



P.O. Box 1749
Halifax, Nova Scotia
B3J 3A5 Canada

Item No. 9.1.1
Environment & Sustainability Standing Committee
May 14, 2015

TO: Chair and Members of Environment & Sustainability Standing Committee

Original Signed

SUBMITTED BY:

Bob Bjerke, Chief Planner and Director, Planning and Development

DATE: March 30, 2015

SUBJECT: Water Quality Monitoring Protocol

RECOMMENDATION REPORT

ORIGIN

E-24, Regional Municipal Planning Strategy (2014)

LEGISLATIVE AUTHORITY

Halifax Regional Municipality Charter, Part VIII: Planning and Development

RECOMMENDATION

It is recommended that the Environment and Sustainability Standing Committee direct this report to the Regional Watersheds Advisory Board for its information.

BACKGROUND

Policy Statement E-24 is presented in the Regional Municipal Planning Strategy, Chapter 2, Environment, Energy, and Climate Change. The Policy states that:

HRM may consider preparing a water quality monitoring protocol to provide guidance for water quality monitoring plans accepted by HRM under clause (n) of policy E-23 and any other monitoring programs to be undertaken for HRM by landowners.

In June 2013, staff engaged Stantec Consulting to propose a water quality monitoring protocol (Attachment 1) to the municipality, in anticipation of the ratification of the Regional Plan (2014). The protocol presented here originates from Stantec's report to the municipality (Attachment 2), and responds directly to the needs of Policy E-24.

DISCUSSION

The proposed water quality monitoring protocol presents a standardized procedural approach to the implementation of water quality monitoring activities required by the municipality. It addresses all elements critical to water quality monitoring procedures, including location, timing, techniques, guidelines, procurement, oversight, and reporting.

The protocol, developed by Stantec in association with selected municipal Planning and Development staff, is intended to provide a consistent approach to water quality monitoring across the municipality. Procedures addressed in the protocol are based on best practice, and may be successfully implemented in lakes and rivers. The protocol provides staff with the discretion necessary to expand the suite of parameters measured or procedures followed for a given monitoring project, should circumstances require any changes to standards established.

Policies regarding aquatic monitoring vary between Halifax's Secondary Planning Strategies (SPS). Effective implementation of the protocol requires the revision of these SPS prior to implementation. Staff will accomplish this revision through the secondary planning harmonization process currently underway.

FINANCIAL IMPLICATIONS

There are no financial implications. The municipal costs associated with implementation of the protocol can be accommodated within the approved 2015-16 Planning & Development operating budget.

COMMUNITY ENGAGEMENT

Members of the community were not engaged in the preparation of the protocol or this report. Meetings of the Environment & Sustainability Standing Committee are open to the public and agenda items of the committee are posted on the corporate website.

ENVIRONMENTAL IMPLICATIONS

Protocol fulfils Regional Plan direction provided in Policy E-24.

ALTERNATIVES

The Committee may direct a copy of this report to the Regional Watersheds Advisory Board for its information (recommended).

The Committee may choose not to direct a copy of this report to the Regional Watersheds Advisory Board for its information. This alternative is not recommended, because not sharing the report may compromise the Board's ability to provide accurate and timely advice to the Committee.

ATTACHMENTS

Attachment 1. Water Quality Monitoring Protocol.

Attachment 2. Stantec Report to Halifax re Water Quality Monitoring Protocol

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 902.490.4210, or Fax 902.490.4208.

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

Original Signed

Report Approved by: Richard MacLellan, Manager, Energy & Environment, 902.490.6056

Water Quality Monitoring Protocol

In developing water quality management plans and monitoring programs, HRM shall ensure that the following minimum requirements are met:

1. All water sampling and analysis shall be done by qualified professionals only.
2. A Request for Proposals (RFP) shall be issued to solicit the services of appropriate qualified professionals. The RFP shall, at a minimum, require the satisfaction of all specifications of this protocol.
3. At least three qualified professionals or firms shall be invited to submit proposals to undertake sampling and analysis and other functions deemed necessary to the effective execution of a water quality monitoring program pursuant to HRM policy and this protocol. No consultant shall be selected pursuant to said RFP who does not commit to a monitoring program that will meet or exceed the requirements of this protocol.
4. (a) Water sampling shall, at the minimum, include collection of the following water quality parameters employing the methods specified:
 - Temperature (In-situ Meter)
 - pH (In-situ Meter)
 - Conductivity (In-situ Meter)
 - Dissolved Oxygen (In-situ Meter)
 - Total Phosphorous (Depth Integrated Sample)
 - Turbidity (Depth Integrated Sample)
 - TSS (Total Suspended Solids) (Depth Integrated Sample)
 - E. coli (Discrete Sample).
- (b) Samples shall be collected monthly except during a designated winter period not to exceed three months during which only one sample shall be required.
- (c) Samples shall be collected from at least one deep location within each subject lentic watercourse and at one location at the mouth of any tributary entering or exiting said watercourse. Lotic watercourses should be sampled in the centre of flow with the number of samples to be determined on a case by case basis.
- (d) Samples shall be handled and assessed consistent with the specifications of the most recent edition of the Environment Canada publication *Inspector's Field Sampling Manual*.
- (e) If in the opinion of responsible staff, circumstances require the expansion of the parameters to be followed or modification of procedures to be followed, staff may make such modifications as are deemed necessary provided any change from this protocol is documented in the RFP to be issued pursuant to point 2.

5. Payment for water quality sampling and analysis undertaken to monitor the impact of land development and/or construction shall be paid for by the developer or other responsible individual or organization party to the development agreement establishing the need for a monitoring program.
6. HRM will receive all data collected by the selected consultant as well as associated reports, and shall provide them for review by the Regional Watersheds Advisory Board.
7. Based on its interpretation of results and reports submitted, HRM staff may direct the expansion of water quality monitoring in terms of criteria collected, timing of collection, or location(s) of sampling. In the event that staff is uncertain of the scope or specific nature of such additional effort, they may arrange further research by qualified professionals in a manner consistent with the prevailing procurement policies of the Municipality. Any additional costs associated with such expansion of water quality monitoring or study of the need for further water quality monitoring shall be borne by the party identified under point 4.
8. HRM will receive all invoices for services rendered by the selected consultant and shall arrange their payment by the party identified under point 4.



December 9, 2013

File: 121511188

Attention: Mr. Cameron Deacoff
Halifax Regional Municipality
Planning & Infrastructure, Energy and Environment
PO Box 1749, Halifax, Nova Scotia
B3J 3A5

Dear Mr. Deacoff,

Reference: HRM Water Quality Monitoring Protocol –Final Report

BACKGROUND

Stantec initiated work on the Water Quality Monitoring Protocol in late July 2013, based on our proposal letter dated June 19, 2013. The proposal letter set out the following tasks to define the protocol:

- Start Up Meeting (including time for Project Management)
- Interview Key Staff
- Review Community Plans and Current Approvals Process
- Identify Potential Policy Options
- Meeting with HRM
- Workshop/Focus Group Meeting with Development/Policy Planning Staff
- Meeting with HRM
- Prepare Draft Letter Report/ Final Review Meeting

All required research tasks have been completed. This letter report is submitted as the product of the final task listed and will be the subject of a final review meeting with HRM staff to conclude the project.

WATER QUALITY MONITORING IN HRM

Because of its topography and geology, HRM has many watercourses. It is dotted with more than 1,000 lakes that are interconnected within distinct watersheds by many small streams. There are also substantial rivers such as Nine Mile River, the Shubenacadie River, and the Salmon River that drain large areas of the municipality and, in some cases, areas beyond HRM's boundaries.

Municipal responsibility for water resource protection is nevertheless limited. The Provincial and Federal governments have primary responsibility through legislation such as the Nova Scotia *Environment Act*, the Canada *Fisheries Act*, 1985, the Canada *Navigable Waters Protection Act*, 1985, and the Canada *Environmental Protection Act*, 1999. An Information Report submitted to HRM Council on August 20, 2013, stated that the Municipality's interest in water resources follows from its:



Reference: HRM Water Quality Monitoring Protocol –Final Report

- Responsib[ility] for management of development in the municipality;
- Responsib[ility] for management of municipal infrastructure operations and construction; and further, has interest in lake water quality for the following reasons:
 - Provision of recreational amenity in lieu of hard infrastructure;
 - [Interest in the protection of property values, and the correlation to water quality and the aesthetic value, for the interest of tax base.

The Municipality also has an interest in the protection of water sources used for municipal water supplies such as the Pockwock Lake and Lake Major. Responsibility for maintaining the quality of water from these sources lies with Halifax Water.

The Information Report also provided the table reproduced here as **Table 1** summarizing established sources of water quality data used by the Municipality. As can be seen from the table, the focus of five of the six “streams of water quality data” is on land development. Substantial water bodies are located within the Regional Centre and many more have been enveloped by development as the region has suburbanized. As growth continues within the region, development projects may place these many water bodies at risk from siltation and other impacts during construction and from increased urban run-off afterwards.

Table 1 HRM Water Quality Data Collection, 2013	
Program	Purpose
Beach program: approximately 25 beaches (100% of Supervised beaches) are tested for health concerns to compliment Recreation programming. That program continues at an approximate cost of \$10,000 annually, paid from D935 (Energy & Environment, Planning & Infrastructure).	Swimmer safety (Recreational)
Developer program: From a variety of development agreements, paid for by the developers, the municipality coordinates and receives water quality data. That program continues and will expand. The value of this work is approximately \$50,000 annually.	Development Management
Historical and external programs: Collectively, there is data that HRM has, or has access to, to inform land use planning decisions.	Development Management
Watershed Studies: As a requisite following adoption of the Regional Plan, a variety of comprehensive watershed studies have been completed or initiated. This work provides municipal data to inform land use planning decisions. Watershed studies continue and are a council priority. A water shed study is typically a \$250,000 project. These studies are paid for by Planning & Infrastructure.	Development Management
The interim baseline data collection program consisting of 71 lakes. That program has been completed. The value of the data is approximately \$500,000 and will provide baseline information for Planning and Development activities. This work was paid for from D935 (Energy & Environment, Planning & Infrastructure).	Development Management
Ongoing baseline data enrichment. The municipality will continue to obtain and acquire data, or access to data that supports municipal planning, development, and infrastructure decisions. It is anticipated that this activity will continue to have a value of approximately \$10,000 to \$20,000 annually. This work is paid for from D935 (Energy & Environment, Planning & Infrastructure).	Development Management



Reference: HRM Water Quality Monitoring Protocol –Final Report

WATER QUALITY MANAGEMENT POLICY

The current HRM Regional Municipal Planning Strategy (RMPS) includes two policies related water quality management. The first, Policy E-17, established a framework for the conduct of watershed studies to be carried out in the context of secondary planning processes:

RMPS Policy E-17

Watershed or sub-watershed studies concerning natural watercourses shall be carried out prior to undertaking secondary planning processes in areas where new or additional development could adversely affect watercourses within the watershed. The studies, where appropriate, shall be designed to:

- (a) protect and manage quantity and quality of groundwater
- (b) set water quality objectives for key receiving watercourses
- (c) determine the amount of development and maximum inputs that can be assimilated
- (d) determine the parameters to be attained or retained
- (e) identify sources of contamination
- (f) identify remedial measures
- (g) identify where development could cause flood damage
- (h) adapt stormwater management guidelines to achieve the water quality objectives
- (i) methods to reduce and mitigate loss of important environmental functions
- (j) protect and manage natural corridors and critical habitats
- (k) identify appropriate riparian buffers
- (l) identify areas that not suitable for development
- (m) recommend regulatory controls and management strategies
- (n) recommend a monitoring plan.

The second, Policy E-18, mandated the preparation of a Water Quality Monitoring Functional Plan (WQMFP):



Reference: HRM Water Quality Monitoring Protocol –Final Report

RMPS Policy E-18

HRM shall prepare a Water Quality Monitoring Functional Plan to establish a comprehensive water monitoring program for the Municipality.

The WQMFP was prepared by Stantec and submitted in final form in May 2009. According to the Introduction to the document on p. 1.1:

The Water Quality Monitoring Functional Plan (WQMFP) is intended to establish a comprehensive water quality monitoring program. The objective of the WQMFP is to guide HRM's decision-making process relative to the ongoing monitoring of water resources such that water quality in lakes, rivers and streams remain[s] safe for body contact recreation, and to assist HRM in establishing effective, watershed-based monitoring controls to assist in the prevention of the decline of water quality in these same surface water systems resulting from eutrophication, sedimentation and other inputs from runoff typically caused by development activities.

The report was accepted by HRM Council but not approved. It, therefore, provides information and guidance but does not represent HRM policy.

The Functional Plan was enabled under Policy E-18 of the 2006 RMPS. Policy E-17, above, is proposed to be retained without modification as Policy E-24 in the draft RMPS proposed under the RP+5 process. Policy E-18 is to be deleted. The draft RMPS proposes the addition of Policy E-25, which addresses the need for a water quality monitoring protocol more explicitly:

Proposed Policy E-25

HRM may consider preparing a water quality monitoring protocol to provide guidance for water quality monitoring plans accepted by HRM under clause (m) of policy E-24 and any other monitoring programs to be undertaken for HRM.

For the most part, the 22 area plans posted on HRM's Web site (<http://www.halifax.ca/planning/map.html>) address water quality issues superficially. Many of the plans prepared for the areas of the former Municipality of the County of Halifax before amalgamation have policy reinforcing the primary responsibility of the Province for water resource protection, a representative example of which is Policy EH-11 from the Municipal Planning Strategy for North Preston /Lake Major Lake Loon/Cherry Brook and East Preston:

EH-11 It shall be the intention of Council to request the Nova Scotia Departments of Natural Resources and the Environment to improve enforcement of the regulations and guidelines governing the infilling or otherwise interfering with lakes and watercourses in the Plan Area.



Reference: HRM Water Quality Monitoring Protocol –Final Report

Only the River-Lakes Secondary Planning Strategy within the MPS for Planning Districts 14 and 17 (Shubenacadie Lakes) makes clear reference to water quality monitoring and the need for water quality performance standards. Its policy, however, was prepared while the WQMFP was under development and refers only to phosphorous.

WATER QUALITY MONITORING

According to the WQMFP, water monitoring in HRM has two components (p. 1.1):

- HRM-wide monitoring program “for selected lakes and rivers to determine the state of water resources and to detect changes over time.”
- A development-oriented monitoring program, “which focuses on short-term, development-specific monitoring activities occurring over the course of construction.”

The two programs are linked so that results can be shared, and so that the development-oriented program can “inform the broader program.”

HRM staff who have overseen Stantec’s work on this project emphasized that the latter responsibility should be the focus of the Water Quality Monitoring Protocol, although the preceding responsibilities provide data that are relevant to understanding the overall state of water resources in the municipality and, therefore, the context in which development takes place. Both programs should be considered in the context of the Water Quality Monitoring Protocol insofar as the Water Quality Monitoring Functional Plan has urged the development of a consistent water quality monitoring database drawn from all sources.

Two critical questions must be addressed by the Water Quality Monitoring Protocol in relation to the objectives of developing a consistent database and establishing a contextual baseline against which to assess the results of development-related monitoring programs:

1. What water quality parameters should be collected?
2. How broad an array of watercourses must be sampled to ensure an adequate baseline against which to assess monitoring results?

Additional questions follow from this pair such as what standards to adopt for the water quality parameters selected and what flexibility to allow in the applications of those standards. There are also questions as to which lakes should be sampled to provide an adequate baseline, how much HRM should be willing to expend to support such a program, and whether other agencies or developers should share in or completely cover the necessary costs.

HRM STAFF CONSULTATION

A variety of HRM staff members are involved in water quality monitoring. Staff with Energy and Environment have a basic knowledge of the conduct of WQM programs and interpretation of the results, although they do not have the experience of consultants who regularly conduct water quality monitoring work. Planners involved in policy creation and development regulation generally have much less WQM knowledge; however, they deal with developers whose projects often have significant implications for water



Reference: HRM Water Quality Monitoring Protocol –Final Report

bodies. To understand better the experience of staff with water quality monitoring in HRM, Stantec interviewed two staff with Energy and Environment, and six involved in planning and development functions, including planners involved in policy formulation as well as development approvals.

To further explore the opinions of staff and encourage their consideration of the issues, Stantec followed up with a half-day Focus Group with the interview respondents and two other HRM staff members who were felt to have useful perspectives on water quality monitoring. Two Stantec consultants with backgrounds and training in water quality monitoring were also included to provide advice and additional technical insight.

Interviews were conducted using the interview outline attached as **Appendix A** to this document. Interview questions, which were modified at times to suit the knowledge and responsibilities of individual interview subjects, addressed the experience of respondents with water quality monitoring, their views on the efficacy of approaches now employed, and their opinions on how water quality monitoring can be more effectively implemented. The focus group was guided by the questions listed in **Appendix B**. It covered areas similar to the interviews but probed for more detail and encouraged staff to comment on and challenge each other's opinions.

While no respondent to the interview survey or any participant in the focus group questioned the value of water quality monitoring, there was general concern with the effectiveness of existing approaches. While some staff would like to see broad-based monitoring, a stronger argument was put forward that monitoring has to be focused in those areas where HRM has a clear responsibility. The core of this assertion was that monitoring has to be affordable to the Municipality and effective in application. The WQMFP, it was suggested, was not approved because of the potential costs of proposed initiatives and because programs were perceived to have limited value.

Planners involved in development approvals largely supported this view. Those directly managing development processes only see the point of monitoring water quality while development is occurring and likely to impact water bodies. Several questioned the value of monitoring even in those cases if there are no clear penalties for non-compliance.

Most staff members consulted were, in fact, only familiar with development-specific monitoring undertaken in association with Development Agreement processes and none wholeheartedly endorsed the methodologies employed in those cases or any other existing approach. In addition to limited familiarity with past and current water quality monitoring approaches, most staff indicated that they have limited knowledge of water quality monitoring processes and the interpretation of results.

Planning staff involved in development control favour implementation of a simple, objective protocol that would allow them to identify situations of non-compliance and assess appropriate penalties. An approach based on fixed standards and compliance emulates the practice of planners applying land use bylaw requirements. The Development Officer compares building plans to bylaw standards and will only issue a Development Permit if all standards are met, recognizing that the Minor Variance process is available to allow approval of plans that are not compliant in all respects where special circumstances justify flexibility.

Water quality monitoring results, however, differ significantly from the quantitative standards applied to buildings and lots. Monitoring results have the following critical features:



Reference: HRM Water Quality Monitoring Protocol –Final Report

- Multiple overlapping water quality measures must be considered
- Water quality measures vary over time
- Water quality measures that are non-compliant at one point may return to compliance at another point
- Measurements are necessarily taken after commencement of development
- Measures are influenced by multiple factors some of which may be beyond the control of the developer.

With respect to the last point, front line planning staff expressed concern with the influence of contextual factors on the responsibility of developers, a matter of clear consequence to technical experts in water quality measurement. Planners are well aware that it is very difficult to apply penalties and/or to secure voluntary compliance if responsibility is unclear.

These conditions make it imperative that the water quality monitoring and enforcement regime be flexible and structured to encourage rapid remediation with punishment as a last resort. Some focus group participants contended in any case that penalties are separate from the development or even the application of a water quality monitoring protocol. The point of water quality monitoring, they suggested, is to collect data to improve development processes and to take corrective action where water quality is diminished below target levels.

The Municipality has collected substantial data on its lakes through the completed lakes program. Additional data will continue to be added to the database created by the lakes program as noted in **Table 1**, above. Previously collected data is valuable for developing monitoring programs and assessing results. Stantec experts in water quality monitoring, however, stated during the focus group session that it is rare to have an adequate, pre-existing baseline. It would be desirable to persuade developers to collect data for at least a year before development commences but HRM staff indicated that most will be reluctant to make such an investment before they have approval to proceed. It is also difficult for HRM to require such actions without granting approval.

Focus group participants generally agreed that water quality monitoring should be area-based. They also agreed that master planned areas subject to development agreements are best suited to the development and application of water quality programs. Five such arrangements are currently in place in HRM. These programs are cost effective for the Municipality given that they are developer funded. One focus group participant offered the opinion that Council might well support broader, HRM funded water quality monitoring as recommended in the WQMFP but the reluctance of Council to approve the document suggests otherwise. Others felt that monitoring in master planned areas will address the most critical issues and create a model that could stimulate gradual expansion of monitoring.

The goals of water quality monitoring at the municipal level are restricted in any case. HRM sets development requirements to limit the impact of development on watercourses. The recent adoption of open space subdivision standards is an example as is the imposition of watercourse setbacks across the municipality. Many other features of development are however beyond municipal influence (e.g., the location of septic fields). For HRM, the clearest benefit of water quality monitoring, according to one key



Reference: HRM Water Quality Monitoring Protocol –Final Report

contact, is the accumulation of data and the related improvement of future development practices (i.e., the identification of measures that can be incorporated in future development agreements to address challenges observed through monitoring).

Staff consulted agreed that it was appropriate that developers pay for sampling programs. Developer funding of monitoring is a form of user pay. On the other hand, some citizens perceive direct relationships between developers and consultants as likely to influence the representation of results.

Staff, however, stated that they have seen no evidence of problems and that the professional interests of consultants are sufficient to dissuade them from distorting samples. Falsification of results where water quality is diminishing is reasonably detectable by skeptical individuals or groups, and would have dire long-term consequences for any professional caught in the practice. That being said, review of best practices in other jurisdictions included in the WQMFP emphasized keeping developer-consultant relationships at arm’s length. Several staff members suggested that the arrangement adopted for Bedford West for which HRM has engaged the consultant and passes invoices to the developer is more appropriate and should better allay public concerns.

WATER QUALITY MONITORING CRITERIA

Table 2 provides a short list of criteria considered primary indicators of typical effects on water quality. The consultants chose these water quality parameters based on their suitability to aid in the determination of the specific effects that residential developments have on local water quality during the construction period. This short list of key measures does not cover all the potential effects that a development may have on water quality. It should be viewed as the basis for the development of water quality monitoring plans specific to residential developments in HRM but not necessarily sufficient to cover all circumstances in all areas.

Table 2 Recommended Water Quality Monitoring Criteria		
Measure	Collection Method	Effects Leading to Changes in Measure
Temperature	<i>In-situ</i> meter	Reduction of riparian zone vegetation, increased overland drainage, decreased stream discharge, increased retention time (ponds/lakes).
pH	<i>In-situ</i> meter	Exposure of pyritic slates, increased sedimentation, stormwater discharge
Conductivity	<i>In-situ</i> meter	Increased sedimentation, stormwater discharge, increased road salt influence
Dissolved Oxygen	<i>In-situ</i> meter	Elevated nutrient levels, organic decomposition, bacteria and poor lake turnover rates
Total Phosphorous	Depth Integrated Sample	Elevated nutrient levels from overland drainage
Turbidity	Depth Integrated Sample or <i>In-situ</i> meter	Increased erosion and sedimentation
TSS (Total Suspended Solids)	Depth Integrated Sample	Increased erosion and sedimentation
<i>E. coli</i>	Discrete Sample	Increased fecal bacteria



Reference: HRM Water Quality Monitoring Protocol –Final Report

The list of water quality criteria in the table includes measures that are monitored using either *in-situ* water quality meters or requires submission to laboratories to achieve meaningful results. Further descriptions of the sample collection procedure are included in the following section entitled “Water Quality Monitoring Procedures.” The table also includes a brief description of the general effects of development that could lead to a change in each criterion.

The list is proposed as a baseline or core set of measures. Additional water quality concerns could be identified by HRM during the planning or development approval processes leading to the decision to adopt a water quality monitoring plan or program. Monitoring itself might also lead to a determination that additional or more in depth sampling and/or testing may be required.

WATER QUALITY MONITORING PROCEDURES

To maximize effectiveness of water quality monitoring during development of a residential area, it is very important that in-field protocols and parameters be consistent in terms of timing, sampling locations, sampling procedures, and sample analysis. The same methods should be followed every time a field sample is collected, taking into account the practicality of dealing with varying situations.

LOCATIONS

Sampling locations should be identified during the initial planning stages and located in watercourses that will capture the potential effects of the residential development. The monitoring locations will vary based on the watercourse(s) that the residential development envelopes or abuts, and whether the subject water bodies are lentic (i.e., lakes, ponds, or other still water bodies) or lotic waters (i.e., watercourses such as rivers or streams characterized by moving water):

- *Lentic* -- For still water bodies, a monitoring location should be situated in the deepest point of the main basin. If the lake contains multiple basins, the basin nearest to the development should be selected. In addition to the in-lake station, monitoring stations should be located at the mouth of any tributaries to the lentic water body that have the potential to interact with the proposed development. This will reveal effects on water quality within the tributaries that are likely to produce effects in advance of the lake. Finally, a monitoring station should also be located at the outlet for the water body to establish the overall quality of water that may impact downstream sites.
- *Lotic* – For moving bodies of water, a monitoring station should be situated in the center of the watercourse channel, with other stations located in adjacent tributaries considered likely to interact with the proposed development.

TIMING

Monitoring should take place monthly with a period of reduced effort during the winter months. During the winter period from January to March, when the majority of lakes in HRM are frozen completely, only one sample collection may need to be scheduled.



Reference: HRM Water Quality Monitoring Protocol –Final Report

TECHNIQUES

Stantec recommends the Environment Canada publication *Inspector's Field Sampling Manual (2005)* and the field manuals included with the consultant's *in-situ* water quality meter as sources for techniques related to the collection of water quality samples. The Environment Canada publication covers the procedures that should be followed from the start of a water quality sampling program (e.g., site selection) through to sample collection and water quality meter use. It is detailed and well organized, making it a valuable resource for training and implementation. The field manual supplied with the *in-situ* water quality meter should be followed to ensure that water quality data is collected properly and accurately represents observed conditions.

The method of surface water sample collection varies based on the parameters of concern and could result in the collection of either a discrete or a depth integrated sample. A discrete sample is a sample collected at one location in the water column whereas a depth integrated sample involves the collection of multiple sub-samples at various depths to represent a sample of the entire water column. Depth integration of samples allows for a single sample to represent more accurately the conditions observed at the time of sample collection. After collection, samples should be submitted to a laboratory accredited by the Canadian Association of Laboratory Accreditation Inc. or the Standards Council of Canada.

PROPOSED WATER QUALITY MONITORING GUIDELINES

Given the lack of established municipal guidelines for surface water quality, the water quality parameters identified in **Table 1** should be compared to the Canadian Council of Ministers of the Environment (CCME) *Guidelines for the Protection of Freshwater Aquatic Life* (CCME FAL) and Health Canada (HC) *Recreational Water Quality Guidelines*. These guidelines provide values developed to protect freshwater aquatic life and recreational use, respectively. The CCME FAL provides guideline values for pH, dissolved oxygen, turbidity, and TSS as well as a guidance framework that establishes trigger ranges for phosphorous. The ranges described in the CCME FAL Phosphorous Guidance Framework correspond to varying levels of nutrient accumulation in freshwater environments. Within previous development agreements in HRM, the CCME FAL Phosphorous Guidance Framework has been employed to set upper limits for the desired concentration of phosphorous in water bodies.

The Recreational Water Quality Guidelines were predominantly chosen to provide an upper guideline value for *E. coli*; as *E. coli* generally has a greater effect on human health than environmental health. Additionally, the CCME Water Quality Index (WQI) could be integrated to provide an indication of water quality status over time and between stations. The index compares the data from the water quality monitoring plan to relevant guidelines resulting in a number between 1 and 100. The higher index values indicate a lower number and magnitude of guideline exceedances and, subsequently, better water quality. Statistical power is limited when only one sample is collected per station. This limits the reliability of comparisons between sampling locations and between samples taken at different times.

WATER QUALITY MONITORING IMPLEMENTATION

Implementation of an effective and consistent water quality monitoring protocol will require the adoption of policy in the RMPS and in relevant area plans. The protocol itself should cover the core parameters to be



Reference: HRM Water Quality Monitoring Protocol –Final Report

sampled, the method of engaging qualified professionals, and the required sampling practices as outlined above.

Given that the protocol is by definition a standardization of procedure, effort should be made to define its requirements in detail and maintain consistency in application. The following should therefore be critical considerations in its development and application:

- *RMPS Policy* – On adoption of the Water Quality Monitoring Protocol by HRM, proposed RMPS Policy E-25, presented above, should be replaced by a policy recognizing that a water quality monitoring program has been created and should be applied whenever water quality monitoring programs are to be undertaken pursuant to clause (m) of proposed Policy E-24. A draft policy is provided in (**Appendix C**). Dependent on the timeline achieved for approving the new RMPS, this policy may replace the currently proposed version of Policy E-25 as a component of the revised RMPS or may be put forward after adoption of the revised RMPS by Council as a special amendment to implement the objective of currently proposed Policy E-25.
- *Secondary Planning Strategy Policy* – Boilerplate policy should be developed (see example in **Appendix C**) for inclusion in Secondary Planning Strategy (SPS) documents in which water quality monitoring is to be incorporated. This approach has been used previously to implement consistent standards across HRM such as for bicycle storage. Sufficient flexibility should however be provided to tailor the protocol to address priorities in each SPS area.
- *Engagement Process* – The foregoing policies establish the requirement to engage qualified professionals to undertake water quality monitoring at the expense of the developer. Given that monitoring is to be standardized, an RFP template for engaging appropriate consultants should be developed. In all cases, HRM should retain final approval over the consultant selection with clear criteria based on the water quality monitoring protocol geared to ensure monitoring is thorough.
- *WQM Oversight* – Maintaining an arm's length relationship between the developer and consultant requires that HRM staff receive and process invoices from the selected consultant to ensure they are paid by the developer. Input from staff indicates that their oversight of monitoring is minimal. Staff are not qualified to directly supervise sampling processes. Adoption of a protocol with clear specifications will ease this requirement in any case.
- *Reporting of Results* – Water quality monitoring results in HRM have historically been reported to the appropriate lakes advisory body. HRM has recently dissolved its three lakes advisory boards (i.e., Halifax, Bedford, and Dartmouth) in favour of a single Regional Watersheds Advisory Board. Like its predecessors, the new board is comprised of recognized experts in water resources management. The past reporting relationship should continue with the new body with an emphasis on adherence to the water quality monitoring protocol. The Board should review the results of water



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Reference: HRM Water Quality Monitoring Protocol –Final Report

quality monitoring programs and recommend changes to current monitoring or the conduct of additional monitoring should results suggest issues of concern.

A proposed Water Quality Monitoring Protocol is provided in **Appendix D**.

Stantec appreciates the opportunity to work with HRM on this assignment with HRM. Should any questions arise with respect to any aspect of the report, please do not hesitate to contact the undersigned.

Regards,

Stantec Consulting Limited

A handwritten signature in black ink that reads "John Heseltine".

John Heseltine, LPP MCIP
Senior Planner
Phone: 902-481-1477
Fax: 902-468-9009
John.heseltine@stantec.com

Attachments:

- Appendix A – Interview Outline
- Appendix B – Focus Group Outline
- Appendix C – Suggested Planning Policies
- Appendix D – Proposed Water Quality Monitoring Protocol

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APPENDIX A – INTERVIEW OUTLINE

HRM Water Quality Monitoring Protocol
Interview Outline

Contact name, position:

1. How are you involved with the issue of water quality monitoring?
2. HRM has more than 20 area plans but our review indicates that very few mention water quality management, even indirectly. Do you think water quality monitoring needs the support of municipal planning policy? Should community plans establish monitoring as a general principle applicable to all types of development or only to developments in locations deemed likely to impact watercourses? Should water monitoring be routinely incorporated in implementation policies?
3. The Water Quality Monitoring Functional Plan lists nearly a dozen monitoring programs that were in place in HRM in 2009. These include:
 - Lakes Water Quality Monitoring
 - Development-specific Modeling for Morris Lake, Russell Lake, and Paper Mill Lake
 - The 10-year Decadal Survey
 - Municipal Beach Monitoring
 - Harbour Solutions Monitoring
4. Are you familiar with any of these? If so, do you have a preference for any particular approach? What is the basis for your preference?
5. Many plans emphasize that the Province and the Federal Government have primary responsibility for water resource protection. What do consider are the appropriate limits to the Municipality's involvement?
6. It is anticipated that developers will pay for water quality monitoring. How should they pay (e.g., taxes, development charges, direct payment of sampling firm by the developer)? If developers pay, do you have any concerns with public perception? If so, do you have any suggestions as to how to address concerns?
7. What types/sizes of development should trigger requirements for water quality monitoring programs?
8. How important is it for monitoring programs to be consistent? Are there any situations where departure from standard procedures would be justified?
9. Are you familiar with CCME's Water Quality Monitoring Protocols Manual, which was issued in 2011 after the WQMFP? Do you have any thoughts as to its suitability for application in HRM?

APPENDIX B – FOCUS GROUP OUTLINE

HRM Water Quality Monitoring Protocol
Focus Group Outline

1. Please describe a current development-related Water Quality Monitoring program in as much detail as you can?
 - a. What objectives do you feel it is achieving?
 - b. Are there any specific shortcomings that you see in this particular process?
2. What do you perceive to be the main impacts of development that Water Quality Monitoring should track?
 - a. Are there specific samples that should be collected?
 - b. Who should assess the meaning of sampling results?
3. Should water quality data be collected before the development process begins?
 - a. Can this be implemented before formal approval of a development proposal by Council?
 - b. How much time can realistically be allocated to developing a water quality baseline before the developer/builder breaks ground?
 - c. Is any ongoing Water Quality Monitoring program needed to provide a contextual baseline?
4. Are there developments that can be excluded from water quality monitoring programs?
 - a. What criteria can be defined to screen out specific developments (e.g., size of development, type of development, proximity to receiving waters, nature of receiving waters)
 - b. Are there developments that fall outside existing approval processes that should be subject to Water Quality Monitoring programs (e.g., as-of-right development, subdivision, site plan approval)
5. Who should pay for Water Quality Monitoring programs?
 - a. How significant are issues of public perception when developers pay? Can adjustments be made that would increase public confidence?
 - b. Should developers pay for ongoing/contextual Water Quality Monitoring? How would they pay?
6. How can penalties be applied in the event standards are exceeded or the developer/builder is not compliant?
 - a. Is this a Provincial responsibility?
 - b. Is there a need for arbitration over cause and effect?
 - c. Should penalties have a financial component (e.g., fines)

APPENDIX C – SUGGESTED PLANNING POLICIES

RMPS Amendment

The proposed draft policy may be added to the RMPS either pursuant to or in place of current Proposed Policy E-25 may read as follows:

Proposed Policy E-25

HRM shall apply its water quality monitoring protocol to provide guidance for water quality monitoring plans accepted by HRM under clause (m) of policy E-24 and any other monitoring programs to be undertaken for HRM.

Secondary Planning Strategy Amendments

The following draft policy text is recommended for incorporation in Secondary Planning Strategies for planning areas in which monitoring plans or monitoring programs are to be applied:

Council shall ensure that all features of HRM's water quality monitoring protocol as mandated under Policy E-25 of the RMPS are adhered to in developing and applying the water quality monitoring plan [or program] for [specify watershed area] [with the following exceptions and/or additions].

APPENDIX D – PROPOSED WATER QUALITY MONITORING PROTOCOL

Water Quality Monitoring Protocol

In developing water quality management plans and monitoring programs, HRM shall ensure that the following minimum requirements are met:

1. All water sampling and analysis shall be done by qualified professionals only.
2. A Request for Proposals (RFP) shall be issued to solicit the services of appropriate qualified professionals. The RFP shall, at a minimum, require the satisfaction of all specifications of this protocol.
3. At least three qualified professionals or firms shall be invited to submit proposals to undertake sampling and analysis and other functions deemed necessary to the effective execution of a water quality monitoring program pursuant to HRM policy and this protocol. No consultant shall be selected pursuant to said RFP who does not commit to a monitoring program that will meet or exceed the requirements of this protocol.
4. (a) Water sampling shall, at the minimum, include collection of the following water quality parameters employing the methods specified:
 - Temperature (In-situ Meter)
 - pH (In-situ Meter)
 - Conductivity (In-situ Meter)
 - Dissolved Oxygen (In-situ Meter)
 - Total Phosphorous (Depth Integrated Sample)
 - Turbidity (Depth Integrated Sample)
 - TSS (Total Suspended Solids) (Depth Integrated Sample)
 - E. coli (Discrete Sample).
- (b) Samples shall be collected monthly except during a designated winter period not to exceed three months during which only one sample shall be required.
- (c) Samples shall be collected from at least one deep location within each subject lentic watercourse and at one location at the mouth of any tributary entering or exiting said watercourse. Lotic watercourses should be sampled in the centre of flow with the number of samples to be determined on a case by case basis.
- (d) Samples shall be handled and assessed consistent with the specifications of the most recent edition of the Environment Canada publication *Inspector's Field Sampling Manual*.
- (e) If in the opinion of responsible staff, circumstances require the expansion of the parameters to be followed or modification of procedures to be followed, staff may make such modifications as are deemed necessary provided any change from this protocol is documented in the RFP to be issued pursuant to point 2.

5. Payment for water quality sampling and analysis undertaken to monitor the impact of land development and/or construction shall be paid for by the developer or other responsible individual or organization party to the development agreement establishing the need for a monitoring program.
6. HRM will receive all data collected by the selected consultant as well as associated reports, and shall provide them for review by the Regional Watersheds Advisory Board.
7. Based on its interpretation of results and reports submitted, HRM staff may direct the expansion of water quality monitoring in terms of criteria collected, timing of collection, or location(s) of sampling. In the event that staff is uncertain of the scope or specific nature of such additional effort, they may arrange further research by qualified professionals in a manner consistent with the prevailing procurement policies of the Municipality. Any additional costs associated with such expansion of water quality monitoring or study of the need for further water quality monitoring shall be borne by the party identified under point 4.
8. HRM will receive all invoices for services rendered by the selected consultant and shall arrange their payment by the party identified under point 4.