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Dartmouth Lakes Advisory Board
June 28, 2006

TO: Chair and Members, Dartmouth Lakes Advisory Board

SUBMITTED BY: Paul Dunphy, Director, Planning & Development Services

DATE: June 16, 2006

SUBJECT: **Morris Lake Phosphorus Threshold**

ORIGIN

Morris-Russell Lake Secondary Planning Strategy (SPS); Portland Hills Phase 4&5 Development Agreement

RECOMMENDATION

It is recommended that:

Dartmouth Lakes Advisory Board consider a phosphorus threshold value for Morris Lake of 15 micrograms (μg) per liter (L).

BACKGROUND

In follow-up to the staff report to DLAB of May 31st on a phosphorus threshold level for Russell Lake, the present report is provided in relation to setting a phosphorus threshold for Morris Lake. As indicated in the May 31st report, the Morris-Russell Lake area SPS requires eutrophication (TP) threshold levels to be set for these lakes. Watershed management controls and development potential are to be revisited if the threshold is exceeded, existing plan policies are to be reviewed, and an appropriate course of action determined regarding watershed management and future land use. A development agreement for the Portland Hills Phase 4&5 Development is presently under consideration by HRM, and a phosphorus threshold needs to be set for Morris Lake.

As previously outlined in the May 31st report, the steps in the CCME Framework for setting a phosphorus threshold are as follows:

- Set Ecosystem Goals and Objectives
- Define Reference Conditions
- Select Trigger Ranges
- Determine Current Phosphorus Concentration
- Compare Current or Predicted Concentration to Trigger Range
- Compare Current or Predicted Concentration to Baseline Condition
- Management Decisions

DISCUSSION

Goals and Objectives: As for Russell Lake, Morris Lake is a valued community resource, and is used for a variety of recreational activities including contact recreation. As such, it is desirable to at least maintain the lake in its current state, and prevent forcing the lake from its present trophic category into a higher category. This lake has an urbanised watershed, and so preservation of the current status is a reasonable objective. Morris Lake is currently near or within the mesotrophic category, based on limited available data (see below).

Define Reference Conditions: As for Russell Lake, one approach to defining reference conditions under the CCME Framework is by comparison to nearby lakes (Topsail, Lamont and Major) which have similar geology, and relatively undeveloped watersheds (as drinking water supply protected watersheds). Based on 1980 data for these lakes, this gives a suggested reference level of 7 micrograms (μg) per liter (L), which is in the oligotrophic category.

Thus, the CCME Reference Condition for Russell Lake would be 7 μg/L.

Select Trigger Range: The trigger range, using a strict application of the CCME framework, would be the limits of the oligotrophic category, 4-10 μg/L TP. This would give a phosphorus threshold of 10 μg/L TP. A management objective of maintaining the lake within the mesotrophic category

could allow a higher threshold of 15 μg/L TP (mid-range of the mesotrophic category) and still allow for appropriate action should the lake exceed the threshold.

Determine Current Phosphorus Concentration: The limited historical data which is available indicates that Morris Lake has been in the mesotrophic category (10-20 μg/L TP range) in the early 1990s, oligotrophic (<10 μg/L TP) in the late 1990s, and more recently (2000) at the mid-mesotrophic level (15 μg/L TP). Overall average of the historical data has been 12.5 μg/L TP. Data collected in May 2006 by HRM showed a level of 8 μg/L TP.

Compare Current or Predicted Concentration to Trigger Range and Baseline: Recent TP levels (2000 data) exceed the CCME trigger range upper limit (10 μg/L), and also exceed a level 50% above the baseline which would also be approximately 10 μg/L TP. Current levels (2006 spring data) are just below the oligotrophic-mesotrophic boundary, based on a single sample.

Management Decisions: Watershed management controls and development potential are to be revisited if the threshold is exceeded. Depending on the threshold value chosen, current values are below or near the threshold value. If the management goal is to preserve the lake within the current mesotrophic category, then ongoing efforts should seek to ensure that the TP level does not exceed 20 μg/L (the mesotrophic-eutrophic boundary).

Colour and depth can affect a lake's response to phosphorus. Recent colour readings in Morris Lake are relatively low, so this should not be a factor. Parts of Morris Lake are shallow (mean depth 3.7 M, maximum depth 13 M), but there are deep areas which may stratify in summer (historical data from 1991-1992 did not show summer stratification occurring).

Current (May 2006) Secchi depth is 3.3M, and chlorophyll level is 7.5 μg/L. These values would tend to place the lake near or into the meso-eutrophic category (Environment Canada, 2004).

Conclusion

Morris Lake prior to any development within its watershed was very likely an oligotrophic lake. During its history, it has at times been within the mesotrophic category due to various land uses within the watershed. Currently, Morris Lake seems to be near the oligotrophic-mesotrophic boundary (possibly above or below). A management goal should be to prevent Morris Lake ransitioning to the category of meso-eutrophic (>20 μg/L TP), which would reduce its aesthetic and recreational appeal. As for Russell Lake, a TP threshold in the 10-15 μg/L range would be suitable to prevent this, assuming that strict controls are applied to any activity which is likely to increase the TP level beyond this threshold.

Strict application of the CCME Framework protocol yields a phosphorus threshold of 10 μg/L TP. It is recommended, based on the management objective for the lake, that a phosphorus threshold level of 15 μg/L TP be adopted for Morris Lake. This threshold will allow for appropriate action before the lake reaches the mesotrophic/meso-eutrophic boundary of 20 μg/L TP.

Watershed management controls and development potential are to be revisited if the threshold is exceeded. Ongoing monitoring by HRM under the Portland Hills Phase 4&5 development agreement will be important to further establish current conditions and assess any changes.

BUDGET IMPLICATIONS

N/A

FINANCIAL MANAGEMENT POLICIES / BUSINESS PLAN

This report complies with the Municipality's Multi-Year Financial Strategy, the approved Operating, Capital and Reserve budgets, policies and procedures regarding withdrawals from the utilization of Capital and Operating reserves, as well as any relevant legislation.

ALTERNATIVES

None recommended.

ATTACHMENTS

A. SPS Water Quality Policy
B. Trophic Category Limits for Canadian Lakes/Rivers

A copy of this report can be obtained by contacting the Office of the Municipal Clerk at 490-4210, or Fax 490-4208.

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ATTACHMENT A -
SPS Water Quality Policy

Morris Russell Lake Secondary Planning Strategy

Monitoring

The eutrophication process is gradual and takes place over many years. Its progress will be seen in extension of vegetation in shallow areas and the seasonal occurrence of algae. In the Morris Lake Watershed Study a Phosphorus Loading Model was used to determine the relationship of the lake phosphorus inputs to trophic status.

The model determined that Morris Lake is currently mesotrophic and is within 10 to 15 percent of the eutrophic boundary. Thus, the amount of land developed within the watershed should be controlled to prevent Morris Lake from reaching a borderline eutrophic state. The actual amount of land that can be developed can only be determined by undertaking a well designed lake monitoring program and adopting a preset maximum permissible limit for total phosphorus. If the results indicate that Total Phosphorus continues to increase, the watershed management plan will have to be revised and development controls strengthened.

ML-30 A water quality monitoring program shall be undertaken for Morris and Russell Lakes to track the eutrophication process. The program is to be designed and undertaken by qualified persons financed in whole or part by developers within the secondary plan area. Specifics of the program are to be negotiated under the terms of a development agreement in consultation with the Dartmouth Lakes Advisory Board.
The monitoring program shall:

(a) specify the duration of monitoring for the pre-construction, construction and post-construction phases of the development;

(b) Specify the physical and chemical water quality indicators to be measured, the location and frequency of testing and the format of submissions to the Municipality in each phase referenced under clause (a);

(c) Establish eutrophication threshold levels for the lakes which would be used as a basis for reevaluating watershed management controls and future development potential within the area;

(d) Conform with all water quality policies, specifications, protocols and review and approval procedures approved by Regional Council.

ML-31 Pursuant to policy ML-30, in the event the critical water quality threshold for Morris or Russell Lakes are reached, it shall be the intention of Council to immediately undertake a review of existing plan policies contained herein and determine an appropriate course of action respecting watershed management and future land use development in this area. Critical water quality thresholds shall be made available to the public.

ATTACHMENT B
Trophic Category Limits for Canadian Lakes/Rivers
(CCME Canadian Environmental Quality Guidelines)

Trigger Ranges based on Environment Canada (2004 - Table 1.1)	
TP (μg/L)	Trophic state
0-4	Ultra-oligotrophic
4-10	Oligotrophic
10-20	Mesotrophic
20-35	Meso-eutrophic
35-100	Eutrophic
100+	Hypereutrophic