


Halifax Regional Council  
January 29, 2002

**TO:** Mayor Kelly and Members of Halifax Regional Council

**SUBMITTED BY:**   
Kulvinder S. Dhillon, P.Eng., Director, Public Works & Transportation

**DATE:** January 15, 2002

**SUBJECT:** Deteriorating Condition of Bissett Lake

## INFORMATION REPORT

### ORIGIN

Halifax Regional Council meeting of August 21, 2001, Item 11.4.1 from Reports, Members of Council.

### BACKGROUND

Councillor McInroy requested that staff provide a report with recommendations for the revitalization of Bissett Lake and that this matter be referred to the Dartmouth Lakes Advisory Board for comment.

Councillor Cooper also requested that the Dartmouth Lakes Advisory Board be requested to look at the capability of the watershed to handle stormwater that comes into it, as well as lower water levels to protect the residents in the area who suffer from flooding because the lake cannot handle the stormwater now being directed to it.

## DISCUSSION

### Revitalization of Bissett Lake

Bissett Lake, like other urban lakes, is subject to the effects of development, which include siltation, exposure to higher levels of nutrients / pollution, and the associated increase in aquatic plant life.

In 1995 staff presented a report on the revitalization of Bissett Lake to the Cole Harbour Community Council of the Municipality of the County of Halifax. A copy of this report summarizing possible solutions and estimated costs is attached. The technical solutions offered in this report are still applicable but the estimated costs may be higher. Also the current environmental regulations governing the implementation of these solutions may be more restrictive.

The Halifax Regional Municipality is not legislated to do this type of revitalization work with respect to lakes, nor do we have a program for revitalizing lakes. The Nova Scotia Department of Environment and Labour (NSDEL) has legislated authority over lakes and other watercourses pursuant to the Environment Act of the Province. HRM is in the process of developing the Water Resource Management Policy which will identify policies and recommendations for implementation with respect to stormwater and wastewater management and the protection of aquatic resources. Once this Policy is implemented it will define the future role of HRM with respect to these types of requests.

### Lower Water Levels, Bissett Lake

This issue was discussed in a previous Information Report to Regional Council dated June 12, 2001, entitled December 20, 2000 - Rainfall Event. In part of that report staff discussed an existing, possibly man-made rock dam located at the outlet end of Bissett Lake, the impact this dam has on water levels and described the issues related to the possible removal of this rock dam. A consultant retained by HRM recommended that the dam be removed.

The part of the June 12 report discussing Bissett Lake is attached.

In 1991, 1995 and 2001 staff informally discussed the possible removal of the rock dam with the Nova Scotia Department of Environment and Labour (NSDEL) who have jurisdiction over watercourses. NSDEL staff have stated that they do not feel the removal of the rock dam would have a significant effect on the lake level.

Staff are aware that the Dartmouth Lakes Advisory Board (DLAB) has been asked to comment on both issues discussed in this report and may be planning a site visit sometime in the future. Staff is scheduled to attend the next monthly meeting of the DLAB on January 30, 2002 to discuss these two issues in more detail. It may also be necessary to meet with NSDEL, in order to confirm an appropriate course of action regarding the rock dam. The results of these meetings will be communicated directly to Councillor McInroy and Councillor Cooper.

### BUDGET IMPLICATIONS

None at this time. If remedial work is identified through the investigation, funding sources will be identified at that time.

### 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

With respect to the water levels of Bissett Lake, two alternatives have been identified: (1) remove the rock dam and (2) construct a spillway and bypass channel. A third alternative is to do nothing.

### ATTACHMENTS

Staff Report to Cole Harbour Community Council, Re: Bissett Lake (dated October 12, 1995).  
Portion of Staff Report to Halifax Regional Council, Re: December 20, 2000 - Rainfall Event.

Additional copies of this report and information on its status can be obtained by contacting the Office of the Municipal Clerk at 490-4210, or Fax 490-4208.

Report Prepared by: Charles Lloyd, P.Eng., Environmental Engineer, Environmental and ROW Services, 490-6942

Report Approved by: \_\_\_\_\_

  
John P. Sheppard, P. Eng., Manager, Environmental and Right of Way Services, 490-6958

# STAFF REPORT

COPY

TO: CHAIRMAN & MEMBERS OF THE  
COLE HARBOUR COMMUNITY COUNCIL

FROM: ENGINEERING & WORKS DEPT.

DATE: October 12, 1995

RE: BISSETT LAKE

\_\_\_\_\_  
CHIEF ADMINISTRATIVE OFFICER

*E. Howard*

\_\_\_\_\_  
DIRECTOR OF ENG. & WORKS

## RECOMMENDATION:

FOR INFORMATION PURPOSES ONLY.

## BACKGROUND:

### 1. INTRODUCTION

Bissett Lake is located in the Cole Harbour area of Halifax County Municipality. The lake itself is approximately 2 km long by 0.5 km wide, with a surface area of 210 acres. The lake has a maximum depth of about 30 ft, although most of the lake is shallower than 15 ft. (See the attached bathymetric map of the lake.)

The watershed of Bissett Lake is approximately 2100 acres, nearly all of which has been developed. (See the attached watershed map.) The brook which drains the lake flows in a southeasterly direction a distance of 3 km before discharging into Cow Bay Lake.

One of the more common side effects of urban development is the deterioration of lake water quality. As the watershed of Bissett Lake has been developed, the lake has experienced an increase in silt levels, aquatic plant life and problems associated with additional nutrient/pollutant loadings.

Some residents of the Cole Harbour area have formed together to raise awareness of such problems at Bissett Lake, in an effort to have something done about it.

At a Cole Harbour/Westphal Community Council meeting on November 3, 1994, a motion was passed requesting that the Department of Engineering and Works liaise with the Department of Environment to identify any concerns that the residents may have in the shallow areas of Bissett Lake concerning the removal of plant growth, and investigate methods for removing the growth.

This report is a summary of our findings and the options available as solutions to the problems.

## 2. OUTLINE OF PROBLEMS

On August 11, 1995, staff met at Bissett Lake with local residents. The various problems as identified by the homeowners are as follows:

- 1) Over the last few years a noticeable increase in the aquatic plant life, in some cases so bad that "boaters had to be rescued from being stuck" and "people can no longer swim".
- 2) A decrease in the depth of the lake due to an increase in silt and sediment deposits.
- 3) Continual cleaning up of plant life that has been thrown ashore due to wind storms, etc.
- 4) Aesthetic displeasure with plants, most notably green algae clogging the lake surface.

The problem area is generally along the northwest side of the lake, comprising an area roughly 1500 ft by 150 ft.

Two persons from the Department of Natural Resources attended the August 11 meeting to assist by identifying aquatic plant life.

Ken Dodsworth and his assistant, Kim Huskins, identified the following plants:

- |                        |                |
|------------------------|----------------|
| 1) Water Horsetail     | 5) Duckweed    |
| 2) Greater Bladderwort | 6) Cattails    |
| 3) Pickerel Weed       | 7) Green Algae |
| 4) White Lily          |                |

## 3. MAINTENANCE SOLUTIONS

There are a number of options available to deal with the aquatic plant growth at the lake. Although we have not examined each and every option available, we present the following list for consideration:

### 1. Plant Cutting

As the name implies, the idea is to remove aquatic plant life by a cutting/harvest style method. There are two approaches as follows:

- (a) Mechanical Weed Harvester - This floating mechanical weed harvester is designed to cut weeds in shallow areas, up to a depth of five feet below the surface. It rakes the plants and then takes them to shore for removal.

Advantages:

- i) Fairly safe and efficient removal of plants.
- ii) Can both cut and harvest weeds up to five foot depths.
- iii) Involves little manpower
- iv) equipment can be contracted locally.

Disadvantages:

- i) Regrowth of weeds means the cutter would have to be used at least twice a year each year.
- ii) Plants will grow back over time.
- iii) Method still has to be proven in this area.
- iv) Floating harvester requires a water depth of 1.5' to 2' minimum so that weeds close to shoreline may not be able to be cut.

Costs:

We have an estimate from a local contractor who owns and operates a weed harvester. He has estimated that it may take up to 40 hours at \$100/hour for an approximate cost of \$4,000 for one cutting.

- (b) Hand Cutting - This would involve a group of people equipped with sharp cutting blades wading into the lake and harvesting the weeds.

Advantages:

- i) Minimal costs if done by volunteers.
- ii) A group of students could be hired as a make-work/summer employment clean-up effort.

Disadvantages:

- i) Weeds will grow back requiring annual maintenance.
- ii) More likelihood of injury due to people handling cutting blades and/or water mishap.
- iii) A concerted effort would be required to organize a clean-up effort.

Cost:

(See summary table)

2. Removal of Sediment

There are a few methods of removing sediment (and aquatic plants) from the lake. Two common methods are removal 'in the dry' and 'in the wet' and are as follows:

- (a) Removal in the Dry - This involves draining the lake and removing sediment with excavation equipment. Because the silt/weed problem is contained mainly to the northwest side of the lake, this method of removal would be contained to this area and would mean that the lake would not have to be completely drained. The lake could be drained through a pumping and blocking of flow operation.

This approach was used on a similar project at Little Albro Lake in Dartmouth in the mid 1980's. For several reasons, it may not be viable at Bissett Lake. Further investigation is required.

Advantages:

- i) Complete removal of sediment and weeds and probable establishment of original depth.
- ii) Reuse of sediment as nutrient rich topsoil.

Disadvantages:

- i) Stockpiling and dewatering would be difficult.
- ii) Disruption of lake use, and possible unpleasant odours.
- iii) Loss of parts of the lake ecosystem including plants, fish, etc.
- iv) possible silt problems in remaining portion of lake due to excavation/construction.
- v) High costs involved.

Costs:

We have not been able to find a contractor to price this job. We have provided a rough estimate and included it in the summary table.

- (b) Removal in the Wet - This method involves the use of a barge mounted hydraulic dredge which operates by sucking up sediment from the lake bottom. Sediment can be transported through a pipe to a determined stockpiling location. The maximum transport distance is 4,000 ft.

Advantages:

- i) Lake does not have to be drained causing less disruption in the lake ecosystem, and less odor, etc. than removal 'in the dry' method.
- ii) Complete removal of sediment/plants to acceptable levels.
- iii) Reuse dewatered sediment for nutrient rich topsoil.

Disadvantages:

- i) High capital costs.
- ii) This style of vacuum does not remove heavy or large objects such as stumps, rocks, and other debris.

Costs:

We have not done any extensive sampling to determine exactly where and to what depth sediment has built up. However, we have based our costs on an area approximately 2,000' X 150' and a depth of 3' for a total volume of 25,000 m<sup>3</sup>. Refer to table for costs.

### SUMMARY OF COSTS

Maintenance Solution Types	Unit Cost	Amount	Estimated Cost	Times Per Year	Total Cost Per Year
1. Plant Cutting					
1) Mechanical weed harvester	\$100/hr	40 hr	\$4,000	3	\$12,000
2) Hand cutting	\$20/hr	160 hr	\$3,200	3	\$10,000
2. Removal of Sediment					
1) Removal in the dry	\$10/m <sup>3</sup>	30,000 m <sup>3</sup>	\$250,000+	--	--
2) Removal in the wet		30,000 m <sup>3</sup>	\$300,000+	--	--

\* The above prices are to be used as a rough guide only. More detailed investigations are required to determine more accurate cost estimates.



### 3. OTHER

The solutions in Items 1 and 2 deal specifically with the removal of the offensive materials - sediment and plants - from the lake. This approach does not deal with the source of the problem, which is increased silt and nutrient loadings from the developed areas of the watershed. There are (at least) two ways of controlling these loadings.

1. At source - The increased loads of silt, nutrients, bacteria, hydrocarbons, litter, and many other materials result from the activities of people within the watershed. One approach is to educate and encourage people to modify their activities to reduce the impact on the lake.

This approach was tested in a pilot project at First Lake in Lower Sackville, in a joint effort by the Municipality and private enterprise. Although the results were encouraging and show promise, this approach has not been tested at a full watershed level, nor is it clear that it would result in marked improvement in lake water quality.

2. "End of Pipe" - Materials which enter the lake are generally carried there by storm runoff, the bulk of which is conveyed by storm drainage pipes.

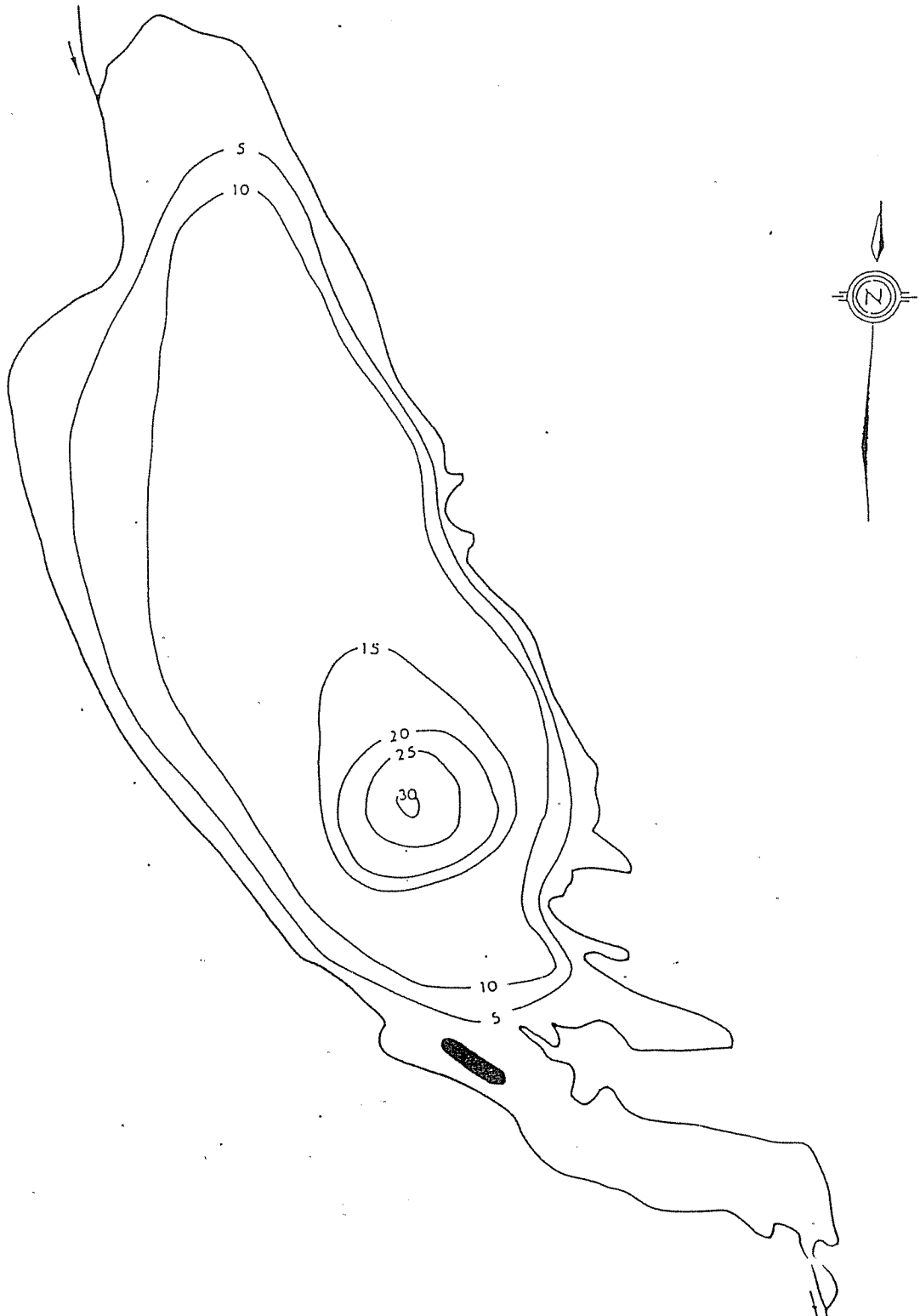
Another approach is to construct facilities to "treat" the storm runoff before it enters the lake. Examples of such facilities are:

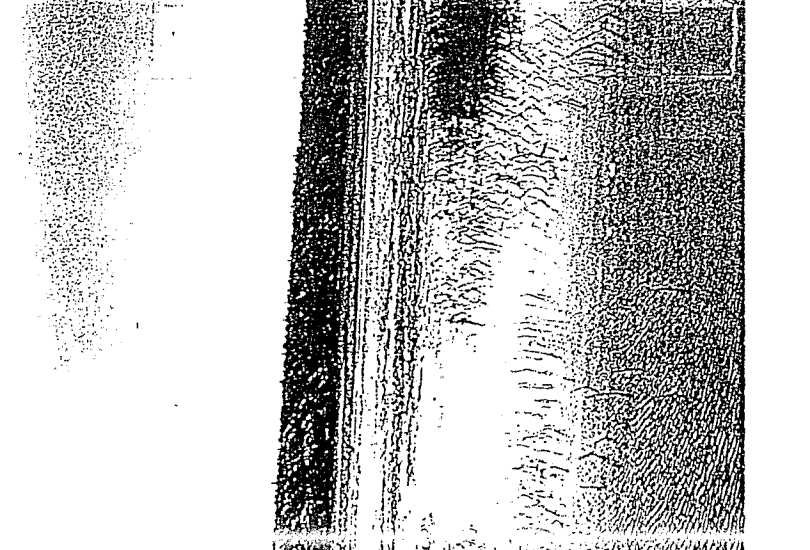
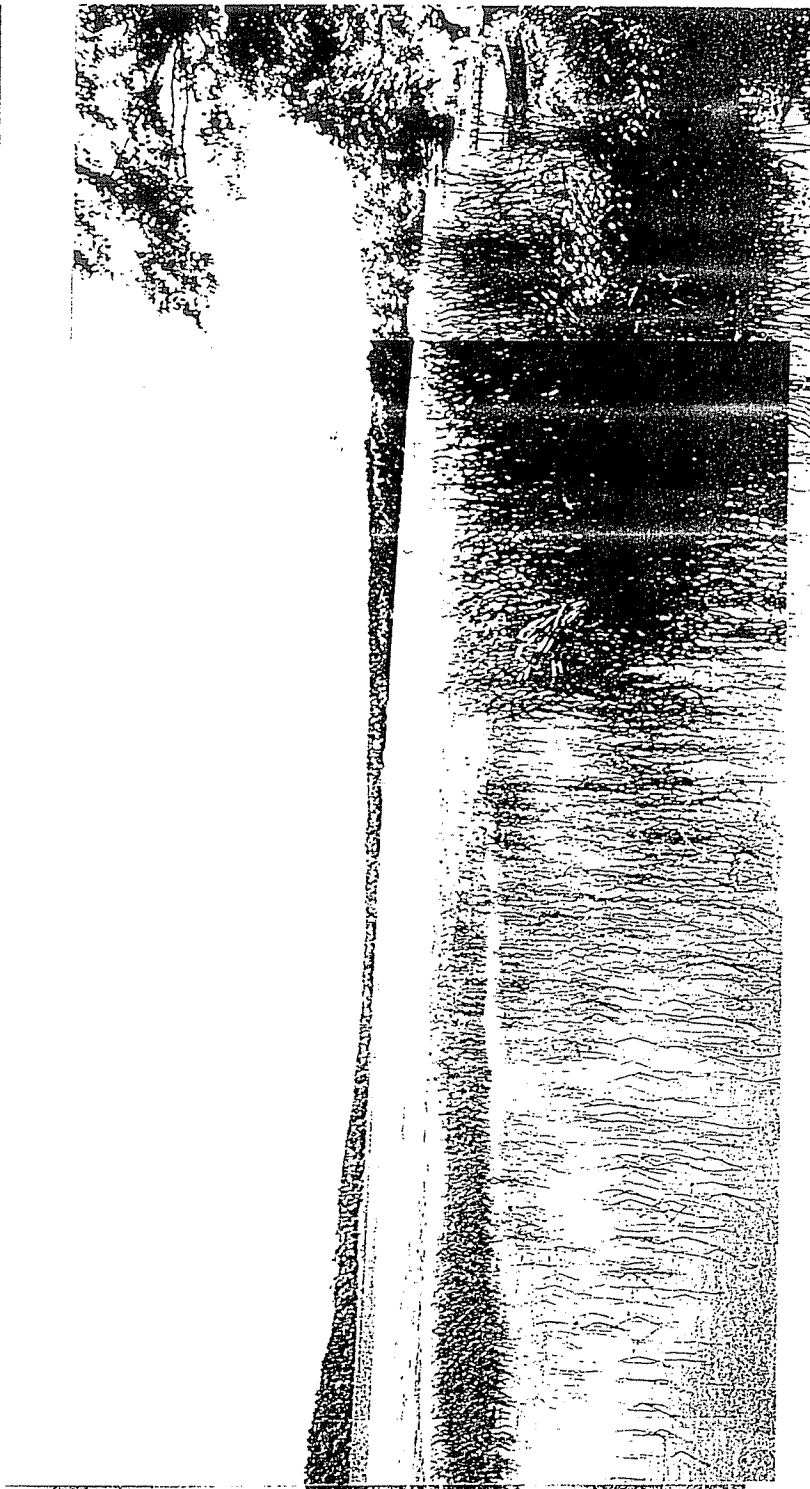
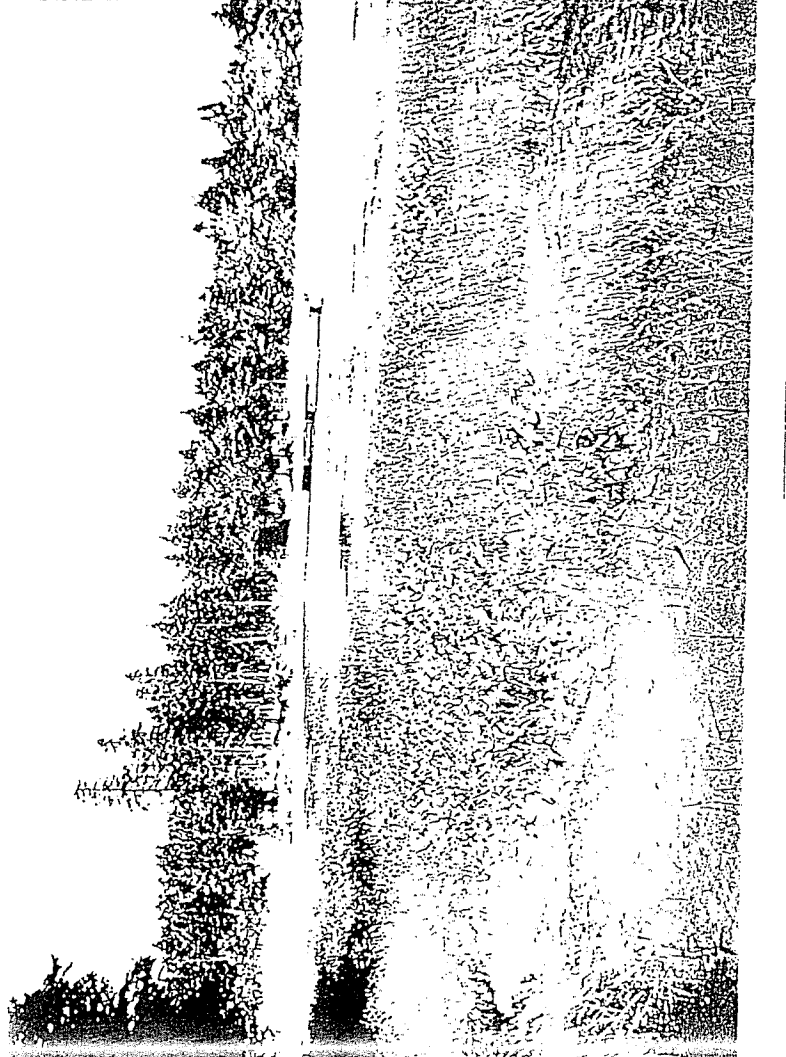
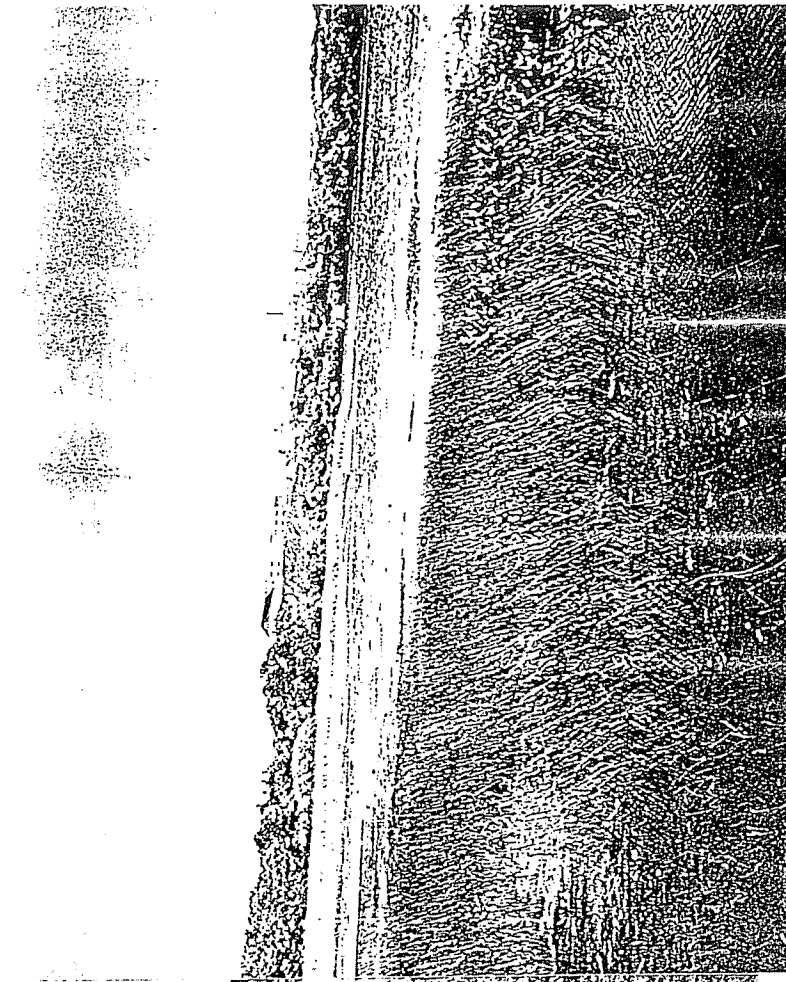
- detention ponds
- infiltration basins and trenches
- wetlands
- filter strips

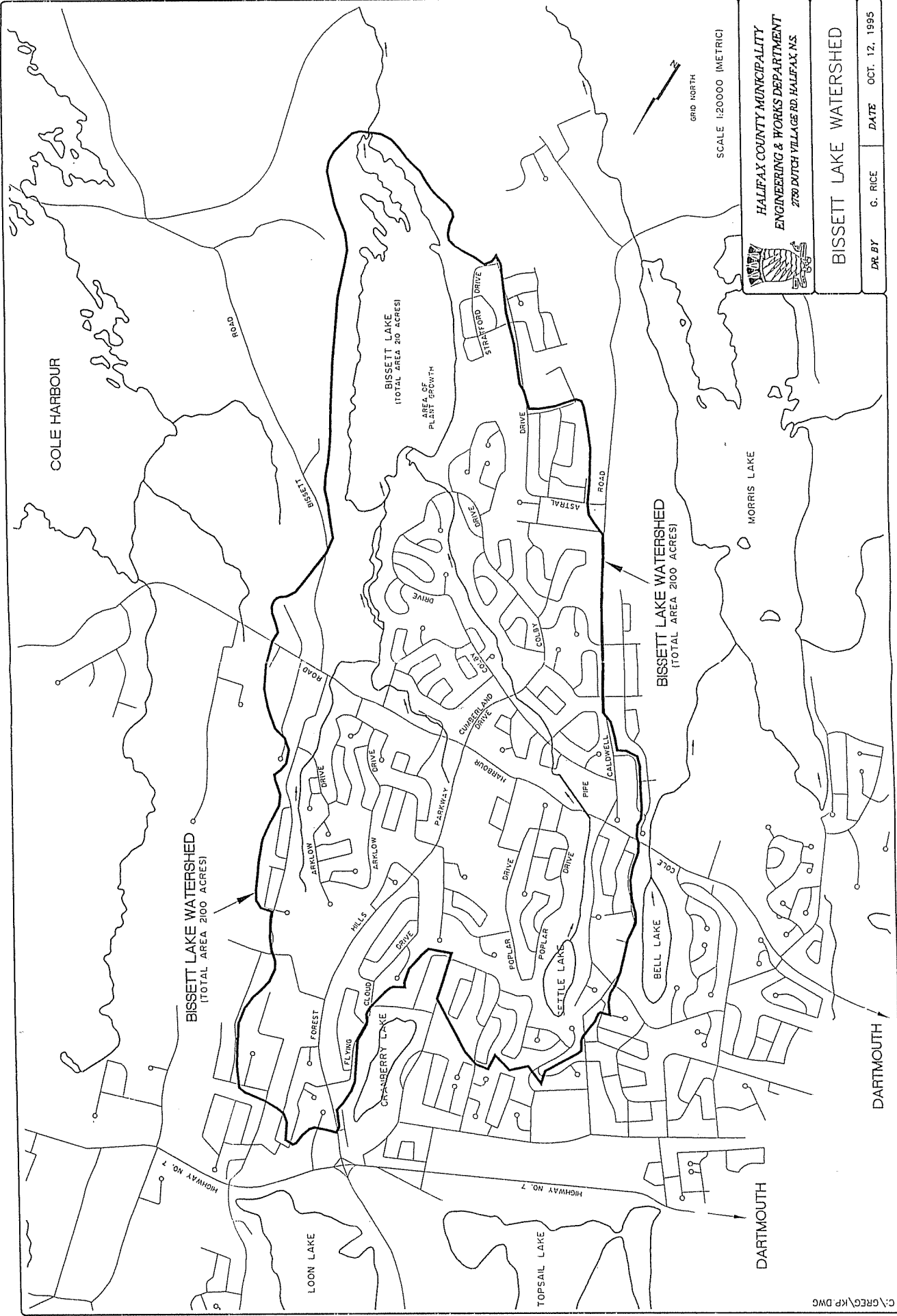

These typically require large areas of land to handle the high volumes of storm runoff involved. This land may be difficult or impossible to obtain given that the watershed is largely developed.

Costs vary widely, as does the effectiveness of the various approaches which are available. Some of these were investigated as part of the Shubenacadie Lakes Planning/Pollution Control Study, carried out for the Municipality and completed in May 1993.

Bissett Lake  
44° 39' 00" N 63° 28' 00" W  
Not to scale. Soundings in feet.





HALIFAX COUNTY MUNICIPALITY  
 ENGINEERING & WORKS DEPARTMENT  
 2789 DUTCH VILLAGE RD. HALIFAX, N.S.

BISSETT LAKE WATERSHED

DR. BY G. RICE      DATE OCT. 12, 1995

**(7) Water Level of Bissett Lake - Councillor Cooper, January 9, 2001 and May 1, 2001**

It was requested that staff look into the possibility of controlling/lowering the level of Bissett Lake as a means of reducing flooding for future storm events. During the storm event of December 20, 2000, staff observed that generally, most lake levels within HRM were high. Although the water level of Bissett Lake was not recorded on December 20, 2000, it is assumed that it was also higher than normal during that storm.

In 1998 a consultant completed a pre-design study of the Cherry Brook storm drainage system for HRM. This report indicated that at the outlet of Bissett Lake there were two existing rock dams obstructing flow. The first rock dam is approximately 0.3 meters (12 inches) high and the second, further downstream, is roughly 0.5 meters (18 inches) high. The consultant felt that these rock dams were man-made and were likely placed there to create additional retention. The origin of these rock dams could not be confirmed.

The consultant recommended that at the first rock dam all stones and boulders above the natural brook bottom be removed. This work would not result in a lower lake level during dry periods as water flows through and between the stones at low flows. Removal of this rock dam would result in a lower and more consistent lake level throughout the year and would increase the discharge rate within the natural watercourse during higher flows.

The consultant indicated that if the two rock dams were removed it might be possible to lower the lake level by approximately 0.75 meters (30 inches) during normal flow conditions. This would significantly increase channel discharge during other times. The consultant did not recommend removing both rock dams as the resulting drop in lake level may negatively impact residents living on the lake.

One alternative identified by the consultant is to allow the existing rock dams to remain and that a new spillway and bypass channel be constructed to allow the lake level to be controlled.

While this option may offer the same effect as removing the rock dam, this work will involve obtaining property and/or easements, construction of an access road, increased capital and operating costs as well as exposing the municipality to additional costs and liability associated with operating the spillway.

In February of 1998, the Halifax County Watershed Advisory Board (the Board) reviewed the consultants report and recommended against the removal of the rocks placed at the outlet. The Board felt that the removal of the rock dam would have a negative effect on the wetland areas surrounding Bissett Lake. The Board favoured the construction of the spillway and bypass channel.

HRM staff is currently reviewing the rock dam(s) and related issues with the NSDEL, as this department has regulatory jurisdiction over lakes and natural watercourses. As this process develops, staff will keep Councillor Cooper informed regarding any significant developments via a report to Harbour East Community Council.