional Plan 2006. This Study is required pursuant to Policy E-17 of the Regional Plan (2006). 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 Sandy Lake Watershed 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 4. The full report can be found at <http://www.halifax.ca/planhrm/#WSstudies>.

Consultants presented draft preliminary and draft final reports for the watershed study to the Regional Watersheds Advisory Board (RWAB) on March 12 and September 10, 2014.

Following the report presentation to RWAB on September 10, HRM staff noted the certain lands within the watershed, anticipated to remain forested within Scenario 2 (full build out), were configured to anticipate future development. To assess the impact of the potential development of these lands on Sandy Lake and Marsh Lake, HRM engaged AECOM to conduct additional modeling and the building of an additional scenario (2a) to account for land use changes should development occur here. Staff has confirmed that the lands under review are eligible for development agreement under policies S-14, S-15, S-16, and S-17 of the Regional Plan.

FINANCIAL IMPLICATIONS

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

COMMUNITY ENGAGEMENT

The municipality and consultants conducted two public meetings, on February 20 & September 11, 2014, to engage members of the community surrounding Sandy Lake, to provide feedback into the development of this Study.

ENVIRONMENTAL IMPLICATIONS

This study was conducted to determine the environmental impact of development on Sandy Lake, as background for the preparation of future secondary planning for the communities surrounding Sandy Lake (i.e., Bedford and Hammonds Plains). Matters concerning the environment will be assessed during the process to prepare the Secondary Plan.

ALTERNATIVES

This is the recommended option for the reasons stated in the report.

Community Council could choose not to accept the report. This is not recommended, as planning staff would not have suitable environmental information available as background to community planning exercises in the affected communities.

ATTACHMENTS

Attachment 1 – Study Area

Attachment 2 – Excerpt from RFP

Attachment 3 – Project Scope Change Document

Attachment 4 – Executive Summary of Sandy Lake Watershed Study

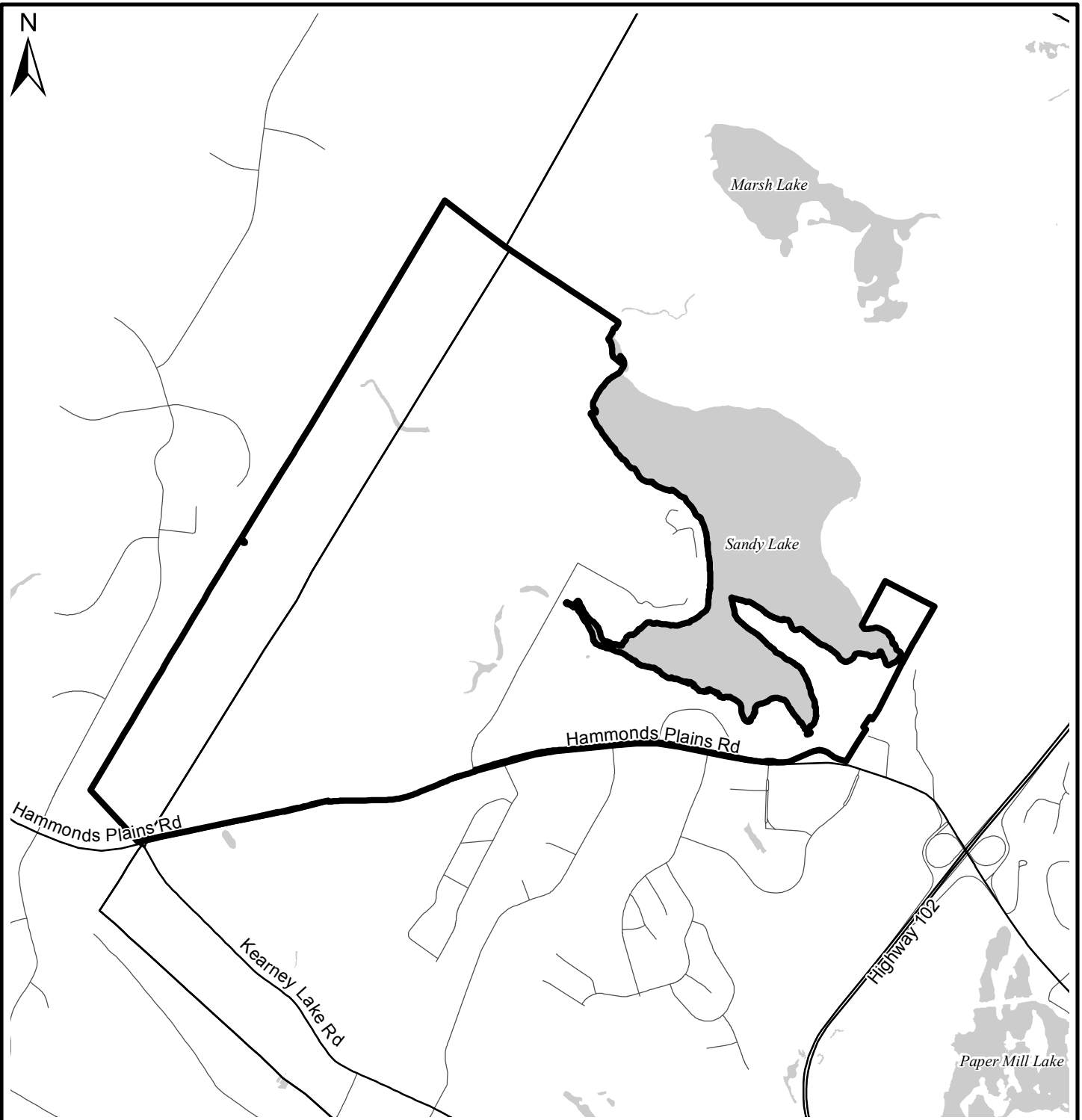
A copy of this report can be obtained online at <http://www.halifax.ca/commcoun/index.php> then choose the appropriate Community Council and meeting date, or by contacting the Office of the Municipal Clerk at 490-4210, or Fax 490-4208.

Report Prepared by: Cameron Deacoff, Environmental Performance Officer, 902.490.1926


Original signed

Report Approved by:

Richard MacLellan, Manager, Energy & Environment, 902.490.6056



Map 1A: Sandy Lake Watershed Study

 Study Area



Beaver Bank, Hammonds Plains and Upper Sackville / Bedford Plan Areas

HRM does not guarantee the accuracy of any representation on this plan. Date of map is not indicative of the date of data creation.

Attachment 2
Study Objectives and Tasks from the RFP for the
Sandy Lake Watershed Study

3.0 PROJECT BACKGROUND AND FRAMEWORK

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> for further information. Relevant studies are listed in Section 3.2.1.

Communities officially designated under either Urban Settlement or Rural Settlement Designations within the RMPS will become the subjects of these Watershed Studies. Sandy Lake is designated as an Urban Settlement, and the Rural Commuter Settlement Designation applies to North Preston and (East Preston – Cherry Brook – Lake Loon).

Further detail regarding the Sandy Lake initiative can be found at: <http://www.halifax.ca/council/agendasc/101116cowAgenda.html> (go to item 3).

HRM Regional Council recently agreed in principle to fund the oversizing of wastewater infrastructure through Bedford West to service potential future development of Sandy Lake. Further details regarding this agreement may be found here, <http://www.halifax.ca/council/documents/C120703.pdf>, at item 10.2.1.

3.1.2 Goal

In response to the Regional Plan requirements, future Secondary Planning Strategy development for Sandy Lake, and possible revisions to water / wastewater service provision in the Preston Area, HRM requires the services of a qualified consultant to conduct two watershed studies for the watershed study areas shown on Appendix E, maps 1 & 2.

3.1.3 Objectives/Critical Path

The objective of the Studies is to determine the opportunities for future development within the Sandy Lake Watershed Study Area and the Preston Area Watershed Study Area 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.

The Studies will establish water quality objectives for surface receiving waters and determine the amount of development that may be 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.

Community consultation within the Preston Area shall be performed to a standard over and above normal practice. The consultants shall work with HRM, Halifax Water and the communities of North Preston, East Preston, Cherry Brook and Lake Loon to determine a range of realistic and achievable population and density targets to use as assumptions in determining carrying capacity and assessment of servicing options. Servicing assumptions to be examined include on-site and/or cluster septic systems to the East Preston / Cherry Brook / Lake Loon Centre, and the provision of central water services to the same Centre.

3.1.4 Requirements

For these studies, the consultant shall be responsible for the following general tasks:

a) Study and investigate the project area, review available HRM / HW records, and collect data from other sources as required to complete the work. The consultant should include discussions with HRM / HW staff and the NS Dept. of Environment (the consultant is responsible to investigate and make contact with these groups).

b) Servicing options and any preliminary designs shall meet the standards, specifications and documentation requirements of HRM / HW, the Nova Scotia Department of Environment, and conform to the standards and codes of other regulatory agencies, from which approval may be necessary. Electronic and paper copies of all project documentation, correspondence, data and calculations shall be provided to HRM upon completion of the project.

c) Community Consultation: The Consultant shall include in the proposal a description of a proposed community consultation program, explaining how, and at what stages, community consultation will occur, based on the objectives and scope of work of this RFP, for example, in determining water quality objectives, general population and density targets, service area boundaries and presentations of findings and recommendations. This program should assume a minimum of two public meetings with residents / representatives of each study area. As stated in section 3.1.3 above, community consultation in the Preston Area shall be performed at a standard over and above normal practice, and therefore additional public meetings may be required for this study area.

Groups and individuals to which specific invitations shall be extended will be identified by HRM's project manager. The consultant shall also make allowance for one or two presentations to Council(s) of the Halifax Regional Municipality.

The consultant shall submit copies of draft reports and presentations to HRM's Project Manager and shall receive approval for those documents prior to the scheduling of any public meetings.

3.2 Project Framework

3.2.1 Resources HRM Will Provide to Successful Proponent

Canadian Council of Ministers of the Environment. 1999. Canadian water quality guidelines for the protection of aquatic life: Dissolved oxygen (freshwater). In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

Canadian Council of Ministers of the Environment. 2002. Canadian water quality guidelines for the protection of aquatic life: Total Particulate Matter. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

Canadian Council of Ministers of the Environment. 2007. Canadian water quality guidelines for the protection of aquatic life: Summary table. Updated December, 2007. In: Canadian environmental quality guidelines, 1999, Canadian Council of Ministers of the Environment, Winnipeg.

CBCCL and Associates. 2004. Final Report: Greenfield Areas Servicing Analysis. Prepared for Halifax Regional Municipality.

CBCCL Limited. 2009. Final Report: Regional Planning Greenfield Sites. Prepared for Halifax Regional Municipality.

Dillon Consulting. 2006 Stormwater Management Guidelines. Prepared for Halifax Regional Municipality.
<http://www.halifax.ca/environment/documents/HRMStormwaterManagementGuidelines2006.pdf>

Dillon Consulting. 2003. Water Resource Management Study. Prepared for Halifax Regional Municipality.
http://www.halifax.ca/environment/documents/wrms_report.pdf

Environment Canada. 2000. Atlantic Canada Standards and Guidelines Manual for the Collection, Treatment and Disposal of Sanitary Sewage.

Environment Canada. 2004. Canadian Guidance Framework for the Management of Phosphorus in Freshwater Systems.

Halifax Water. 2007. Source Water Protection Plan – Lake Major Watershed.

Health Canada. 2012. Guidelines for Canadian Recreational Water Quality, Third Edition. Water, Air and Climate Change Bureau, Healthy Environments and Consumer Safety Branch, Health Canada, Ottawa, Ontario. (Catalogue No H129-15/2012E).
http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/guide_water-2012-guide_eau/guide_water-2012-guide_eau-eng.pdf

Jacques Whitford Stantec Limited. January 2010. Water Quality Monitoring Functional Plan Report. (Project No. 1043788). Prepared for Halifax Regional Municipality.
<http://www.halifax.ca/environment/documents/HRM.Water.Quality.Monitoring.Fun>

[ctional.Plan.Jan2010.pdf](#) This FP is predicated, in part, on the work of Policy E-17, which forms the basis of this proposal.

Land Design Engineering Services. 2005. Options for Onsite and Small Scale Wastewater Management. Sackville Rivers Association. 2010. Sackville River Watershed Wetland Inventory. Prepared for the Nova Scotia Department of Transportation and Infrastructure Renewal.

Sackville Rivers Association. 2011. Sackville River Watershed Wetland Inventory Part 2. Prepared for the Nova Scotia Department of Transportation and Infrastructure Renewal.

4.0 PROJECT OBJECTIVE

Complete the project on time and on budget using sound project management principles.

5.0 DETAILED SCOPE OF CONSULTING SERVICES

The Regional Planning Strategy requires that watershed studies be undertaken as a prerequisite to more detailed secondary planning. As required by Regional Plan Policy E-17, the studies shall be designed to:

Watershed or sub-watershed studies concerning natural watercourses shall be carried out as part of comprehensive secondary planning processes. These studies shall determine the carrying capacity of the watersheds to meet the water quality objectives which shall be adopted following the completion of the studies. The studies, where appropriate, 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) *recommend water quality objectives for key receiving watercourses in the study area;*
 - These recommendations are to be based on current water quality status and water quality objectives stated within the Regional Plan
- (c) *determine the amount of development and maximum inputs (of total phosphorus, bacteria and suspended solids) that receiving lakes and rivers can assimilate without exceeding the water quality objectives recommended for the lakes and rivers within the watershed;*
- (d) *determine the parameters to be attained or retained to achieve marine (sic) water quality objectives;*
 - It is intended that future growth within Sandy Lake will be accommodated through central water and sewer services. A stormwater management plan will be developed by the property owner for approval by Halifax Water, in accordance with its Design and Construction Specifications guide book for

the applicable calendar year.

- Future growth in the East Preston / Cherry Brook / Lake Loon areas may be accommodated through central water services or on-site well water, as well as individual wastewater management systems. HRM staff will provide growth scenarios for consideration.
- Future growth in the North Preston area will be accommodated through central water and wastewater services, which are already operating within the community.
- The consultant must identify key lakes & rivers 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.
- Water quality samples should be taken from selected locations for a minimum of three seasons (spring, summer, fall) 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. Recommendations of Total Phosphorus objectives based on this work should be in accordance with the CCME Framework for Phosphorus Management. Recommendations should also address other parameters considered problematic within the study area, and identify the maximum density of developments that may be accommodated within the area of freshwater bodies that is likely to contribute significantly to phosphorus loading. Water quality testing shall also include metals that may undermine desired water quality objectives recommended under this study for all key receiving waters. Low level detection limits of 2 micrograms per Litre shall be used for laboratory analysis of total phosphorus, and E. Coli is the parameter to be used for investigation of bacteria.
- The consultant shall undertake well sampling and analysis for a representative sample of households throughout the Cherry Brook / East Preston / Lake Loon communities on private wells. Samples should be analyzed for those parameters identified by the consultant as important to public health. These are anticipated as follows: Total coliforms and E. Coli, Standard Water Analysis + Metals Scan.

(e) identify sources of contamination within the watershed (study areas);

- identify and catalog existing known and suspected sources of contamination including malfunctioning septic systems based on all available information

(f) identify remedial measures to improve fresh and marine water quality;

(g) recommend strategies to adapt HRM's stormwater management guidelines to achieve the water quality objectives set out under the watershed study

(h) 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 and create methods to reduce cut and fill and overall grading of development sites;

(i) identify and recommend measures to protect and manage natural corridors and critical habitats for terrestrial and aquatic species, including species at risk;

(j) identify appropriate riparian buffers for the watershed;

- Also recommend site-specific riparian buffers in areas that require a higher

degree of protection than provided for in the Regional Plan.

(k) *identify areas that are suitable and not suitable for development within the watershed;*

- These are to be based on recommended water quality objectives, receiving water constraints, critical habitats, groundwater resources and potential central water supply, floodplains or other constraints identified within the watershed study area and the opportunities for water and wastewater services. The Consultant shall provide details regarding their recommendations for the land's capacity for development and identify areas of land that are suitable for development of certain types, areas that are not suitable for development, and lands that may be suitable for development under certain conditions. Data analysis and rationale are required as part of the explanation for these recommendations.

(l) *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.*

(m) *recommend a monitoring plan to assess if the specific water quality objectives for the watershed are being met.*

- From 2006-2011 the Municipality operated a lake-based water quality monitoring program. A developer-funded site-specific water quality monitoring program was also established in 2006 in association with specific development proposals. HRM received a report recommending a water quality monitoring policy in 2010; that report is accessible at <http://www.halifax.ca/environment/documents/HRM.Water.Quality.Monitoring.Functional.Plan.Jan2010.pdf>

The Sandy Lake lands are within the Sackville River Watershed (see Map 1, Appendix E) and the Preston Area lands are within the Little Salmon River & Partridge River – Lawrencetown Lake Watershed systems (see Map 2, Appendix E).

The study scope identified above addresses matters specifically identified in Policy E-17 of the Regional Planning Strategy. In addition to those matters, the following specific tasks are to be undertaken:

- A. Meet with the respective organizations for each watershed study, in separate meetings, to identify the project, explain the work to be undertaken and to hear any concerns or issues arising from the presentation and associated work plan.
 - i. For the Sandy Lake Watershed Study, two presentations shall be given at public meetings with residents / representatives of the affected area to be identified by HRM's Project Manager. The first presentation will be held at the earliest mutual opportunity of these organizations and the consultant and its purpose will be to identify and describe the project and request input from these organizations and others in attendance. The second presentation will occur after the draft preliminary report has been developed and submitted to HRM, to report upon the findings made and receive further comments from

those in attendance.

- ii. In the Preston Area Watershed Study, a minimum of two presentations shall be given at public meetings with residents / representatives of the study area to be identified by HRM's Project Manager. HRM will actively participate in the engagement of these groups. The first presentation will be held at the earliest mutual opportunity of these organizations and the consultant, and its purpose will be to identify and describe the project and request input from these organizations and others in attendance. The second presentation will occur after the draft preliminary report has been developed and submitted to HRM, to report upon the findings made and receive further comments from those in attendance.
- B. Prepare a draft preliminary report for each study area with recommended water quality objectives for key receiving watercourses. Each report is to explain the criteria for the recommendations and will be presented at 1) a joint public meeting of the bodies identified in task A, above, and at a meeting of HRM Council for an endorsement of the recommendations. Separate public meetings will be scheduled for each watershed study and it should be assumed that separate presentations to Council will be required. Following each presentation at the public meeting, the Proponent will be expected to respond to questions arising and consider revisions based on the comments received which are to be incorporated into the preliminary final report to Council.
- C. Review existing water quality data available and undertake a sampling program needed to establish a reliable and accurate baseline of the water quality in key receiving water courses.
- D. Undertake spatial modeling utilizing HRM LiDAR data for each watershed. The Proponent will use the data to develop an ArcGIS 9.3 Digital Surface Model (DSM) of each watershed. Further modeling will include the following tasks: watershed delineation including identification of vernal ponds, wetlands and intermittent streams; pre and post development analysis of impervious surface effects; and pre and post development watercourse sediment loads. Stormwater modeling is to take into account the anticipated effects of climate change (increased frequency and intensity of storm events).
- E. Liaise with provincial and federal representatives to determine if any regulations or guidelines may affect the study outcome.
- F. Prepare a draft preliminary report for each study area with recommended water quality objectives for key receiving watercourses. Each report is to explain the criteria for the recommendations and will be presented at a public meeting and at a meeting of Regional Council for an endorsement of the recommendations. A separate public meeting will be scheduled for each watershed study and it should be assumed that separate presentations to Council will be required. Following each presentation at the public meeting, the Proponent will be expected to respond to questions arising and consider revisions based on the comments received which are to be incorporated into the final preliminary report to Council.
- G. Prepare a draft final report for each study area which addresses the applicable matters identified under Policy E-17. A presentation based on this report will be presented at a public meeting (one for each watershed). The Proponent will be expected to respond to questions and will consider revisions to the final report which is then to be presented to Regional Council, or an alternate body of HRM Council as designated by HRM staff.



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Scope Change

Date:	October 1, 2014	Project:	Sandy Lake Preston Area Watershed Study
Client:	HRM	Project #:	60303077
Address:	Alderney Landing Building	Contract #:	PO 2070623959
AUTHORIZATION:			
Client requests and authorizes AECOM Canada Ltd. Halifax, NS to perform the work specified in the following change of scope ("Work") in accordance with the terms and conditions of the Work Authorization ("Agreement").			
DESCRIPTION OF CHANGE: AECOM has been requested to provide a change order to include modelling a new scenario, which will involve quantifying the area of land use change; and, the number of residences within 300m of a watercourse.			
Task			Amount (\$)
<ul style="list-style-type: none"> ▶ Create a new model scenario. ▶ Update the AECOM Sandy Lake Preston WS Report to include the new modeling scenario. This would include text updates and creation of new figure(s). ▶ We estimate this would require 32 hours of time. ▶ Revised contract amount, including this CO, will be \$196,421.70. 			3200.00
Total			3200.00

IN WITNESS WHEREOF the parties have executed this Agreement.

Halifax Regional Municipality

AECOM Canada Ltd.

By: _____
Signature of Authorized Representative
 Bob Bjerke

Name of Authorized Representative
 Original signed

Date

Original signed
 By: _____
Signature of Authorized Representative
 André Lauzon

Name of Authorized Representative
 October 3, 2014

Date

By: _____
Signature of Authorized Representative (if required)

Name of Authorized Representative

Date

Attachment 4

Executive Summary from Sandy Lake Watershed Study Final Report

A copy of the main conclusions and recommendations from the Executive Summary of the study's Final Report is presented below. A full copy of the final report may be reviewed online at

<http://www.halifax.ca/planhrm/#WSstudies>.

Executive Summary

Halifax Regional Municipality (HRM) in 2002 accepted the HRM Water Resources Management Study (Dillon 2002) as a basis for watershed planning policies. Following from this study, HRM uses the watershed as the basic unit of land use planning. This approach is consistent with the provincial Water Resources Management Study, which adopts a watershed-based Integrated Water Management approach to water protection and conservation (NSE 2010).

Land development within a watershed is one of the primary activities that may negatively affect a watershed's biophysical environment and by extension, the rivers and lakes downstream from that watershed. Given this, HRM's 2006 Regional Municipal Planning Strategy (also called the Regional Plan) requires that, prior to undertaking secondary municipal planning or considering amendments to existing secondary plans, HRM must complete watershed studies to aid in municipal planning. The objectives of these studies (given in Regional Plan Policy E-17) are both broad and comprehensive, and include the assessment of a range of environmental issues within the study area. The watershed studies are intended to provide solutions to existing issues or issues arising from the anticipated form and degree of development. Recommendations must balance development versus environmental protection, and provide specific recommendations to address the issues identified within the watershed studies.

Communities officially listed under either Urban Settlement or Rural Settlement Designations within the Regional Plan are subject to these watershed studies. The Sandy Lake watershed is designated as an Urban Settlement area and currently hosts urban development along main thoroughfares (Hammonds Plains Road, Lucasville Road), in industrial areas and suburban style communities. Portions of the watershed are serviced with municipal water and wastewater services and portions of the watershed utilize on-site water wells and septic systems.

A development constraints map of the watershed identifies areas that are not suitable for development (wetlands, watercourses and riparian zones) and areas that may require environmental mitigation to be included in development plans, if the areas are developed. Areas that may require environmental mitigation were identified by developing a groundwater recharge map to define areas with high groundwater recharge and areas with steep slopes, identified using GIS.

Historic water quality samples and water samples collected during the course of this study are used to identify water quality objectives for parameters that are influenced by development. The water quality in Sandy Lake and Marsh Lake is currently being affected by urban development, as displayed by the increasing phosphorus concentration in Sandy Lake. Both Sandy Lake (12 µg/L) and Marsh Lake (10 µg/L) have median phosphorus concentrations that place them in the lower end of the mesotrophic range. Water quality objectives and early warning values are set at: 18 µg/L and 15 µg/L for Sandy Lake; and 15 µg/L and 13 µg/L for Marsh Lake, respectively.

Parameter	Derivation of Objective	Sandy Lake Watershed Water Quality Objective	Early Warning Alert Value	Evaluation Method for Objective/Alert Value
NO ₃ – Nitrate	CCME	• 13 mg NO ₃ /L	• ≤10 mg/L	• 75 th percentile of 3 year historical data. See footnote ¹
Total Suspended Solids (TSS)	CCME	• Short term ¹ : 25 mg/L increase • Long term ² : 5 mg/L increase	• Lake dependent	• 75 th percentile of 3 year historical data not to exceed base line by more than 5 mg/L
Chloride	CCME	• 120 mg/L	≤90 mg/L	• 75 th percentile of 3 year historical data
<i>E. coli</i>	Nova Scotia and Health Canada	• 200 <i>E. coli</i> /100 mL • (geometric mean of 5 samples)	• 200 <i>E. coli</i> /100 mL	• Geometric mean of 5 most recent samples

¹ 75th percentile of the reported values from the results of previous 3 years of monitoring. This assumes the results are from a technically justifiable monitoring program, such as the program recommended in Section 9.

Lake	Trophic State Objective	Numerical Objective	Early Warning	Evaluation
Sandy Lake	Mesotrophic	< 18 µg/L	15µg/L	Based on 3 year running average
Marsh Lake	Mesotrophic	< 15 µg/L	13 µg/	Based on 3 year running average.

Existing conditions and four possible future development scenarios are identified in the watershed and land use maps prepared for this study. The land use maps were used as inputs to a phosphorus load model (Lake Capacity Model) to predict how future development may impact the phosphorus concentrations of these two lakes. Phosphorus is identified as a key water quality parameter to assess the trophic status of the lake.

Cumulative impacts of development are predicted to increase phosphorus concentrations to 17.4 µg/L for Sandy Lake and 14.7 µg/L for Marsh Lake. These levels are above the early warning values, but below the water quality objectives. Removing point sources of phosphorus such as the Uplands Wastewater Treatment Facility (WWTF) and septic systems near Sandy Lake by connecting them to municipal wastewater services decreases the predicted phosphorus concentrations to 14.5 µg/L and 12.9 µg/L for Sandy Lake and Marsh Lake, respectively. Additional phosphorus mitigation measure requiring advanced stormwater management in new development areas is predicted to further decrease the phosphorus concentration of Sandy Lake to 12.8 µg/L and of Marsh Lake to 11.5 µg/L.

Scenario	Sandy Lake Predicted Phosphorus (µg/L)	Marsh Lake Predicted Phosphorus (µg/L)
Scenario 1: Existing Conditions	12.0	11.0
Scenario 2: Planned Developments	15.8	13.7
Scenario 2a: Planned Development extended	17.4	14.7
Scenario 3: Planned Developments + removal of Uplands WWTF and Septic Systems near Sandy Lake	14.5	12.9
Scenario 4: Future Developments (Scenario 3) with Advanced Stormwater Management	12.8	11.5
Recommended Water Quality Objective	18	15

The results of the modeling scenarios provide a hypothetical example of how water quality may be impacted by development and an approximation of the scale of nutrient reduction that could be achieved using viable mitigation measures. Full development without mitigation measures to control nutrient loading into the lakes will likely result in steady increases in phosphorus concentrations that will approach the water quality objectives. Removal of nutrient sources such as septic systems, wastewater treatment facilities and stormwater runoff from new development areas will reduce the impact of urbanization within the watershed.

The predictions from the phosphorus load model are consistent with observations of urbanization in other watersheds. However, the degree of influence of urbanization on water quality in Sandy Lake can only be approximated using the phosphorus load model because of limitations arising from assumptions and uncertainty in the application of the model. Therefore, a robust water quality monitoring plan is proposed for the Sandy Lake watershed to provide further assessment of current conditions and to evaluate the impacts of development on the water quality.

Recommendations to maintain the quality and quantity of surface water along with the groundwater resources in the Sandy Lake watershed include focussed planning strategies, following existing regulatory requirements and stewardship.