CRAMAHE SHORELANDS PROJECT

Project completed by
LOWER TRENT CONSERVATION
for the
TOWNSHIP OF CRAMAHE

1997

LOWER TRENT CONSERVATION STUDY TEAM
Glenda Rodgers, Watershed Planner (Project Coordinator)
Jim Kelleher, General Manager
Mike Lovejoy, Watershed Monitoring Technician
Steve Whitehead, Geographic Information Systems Technician
Derrick Hammond, Municipal Planning Advisor
Anna Morgan, Resource Information Technican

CONSULTANTS
Gifford, Harris Surveying Ltd.
Metropolitan Toronto and Region Conservation Authority
Shoreplan Engineering Ltd.

REVIEWERS
Tija Luste, Waterfront Regeneration Trust
Alastair Mathers, Ministry of Natural Resources
Township of Cramahe

CRAMAHE SHORELANDS PROJECT

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- Newspaper Advertisements
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- News Coverage
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- Questionnaire Response Summary
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B. DYNAMIC BEACH IDENTIFICATION

- MNR Memorandum
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- Shoreplan Engineering Ltd. Report (October 8, 1996)

C. EROSION MONITORING STATIONS SURVEYS

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--photographs and station descriptions
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- Baseline Environmental Inventory for Hunt and Beach Wetland and Salem Creek Mouth, 1996.
- Wetland Evaluation Scoring Record:
  - Popham Bay Wetland
  - Spencer Point Wetland
  - Colborne Creek Wetland
- Environmental Sensitivity Atlas for Lake Ontario's Canadian Shoreline--Map 20
- Waterfront Natural Areas--Part I (relevant sections)
- Waterfront Natural Areas--Part II (relevant sections)
- Natural Area maps

F. SHORELINE PROTECTION OPTIONS

- Shoreplan Engineering Ltd. Report (January 24, 1997)

G. PLANNING RECOMMENDATIONS MAPPING

- Official Plan
- Comprehensive Zoning By-Law

CRAMAHE SHORELANDS PROJECT

1. INTRODUCTION

1.1 INTRODUCTION TO SHORELINE MANAGEMENT IN ONTARIO

In June, 1987, the Minister of Natural Resources delegated responsibility for developing Shoreline Management Plans for the Great Lakes shoreline to Conservation Authorities. Conservation Authorities were also designated as the agencies responsible for implementing the shoreline policies of the Ministry of Natural Resources.

More recently, the Waterfront Regeneration Trust (WRT) recognized the need for a coordinated, ecosystem approach to address shoreline issues. The WRT identified 9 waterfront principles: clean, green, accessible, useable, diverse, affordable, attractive, open, connected. Based on these principles, the Trust developed shoreline management strategies for the Lake Ontario Shoreline from Burlington Bay to the Trent River.

In response to the provincial direction and to local shoreline flooding and erosion concerns, Lower Trent Conservation has identified the need for an integrated management plan for its Lake Ontario shoreline. In step with the latest advancements in shoreline management and planning, Lower Trent Conservation believes that shoreline management should look beyond flooding and erosion related hazards. It should take an integrated ecosystem approach which considers broader issues such as fisheries habitat, public access, terrestrial habitat and the cumulative impact of individual shoreline activities.

An integrated shoreline management plan provides the necessary framework for the Conservation Authority and municipalities to initiate and evaluate site specific proposals for shoreline erosion works, protection of natural features, lake-filling, habitat protection and regeneration, private development and public recreation activities. It should also provide the background information to address the pertinent portions of the Provincial Policy Statement in municipal Official Plans.

Specific objectives for an Integrated Shoreline Management Plan include:

- Review and consolidate existing information
- Identify shoreline issues in consultation with the public
- Identify the features, functions and processes of the shoreline ecosystem
- Minimize danger to life and damage to property from flooding, erosion and associated hazards
- Assess the health of the shoreline ecosystem and identify measures to monitor its health on an ongoing basis
- Establish criteria for assessing impacts of development and public use

- Develop solutions to site specific issues within a broader shoreline context
- Identify opportunities for wise public use and enjoyment
- Identify roles and responsibilities of agencies involved in shoreline management
- Identify research and monitoring needs
- Identify priorities and options for shoreline erosion and flood protection, enhancement and regeneration.

1.2 THE CRAMAHE SHORELANDS PROJECT

Development of an integrated shoreline management plan is dependent upon funding from the lakeshore municipalities. As funding becomes available, Lower Trent Conservation intends to develop an Integrated Shoreline Management Plan for its entire lakefront. Cramahe Township expressed an interest in proceeding with the Shoreline Management Plan. In 1995, the Conservation Authority initiated work on a management plan for Cramahe's shoreline, completing the project in early 1997.

The purpose of the Cramahe Shorelands Project is:

- to summarize the current information base on the Cramahe shoreline
- identify shoreline issues
- identify areas that are at risk from shoreline hazards
- interpret the environmental policies of the Provincial Policy Statement in light of the Cramahe shoreline and make recommendations for the Cramahe planning documents that will "have regard to" the provincial policies
- identify potential options for further shoreline treatment/regeneration work

2.0 DEFINING THE CRAMAHE SHORELANDS

2.1 LOCATION

Cramahe Township is located in the southern portion of Northumberland County, approximately 12 miles east of Cobourg. The study area includes the Lake Ontario shoreline and the lands adjacent to it .

Shoreline management should consider ecological connections along the shorelands: the natural features and their functions in the nearshore area of the lake, along the water-land interface, and on the adjacent land. The landward limit of the shorelands for this project takes in the natural areas along the Cramahe shoreline and extends inland up the stream valleys. Recognizable landmarks have been chosen to define the northern study limits: Hwy 2 (in the east) and the CNR tracks west of Colton Street (on the east side of Colborne). Based on this, the Cramahe shorelands extend approximately 4 kilometres inland from the shoreline (Figure 1).

2.2 THE CRAMAHE SHORELANDS AS PART OF THE LARGER PICTURE

Cramahe Township's shorelands are part of the Lake Ontario Waterfront that has been described and studied by the Waterfront Regeneration Trust (WRT). The "Waterfront" extends 263 km along the north shore of Lake Ontario from Burlington to Trenton. Cramahe Township accounts for 12 km of the shoreline length.

The WRT has placed the shorelands into larger regional units. Since the shoreline is at the interface between land and water, each area is placed into a landscape unit and a coastal unit. Those pertinent to the Cramahe shorelands are described below (Figure 2).

2.2.1 LANDSCAPE UNIT

Each Landscape Unit has a set of distinctive environmental or land use characteristics. The factors used to subdivide the units are outlined in Lake Ontario Greenway Strategy: Next Steps, (WRT, 1995).

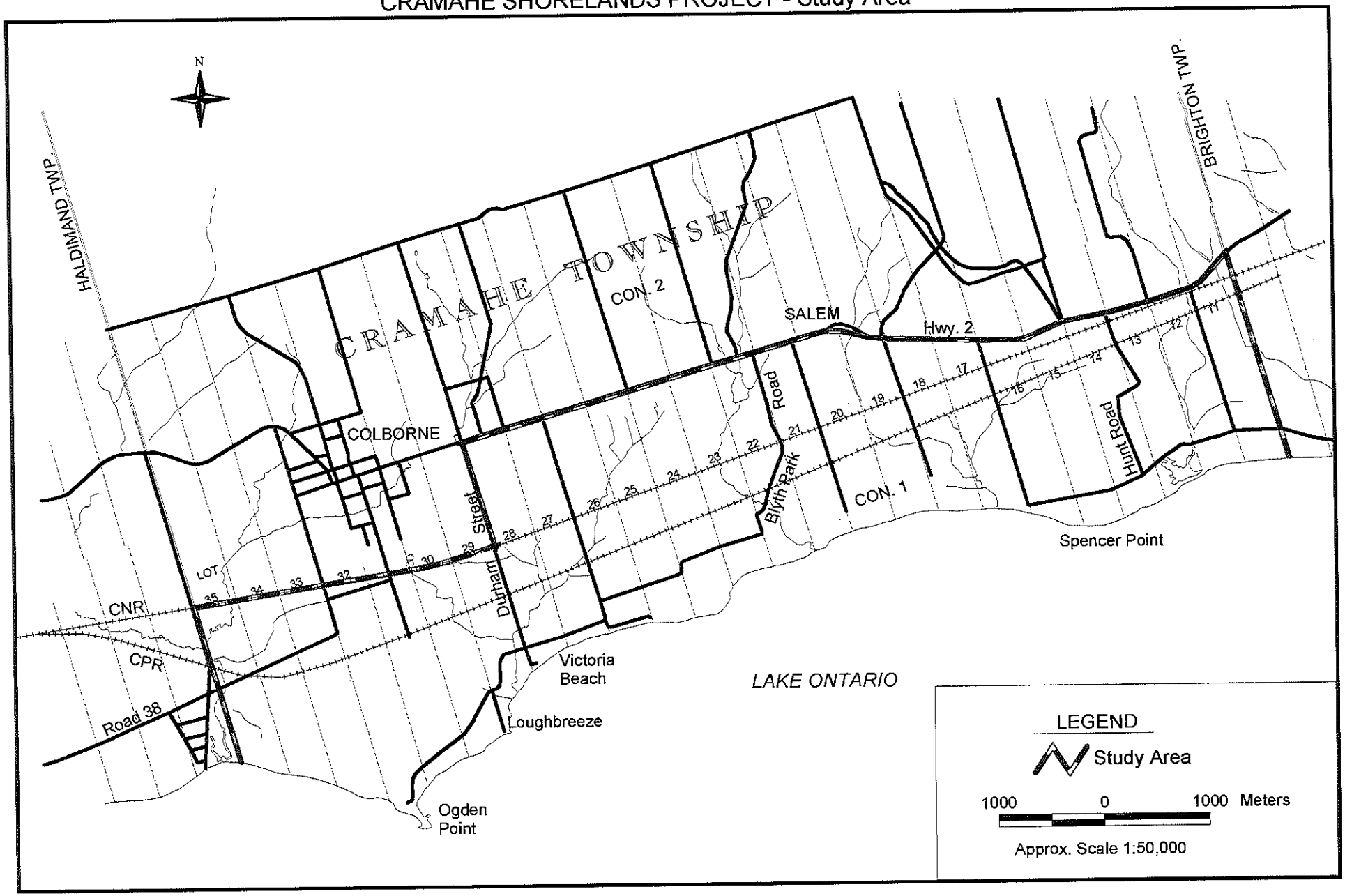
Cramahe Township shorelands are located within the Grafton-Colborne Landscape Unit that stretches from Hamilton Township to Brighton Township. The following information is summarized from the Next Steps publication (WRT, 1995).

- **Physical Characteristics**

The landscape of the Grafton-Colborne Landscape Unit is mostly flat to gently sloping sand plain, interrupted in places by drumlin and esker features, and rising to abandoned Lake Iroquois shoreline features to the north. The Cramahe shorelands are located on the bed of glacial Lake Iroquois, with the old shoreline located north of Hwy 2 in the eastern portion of the Township and sweeping to the north of Hwy 401 in the central and western part of the Township. Sandy plains are dominant in the Cramahe Township shorelands, with two

CRAMAHE SHORELANDS PROJECT - Study Area

FIGURE 1



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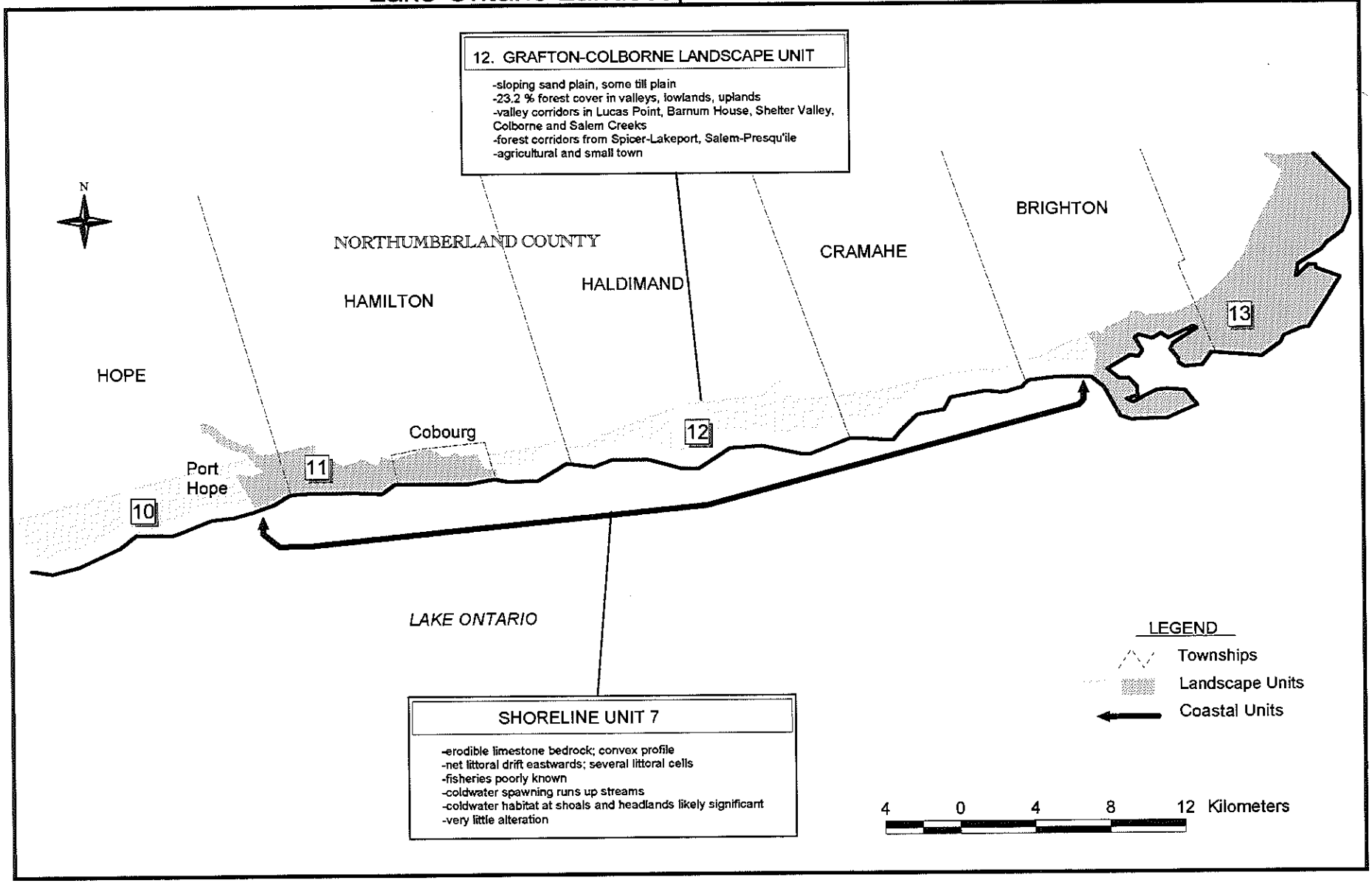
Lake Ontario Landscape and Coastal Units

FIGURE 2



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Source: Waterfront Regeneration Trust. Lake Ontario Greenway Strategy: Next Steps, 1995.

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drumlins in the eastern portion of the Township and till moraine cutting across the western corner of the study area. There also appears to be an old shorecliff/beach, just north of the shoreline, east of Loughbreeze. Figure 3 shows the physiography of the area.

The Grafton-Colborne Landscape Unit is traversed by a number of streams. While Shelter Valley Creek (Haldimand Township) cuts across the landscape unit in a deep forested valley, other smaller watercourses have less pronounced valleys near the lake, becoming deeper in the north.

The main watercourses flowing into the Lake in Cramahe Township are Colborne Creek, Loughbreeze Creek, Salem Creek and Spencer Point Creek. These streams have wetlands at their mouth.

The shoreline along this unit is primarily cobble beach, with some eroding bluffs and wetlands. There are few erosion/flood protection works along the shoreline.

- **Biological Communities**

The Grafton-Colborne Landscape Unit contains approximately 23% forest cover, mostly associated with valleylands, Lake Iroquois shoreline features, and forested wetland and lowland areas. A small amount of interior forest is present.

Shelter Valley Creek provides a major habitat corridor to the Oak Ridges Moraine. A mosaic of forested lowlands stretches from the Creek mouth west to Spicer, and another complex of forested wetlands provides a significant habitat node north of McGlennon Point. There are also several pockets of forested lowlands within the Cramahe shorelands, mostly associated with creeks and wetlands.

Most of the streams draining into Lake Ontario within this unit are cold water and in excellent condition; they provide seasonal habitat for anadramous fish (fish that swim up rivers to spawn, living in the lake the rest of the year).

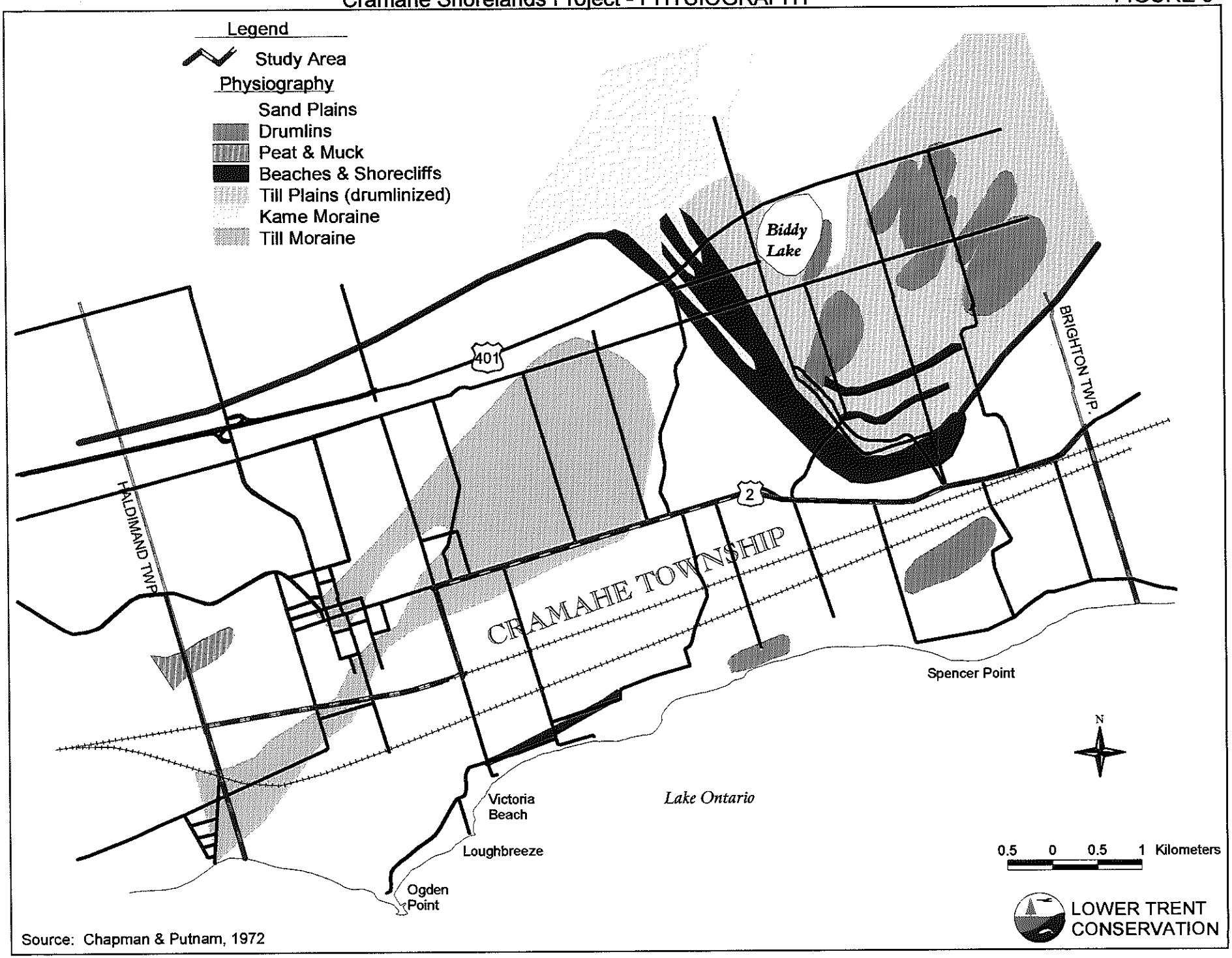
- **Cultural Landscape**

The Grafton-Colborne Landscape Unit is rich in cultural history, particularly for the period since the first United Empire Loyalists and British settlers arrived in the 18th century. While most of the villages developed along the Danforth Road (now Highway 2), associated ports were active at Grafton Harbour and Lakeport, with a cairn marking the site of Keeler's Wharf at the latter location. Grafton and Colborne have retained much of their historic character, and other buildings and cemeteries of historic interest are scattered across the rural parts of the unit.

Current land use is largely agricultural, with a considerable number of apple orchards in the eastern part of the unit. Along the shoreline, there are church camps, private recreational facilities and residential uses. In Cramahe Township, there are several clusters of residential areas along the shoreline (both seasonal and permanent). A large limestone quarry, owned

Cramahe Shorelands Project - PHYSIOGRAPHY

FIGURE 3



Source: Chapman & Putnam, 1972

by St. Lawrence Cement Company, and associated loading machinery for lake transport are highly visible at Ogden Point.

The Waterfront Trail in the Grafton-Colborne Landscape Unit is almost entirely road-based, for the most part on scenic, low-traffic rural roads with occasional views of the lake. There are a few opportunities for side trails for walking associated with more recent shoreline subdivisions in Haldimand Township, but in general public access to the shoreline is very limited. Haldimand Conservation Area and a recently-developed boat launch ramp in the Wicklow Bay area provide the best current opportunities for public use of the shoreline. There are no access points to the shoreline in Cramahe Township along the Waterfront Trail, with the exception of road allowances which provide very limited access.

2.2.2 COASTAL UNIT

- **Physical Factors**

Most of the waterfront from the Rouge River to Burlington has been subject to shoreline treatment, either through erosion/flood protection works or through lake filling. The eastern half of the shoreline (eg. Northumberland County shoreline) remains in a fairly natural condition.

The WRT has placed Cramahe Township in Shoreline Unit 7 (see Figure 2), that stretches from Port Hope to Presqu'ile. The following description is based on the Next Steps publication (WRT, 1995). The material that makes up the lakebed near the shore (the substrate) is described as erodible limestone bedrock and the shoreline profile is described as convex with a nearshore shelf. This shelf helps to protect the shoreline from erosion during moderate and low water levels, and often permits the development of extensive shallow beaches of cobble or sand along the shore. Extensive reaches of cobble beach are evident along the Cramahe shoreline.

The backshore consists of silt, sand and gravel deposits overlying the bedrock, with the interface between the bedrock and the overburden generally located near the average lake level. The erosion of the backshore leads to the development of sand and gravel beaches where there are embayments. Also, high bluffs are found in some sections of this shoreline unit. The average annual erosion rate varies from 0.1 m/yr to 0.3 m/yr. The net littoral drift is from west to east and is confined to the narrow band of loose sediment along the shore (WRT, 1996).

The primary driving force for long term shoreline change along the Lake Ontario shoreline between Burlington and Trenton is wave action cutting downwards into the lakebed, which in turn causes bluff erosion and slumping along the shore. The effects of wave action in altering shoreline features are most apparent during storms in periods of high water levels (WRT, 1995).

- **Biological Factors**

There are several streams flowing into Lake Ontario along this coastal unit. These are cold water and support cold water fish species. Wetlands along the shore also provide habitat for a variety of species.

There is little site specific information on the nearshore habitat of Lake Ontario for the reach that stretches from Port Hope to Presqu'ile. However, lake trout and lake whitefish are known to spawn in areas associated with shoals and headlands. Remaining open coast habitats are important for production of forage species such as alewife, lake herring, and smelt.

2.3 CRAMAHE SHORELINE DESCRIPTION

The Cramahe Township shoreline is fairly exposed to the open lake, with small headlands and embayments. Much of the shoreline is fronted by cobble beach; a shale beach is located west of Ogden Point and a sand beach to the east of this area. Portions of the shoreline are backed by bluffs, ranging in height from 3 to 8 metres. Wetlands are located behind some of the beaches--west of Ogden Point, at the mouths of Loughbreeze and Salem Creeks, west of Spencer Point and along Beach Road in the east end of the Township.

2.4 HUMAN DEVELOPMENT ALONG THE CRAMAHE SHORELANDS

Compared with shoreline areas to the west, the Cramahe shorelands are relatively undeveloped. Aside from three main areas of residential development parallel to the shoreline (approximately 3 kilometres), the remainder of the study area is mainly agriculture with scattered rural development. The one exception is the St. Lawrence Cement quarry operation, located at Ogden Point (to the south of Colborne).

Some of the residential areas are older cottages--some of these have been converted to year round residences while others remain seasonal. There are also some newer homes, particularly in the Victoria Beach area.

The three areas of residential development are: Loughbreeze/Victoria Beach, Spencer Point and Beach Drive.

- ***Loughbreeze/Victoria Beach Development Area***

The largest development along the shoreline is located in the Loughbreeze/Victoria Beach area. This area was once characteristically seasonal residential and is slowly being converted to year round use. Approximately 45 houses are located along this reach.

The Lake Ontario Shoreline Management Plan (Sandwell, 1990) listed this area as one of the 17 damage centres between Whitby and Trenton. Damage centres were defined as areas of high risk due to flood or erosion potential. They include shorelines subject to high erosion rates, low lying regions prone to flooding and areas where structures are located in

close proximity to the shoreline.

The damage centre includes Lots 26 - 30 of Cramahe Township. (In the Sandwell Plan (1990), it is identified as Damage Centre L2 on Map 2.21, Reach #54.)

A creek enters Lake Ontario at the west end of the site, at Loughbreeze. This area is prone to flooding during storm events. The shoreline rises to the east at Victoria Beach where low bluffs are fronted by a shingle beach. The bluffs, with heights up to 8 metres, are subject to erosion particularly during high water levels.

A number of different types of shore treatment have been used in this areas including concrete well heads , rip-rap, gabion baskets, and cement walls. Sandwell (1990) noted that many of the properties were protected by armourstone, but it appeared that in a number of cases the stone has been dumped without an underlying layer of filter fabric. During high water levels and storm activity there is a risk that bluff material will wash out from between the stones and the structure will fail.

- ***Spencer Point Development Area***

This smaller developed area, located in Lot 16, has 11 residential structures. It is fronted by a cobble beach with a low bank and is subject to potential erosion/flooding hazards.

- ***Beach Drive Development Area***

Six homes have been built along Beach Drive in Lot 11, at the eastern end of the Township. This area is fronted by a cobble beach. Flooding is a potential concern in this area

- ***St. Lawrence Cement***

St. Lawrence Cement is a major property owner in the west end of the Township. The quarry operation is located inland from the shoreline.

- ***Agriculture***

The remainder of the Cramahe Township shoreline that is not developed or in a natural state (wetland) is used for agriculture. Some of the agricultural lands are fronted by bluffs, beaches and wetland.

3. STUDY METHODS

Existing information was reviewed and new data collected in order to complete this project. An outline of the methodologies is provided below.

3.1 REVIEW OF EXISTING INFORMATION

Information about the shoreline was available from a variety of reports. This information was reviewed and consolidated. A list of reports, data sources and information bulletins is provided in the "References and Suggested Reading" section of this report.

3.2 PUBLIC INVOLVEMENT

A commitment was made as part of this project, to keep the landowners informed of the project. A summary of the public awareness component of the project is provided in Appendix A.

Over the course of the study period, 4 newsletters were distributed to shoreline property owners (October, 1995, December, 1995, March, 1996, September, 1996). Letters were also sent to landowners requesting permission to access properties prior to the 1996 field season.

A questionnaire was sent to all landowners in October, 1995 with property adjacent to Lake Ontario and was made available to the public at the Township and Conservation Authority offices. A copy of the questionnaire and responses are included in Appendix A. The purpose of the questionnaire was to identify shoreline issues and concerns of shoreline property owners.

Two public meetings were held to solicit landowner input and keep them informed of the project. Notice of the meetings was provided through direct mail-out to shoreline residents and by placing ads in a local paper. The first meeting was held on November 7, 1995 at Salem United Church. Approximately 40 individuals attended the meeting. Presentations on the shoreline were made by Lower Trent Conservation staff and individuals attending were given the opportunity to ask questions and identify issues. A second public meeting was held on February 27, 1997 to present the findings of the study and the draft recommendations.

3.3 DYNAMIC BEACH FIELD SURVEY

Field inspections of the dynamic beaches previously identified by the Ministry of Natural Resources through aerial reconnaissance were conducted on April 10, 1996 and June 1, 1996 by the coastal engineering firm, Shoreplan Engineering Ltd. Based on these inspections the locations and extent of the dynamic beaches were verified and where appropriate, either removed from the classification or altered in actual beach length. The results of this analysis is presented in Appendix B--Dynamic Beach Identification.

3.4 Erosion Monitoring Stations

Three erosion monitoring stations, set up in the 1970s, were relocated and surveyed using a Total Station. Three new stations were also set up along the Cramahe shoreline in the developed areas (see Figure 4). This work was completed during September, 1996. The survey lines were to extend inland at least 30 metres from the top of bank (although two of the original stations are somewhat shorter) and out into the water to an elevation of approximately 72.0 metres.

The surveying was completed by an Ontario Land Surveyor (Gifford and Harris Surveying Ltd.) and Lower Trent Conservation staff. The surveys are tied into permanent landmarks so that they can be re-located for future monitoring. The details of the survey and the data are provided in Appendix C--Erosion Monitoring Stations Surveys.

The data will be useful in verifying the rates of erosion along the shoreline.

3.5 Wave Run-Up Surveys

Nine wave run-up surveys were completed in the developed areas along the shoreline that are susceptible to flooding (see Figure 5) to supplement contour information on the Flood Damage Reduction Mapping. This was completed in September, 1996 by an Ontario Lands Surveyor (Gifford and Harris Surveying Ltd.) and Lower Trent Conservation staff using a Total Station. The details of the survey and the data are shown in Appendix D--Flood Susceptible Areas Surveys.

Cross-sections extend from the water (depths ranging from 0.6 to 1.5 metres) to a landward elevation of approximately 77 metres.

3.6 House Elevation Surveys

The lowest opening of all houses located below the 77 metre elevation were surveyed by Lower Trent Conservation staff using an engineers level in November, 1996. This information will increase landowner awareness of the degree or risk during periods of high water and flooding. Maps and photographs are presented in Appendix D--Flood Susceptible Areas Surveys.

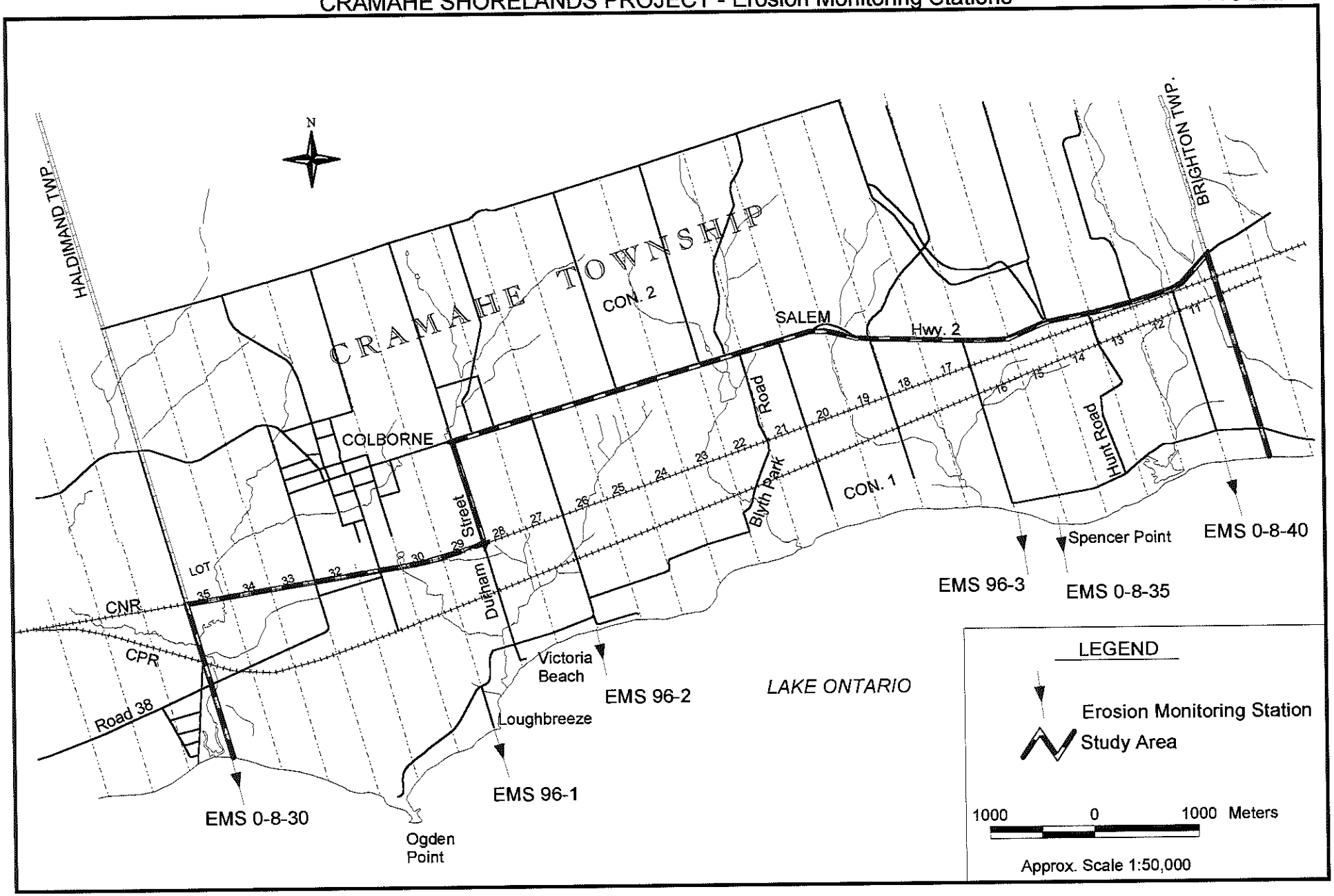
3.7 Aquatic Sampling

Aquatic surveys were completed in the mouth of Salem Creek and in two wetlands along the shore in October, 1996 by the Metropolitan Toronto and Region Conservation Authority. The results of this survey is presented in Appendix E--Natural Areas Inventories (Terrestrial and Aquatic).

The information will be useful in filling the gaps on aquatic information along the Cramahe shoreline.

CRAMAHE SHORELANDS PROJECT - Erosion Monitoring Stations

FIGURE 4



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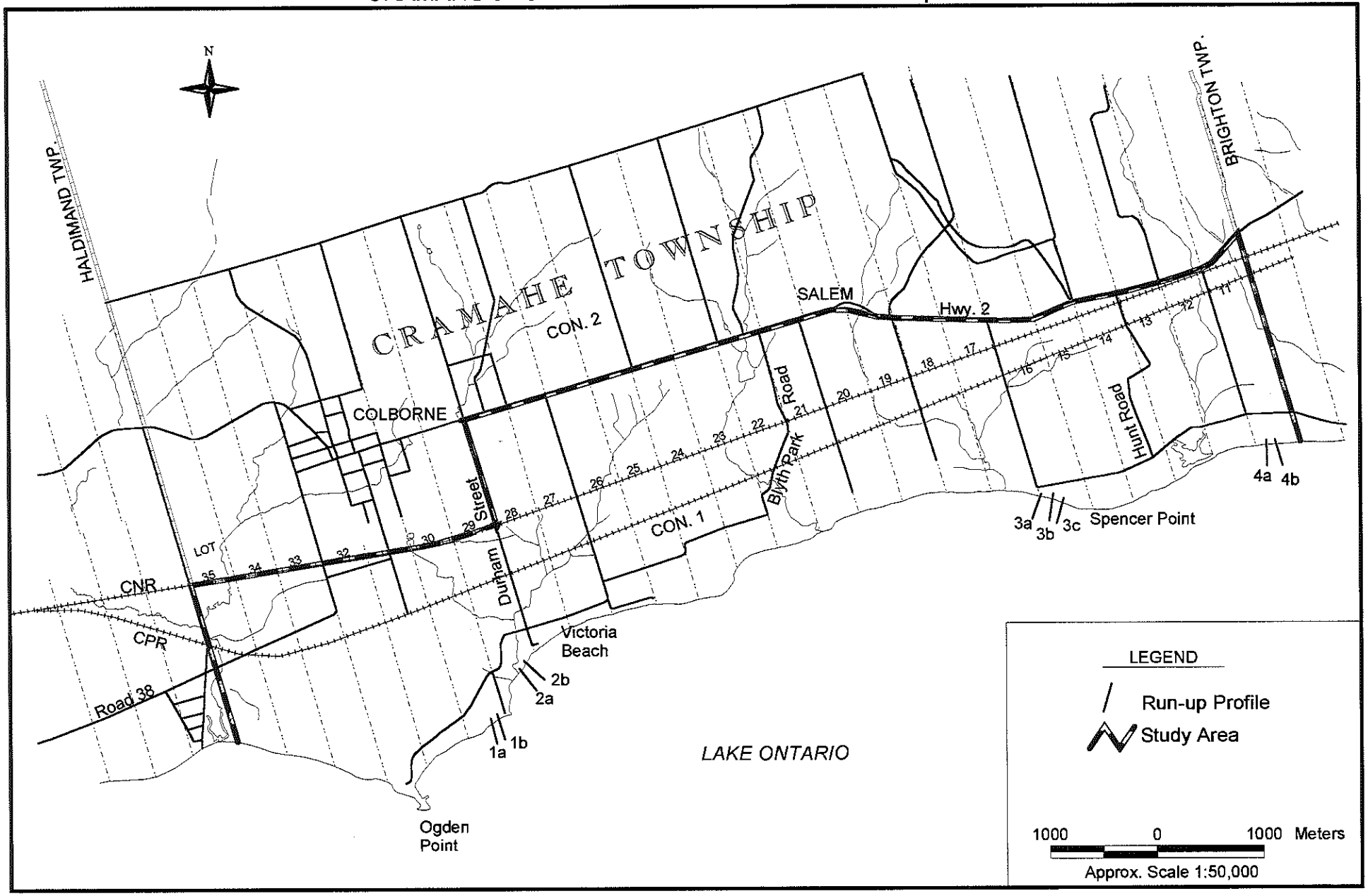
CRAMAHE SHORELANDS PROJECT - Wave Run-Up Profiles

FIGURE 5



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4. ISSUES

Cramahe shoreline residents were given the opportunity to identify concerns and issues along the shoreline at a public meeting and by responding to a questionnaire. The results of the questionnaire are provided in Appendix A. The main issues identified by the community included:

- shoreline erosion
- land use planning implications (flooding, erosion and dynamic beach setbacks)
- lake level fluctuations and regulation
- overlap and duplication in the permitting process
- private property/public access to the shoreline
- natural area enhancement, and
- pollution.

The report has been written to provide an overview of the shoreline ecosystem and the natural processes that occur and to provide an understanding of the above noted issues and recommendations on how to address or respond to them.

5. NATURAL AREAS: WETLANDS, WOODLANDS, AND AQUATIC HABITAT

5.1 WETLANDS AND WOODLANDS

Seven key natural areas have been identified within the study area. These are Colborne Creek Wetland, Colborne Woodlot, Loughbreeze Creek, Salem Creek Woods, Salem Corners Swamp, Spencer Point Creek Wetland and Woodlot and Hunt and Beach Road Wetland. Three of these areas form Provincially Significant Wetlands--Popham Bay Wetland (part of Hunt and Beach Road Wetland), Colborne Creek Wetland, and Spencer Point Wetland (part of Spencer Point Creek Wetland and Woodlot). The location of these areas is shown on Figure 6. Information on these natural areas has been collected from a number of sources and summarized by Brownell (1993) for the Waterfront Regeneration Trust. A copy of the pertinent sections of the report are included in Appendix E. A review of the information is provided below.

5.1.1 COLBORNE CREEK WETLAND

The Colborne Creek Wetland is 18 ha in size and located at the mouth of Colborne Creek along the lakeshore. It is located within the Townships of Haldimand and Cramahe. Most of the area is owned by the St. Lawrence Cement Company.

The wetland is 33% swamp and 67% marsh. There also is a barrier beach. The area has been disturbed by cattle grazing and by the large quarry and gravel pit on the east side of the wetland.

The Double-crested Cormorant (a provincially significant species at the time of the evaluation) and a regionally significant species, the Osprey, have both been sighted in this area. The creek provides provincially significant spawning grounds for rainbow trout, coho salmon and chinook salmon and is regionally significant for brook trout.

The wetland was evaluated in 1986 and was classified as a Provincially Significant Wetland.

5.1.2 COLBORNE WOODLOT

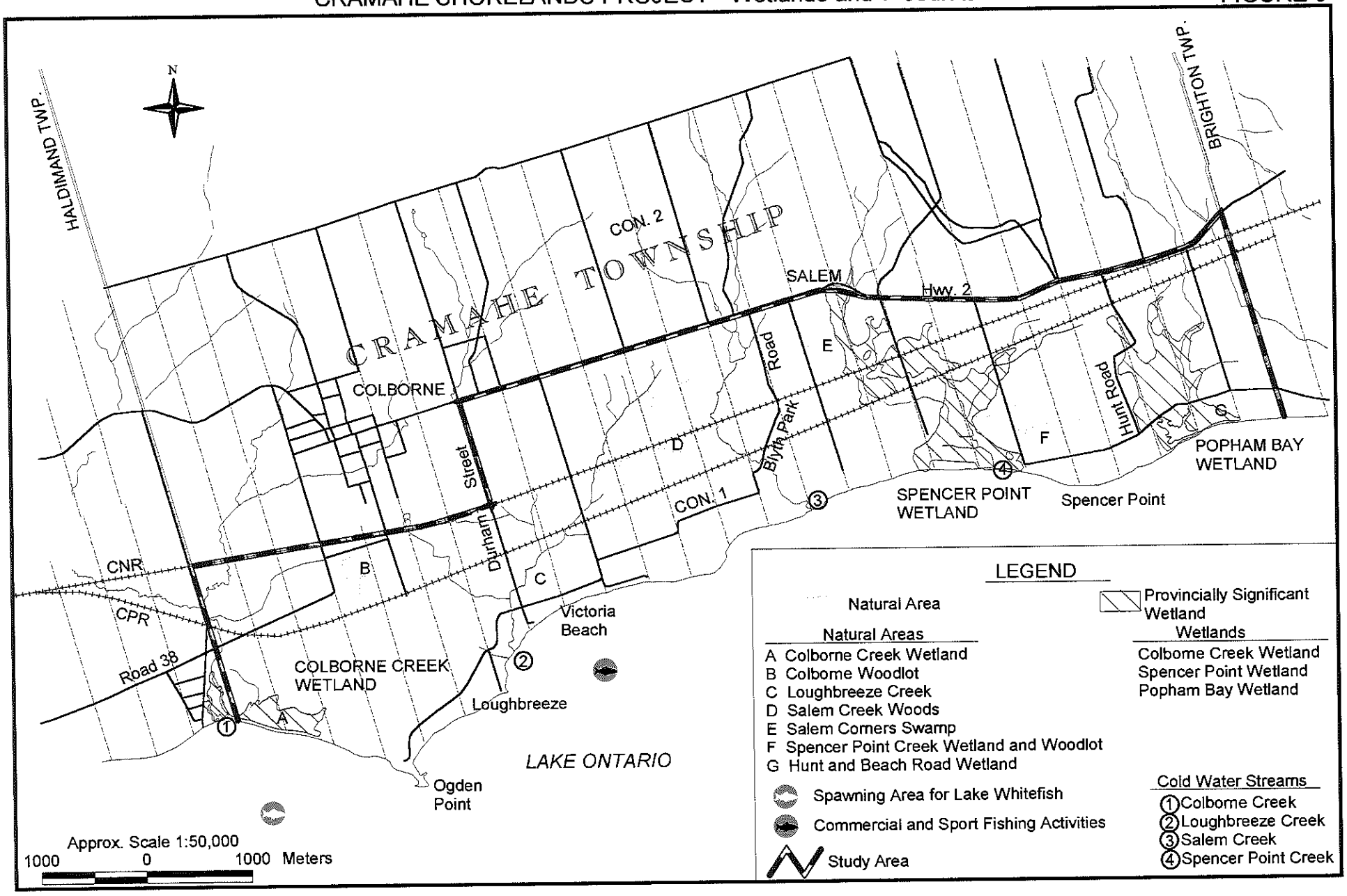
The Colborne Woodlot is 11.4 ha in size. It is privately owned and located 1.4 km inland from the lake, in Cramahe Township, just to the south of the Village of Colborne.

The woodlot lies on the edge of a till moraine. The terrain slopes to the southeast with granite boulders evident at the surface. The woodlot is comprised of a mature, mesic sugar maple-beech-hemlock forest. It is the only example of a forested till moraine landform along the Waterfront and the best known example of mature, relatively undisturbed sugar maple-beech-white ash forest in the eastern section of the waterfront.

While the woodlot is relatively undisturbed, there is a small trail at the west edge of the

CRAMAHE SHORELANDS PROJECT - Wetlands and Woodlots

FIGURE 6



LOWER TRENT CONSERVATION

Sources: Natural Areas (1:10,000): V. Brownell, Natural Areas for the Lake Ontario Shoreline, Waterfront Regeneration Trust, 1995.
Fish Spawning and Sport Fishing Activities: Environmnet Canada, Envrionmental Sensitivity Atlas for the Lake Ontario Shoreline, 1993.
Provincially Significant Wetlands (1:10,000): M.N.R.

Steve Whitehead, 1997
File: d:\cramahe\(wetland

woodlot. Adjacent land uses include residential to the north, agricultural fields on the west and east sides, and the CP railway on the south side of the woodlot.

5.1.3 Salem Creek Woods

The Salem Creek Woods consists of 158 ha of privately owned land, and is located just southwest of Salem, approximately 1.3 km inland from the Lake Ontario. It is comprised of 14 vegetation community associations including several types of forest communities, and a swamp, marsh, pond and sand barren.

Due to varying cutting practices of numerous landowners, a variety of age classes and composition exists. The Woods at the south east end are traversed with trails. Surrounding land has been cleared for agriculture and a campground is located at the northeast end. The CN railway and adjacent hydro line traverse the Woods; the CP railway borders the southern extent of the lands. A portion of the land on the northwest side has recently been rezoned from rural to estate residential to permit development of a 69-lot subdivision.

The mature hemlock-yellow birch forest on undulating terrain, found within the Salem Creek Woods, is considered rare along the Waterfront. Salem Creek itself is noted as a provincially significant spawning ground for brook trout, rainbow trout, coho salmon and chinook salmon.

5.1.4 Salem Corners Swamp

Salem Corners Swamp is 50 ha in size. It is located 1 km southeast of Salem and 1.4 km inland from Lake Ontario. The Swamp is located on privately owned lands.

The natural area includes swamp, shrub thicket and marsh, with two small creeks running through it. The adjacent lands have been cleared for agriculture; therefore the natural area is limited to wetland. Cutting has recently been done in the mixed forest on the west side. The CN railway track, that runs through the swamp, impedes natural water movement.

A regionally significant deer yard is located within the natural area. As well, a regionally significant water snake and sedge have been sighted. The stream is cold water, and there is a connecting link to the Spencer Point Creek natural area.

5.1.5 Spencer Point Creek Wetland and Woodlot (Spencer Point Wetland)

The Spencer Point Creek Wetland and Woodlot is located just west of Spencer Point along Popham Bay. It is 134 ha in size and is privately owned. Some of the land is owned by the Broken Front Ratepayers Association.

The natural area is traversed by Spencer Point Creek, which originates from two sources upstream. Nineteen vegetation community associations have been noted including both upland and wetland communities. Physical features include a partially forested drumlin and a stony barrier beach with one outlet to the Lake.

The area is surrounded by agricultural land, with some orchards. The CP railway borders the north side. It appears that most of the forest has been cut within the past 70 years.

The natural area contains the best representation of swamp along the eastern portion of the wetland. A provincially rare plant, Fall Witch Grass, was discovered on the drumlin sand barren. A number of regional rare vegetation species were also noted. The creek provides provincially significant spawning grounds for rainbow trout, coho salmon and chinook salmon.

The Spencer Point Wetland was evaluated in accordance with the Ontario Wetland Evaluation System Southern Manual, 3rd edition, in the summer of 1994. The evaluated wetland is 90.4 hectares in size and was determined to be Provincially Significant. It forms only part of the Spencer Point Creek Wetland and Woodlot (see Figure 6)

5.1.6 Loughbreeze Creek

A small natural area has been identified adjacent to Loughbreeze Creek. This creek is located to the east of the Village of Colborne and empties into the Lake just west of Victoria Beach. It is located on a sand plain in the Iroquois Plain physiographic region. The lands adjacent to Loughbreeze Creek have been largely cleared for agriculture. However, the creek has been noted as provincially significant spawning grounds for rainbow trout, coho and chinook salmon.

5.1.7 Hunt and Beach Road Wetland (Popham Bay Wetland)

This natural area consist of 22 ha of privately owned land and is located just east of Spencer Point along Popham Bay, Lake Ontario.

The communities include a sandy beach strand, marshes, swamp and open water. A small creek, originating north of Hwy 2, flows through the wetland. A sandy barrier beach occurs along the shoreline with one outlet to the lake.

The land surrounding the wetland has been cleared for agriculture and there are several residences. Noted disturbances include garbage deposited on the beach.

The sandy beach strand is considered rare or uncommon in Ontario and along the waterfront. The provincially significant Red Breasted Merganser, as well as the Double-crested Cormorant, have been seen feeding and roosting in the area.

The wetland, known as the Popham Bay Wetland was evaluated in accordance with the Ontario Wetland Evaluation System Southern Manual, 3rd edition, in the summer of 1994 and was determined to be Provincially Significant. The boundaries of the wetland, defined in the wetland evaluation, extend beyond the boundaries of the natural area described by Brownell, 1993. The wetland is a connecting link between the marshes at Presqu'ile Bay and Spencer Point Creek Wetland. During the 1993 evaluation three additional provincially

significant animal species were noted within the Popham Bay Wetland: Caspian Tern, Surf Scoter, White Winged Scoter. Regionally significant species: the Double Crested Cormorant, American Wigeon and Ruby Crowned Kinglet were also sighted.

5.2 AQUATIC HABITATS

The cold water streams, wetlands and the nearshore area of the lake all provide habitat for a variety of aquatic species. While there is not a lot of data to document the existing aquatic habitat, especially in the nearshore area, there is some general knowledge of the conditions and species present. The linkages between land use practices and aquatic health cannot be overlooked and need to be taken into consideration for any proposed work in the shorelands.

5.2.1 NEARSHORE HABITAT

Generally, the nearshore habitat of the area that stretches from Port Hope to Presqu'ile consists of sand, gravel and boulder deposits overlying bedrock (Shore Management Opportunities, WRT, 1996). According to the WRT (1996), the nearshore community of the Port Hope to Presqu'ile reach is expected to consist of alewife, smelt, and suckers, as well as round whitefish, lake whitefish, lake trout, and walleye. Lake trout and lake whitefish are known to spawn off this shoreline in areas associated with shoals and headlands. Although lake whitefish and round whitefish continue to spawn off this shoreline, they are likely less abundant than they were historically, and lake trout spawning remains unsuccessful.

The Environmental Sensitivity Atlas for Lake Ontario's Canadian Shoreline identifies one location (Figure 6) within the Cramahe shorelands (south of Lakeport) where Lake Whitefish are known to spawn in the fall (November to December) (Environment Canada, 1993).

Remaining open coast habitats are important for production of forage species such as alewife, lake herring, and smelt. The onshore-offshore and alongshore linkages are important to the maintenance of the cold water community in this unit (WRT, 1996).

5.2.2 TRIBUTARY HABITAT

The small streams that flow through the Cramahe shorelands into Lake Ontario are cold water streams and support migratory runs of salmon or trout species. Upstream-downstream linkages in the watersheds and overall watershed health are essential to maintain the successful production of migratory salmonid species (WRT, 1996). Brownell (1993) has listed the significance of the streams for fisheries habitat. The findings are as follows:

Colborne Creek:	Provincially significant spawning grounds for rainbow trout, coho salmon, chinook salmon
	Regionally significant for brook trout
Loughbreeze Creek:	Provincially significant spawning grounds for rainbow trout,

	coho salmon, chinook salmon
Salem Creek:	Provincially significant spawning grounds for brook trout, rainbow trout, coho salmon, chinook salmon
Spencer Point Creek:	Provincially significant spawning grounds for rainbow trout, coho salmon, chinook salmon

Salem Creek is reported to have 1.9 kilometres of stream accessible to lake run salmonids (Bowlby et al, 1994). The work completed in the fall of 1996 indicated that the mouth of Salem Creek provides good fish habitat with an abundance of onshore cover. Emergent vegetation was noted as being sparse. The two large pools near the mouth would act as potential staging areas for spawning migratory salmonids and coastal species such as bass and northern pike. Forage species are also expected to use the area to spawn and in turn are preyed upon by the resident fish population. Large rainbow trout were captured during the fall sampling, along with bluntnose minnow, brassy minnow, johnny darter, pumpkin seed and white sucker. Spawning success in the creek is dependent on the size of the outflow breach where fish have access to the creek.

Colborne Creek is reported to have 11.7 kilometres of stream accessible to lake run salmonids (Bowlby et al, 1994). In 1993 and 1994 MNR catch data, rainbow trout were captured along with brook trout, blacknose dace, longnose dace, creek chub, brook sticklback, and johnny darter. One lamprey was captured in 1993.

5.2.3 Wetland Habitat

Coastal marshes provide vital spawning and nursery habitat for both game and forage species of fish. But these marshes are a rare and threatened resource along the Great Lakes; the loss of spawning and nursery habitat is the greatest threat to the Great Lakes fisheries. Even the smallest coastal marshes provide valuable and significant ecological function. (MTRCA, 1996). Two of the wetlands along the Cramahe shoreline were surveyed as part of this project to establish baseline data and evaluate the health and function of the wetlands.

- ***Hunt and Beach Road Wetland (Popham Bay Wetland)***

The Hunt and Beach Road Wetland originates as a small creek north of Hwy 2. South of Hwy 2, the flow expands to a large open water area. Water depth is on average 3 metres, with approximately 1 metre of sediment below. The open water area is approximately 1 hectare, and is surrounded on the north, east and west by cattails and burreed. Sedges, willow and alder are also present.

The eastern edge of the open water is irregular and varied and provides habitat for minnows, carp and immature fish. This shoreline also provides ideal habitat for spawning northern pike.

The marsh is protected from Lake Ontario by a large gravel and stone/sand barrier beach with a fast flowing outlet. The outlet to the lake is a possible migration corridor for spawning pike, salmonids, basses, etc. The barrier beach shows signs of seasonal breaches , which would cause variable rates of flushing between the lake and wetland. A notable feature is the lack of emergent and submergent vegetation within the open water zone (with the exception of a small patch of lilies near the centre). The marsh may have been flushed of its vegetation during a recent large breach of the barrier beach.

Several fish species were captured in the Hunt and Beach Road Wetland: bluntnose minnow, brown bullhead, central mudminnow, common carp, pumpkinseed, white sucker, and yellow perch. Northern Pike were also observed. Most of the fish caught were young fish suggesting that the area is providing spawning and nursery habitat. Piscivorous (fish-eating) bird species were also sighted in the wetland, including the Belted Kingfisher, Great Blue Heron and Double-crested Cormorant.

- ***Spencer Point Wetland***

Spencer Point Wetland is fed by Spencer Point Creek and several seeps (Brownell, 1993). This wetland is 134 hectares in size (Brownell, 1993); the deep, open water section near the lake is approximately 0.75 hectares. The water depth is approximately 1.5 metres with 0.5 metres of sediment below.

The west and east sides of the open water support very dense cattail and burreed, with a number of diverse soft stem plants dispersed throughout. Both emergent and submergent plant species dominate the open water. Fish species use these features for foraging and shelter, throughout their life cycle.

Similar to Hunt and Beach Road Wetland, the marsh is protected by a large gravel and stone/sand barrier with one continuous outflow breach. This feature is possibly a travel corridor for spawning fish species. While the beach is steeper than the Hunt and Beach Road Wetland barrier, it also shows signs of seasonal breaches.

This wetland is undoubtably a significant and rich habitat. Ten fish species were captured during the sampling run, including banded killifish, brown bullhead, central mud minnow, emerald shiner, largemouth bass, mottled sculpin, pumpkinseed, threespine stickleback, white sucker and yellow perch. Both yellow perch and largemouth bass are important recreational and commercial game fish of Ontario.

Fifty percent of the catch were young of the year, suggesting that this wetland is important as a fish spawning and rearing area. The preferred spawning habitat for largemouth bass is warm, shallow, quiet bodies of water with a soft mud bottom and an abundant amount of emergent vegetation. Spencer Point Wetland meets all these criteria and it is safe to assume that largemouth bass spawn in this area.

The Hunt and Beach and Spencer Point wetlands are valuable fisheries resources due in part to their existing natural state. They are excellent examples of healthy ecosystems. In time, when resource managers are trying to rehabilitate or reconstruct coastal marshes along Lake Ontario and elsewhere, these marshes will serve as a valuable reference of both the function and features of coastal marshes.

5.3 CRAMAHE SHORELANDS NATURAL HERITAGE SYSTEM

The kind of landscape that supports diverse communities of plants and animals goes beyond self-contained remnant natural areas. Links between natural areas (eg. stream corridors and wooded fencerows) let plants migrate and animals move to breed, find water and food. This results in more diverse, healthy wildlife populations.

While the individual natural features of the Cramahe shorelands are valuable natural habitat areas, together they form a larger, connected ecosystem. The stream corridors connect some of the natural areas, and where possible vegetation buffers along the streams should be enhanced. East-west connections are less prominent, but can be established along fence lines through tree planting or reduced cutting.

Lake Ontario fisheries is a good example of how "everything is connected to everything else." Fish habitat in Lake Ontario is dependent not only on the lake environment, but on the quality and quantity of spawning grounds in wetlands and streams, which is in turn impacted by the amount of forest cover and the types of land use practices on adjacent lands.

Aside from the environmental benefits of a connected natural heritage system, there are also social and economic benefits. An attractive natural landscape provides a nice place to live and a sense of community pride; property values can actually be enhanced by proximity to natural features. Natural areas present opportunities for recreation such as nature viewing, fishing, and trails. And traditional resource-based activities such as trapping, forestry and fishing can be supported in a healthy, well-balanced system.

Following completion of the natural areas inventory by Brownell (1993), Lower Trent Conservation, in partnership with the Waterfront Regeneration Trust, initiated landowner contact in the waterfront natural areas (including those in Cramahe Township) to promote good stewardship of the land. By providing natural areas information to landowners , it is hoped that the watershed community will recognize the value of the individual wetlands and woodlands along the shorelands and the links between them.

5.4 RECOMMENDATIONS

1. The natural areas within the Cramahe Shorelands described by Brownell (1993) (Colborne Creek Wetland, Salem Creek Woods, Salem Corners Swamp , Hunt and

Beach Road Wetland, Spencer Point Creek Wetland and Woodlot Loughbreeze Creek and Colborne Woodlot) should be recognized for their significance and be protected through planning documents.

2. The mature red maple-hemlock and hemlock-yellow birch forests within the Salem Creek Woods should be recognized for their rarity along the north shore of Lake Ontario and appropriately managed and protected.

3. Follow-up landowner support is recommended for all natural areas within the Cramahe Shorelands. Landowners should be advised of what is special about their natural area and what they can do to protect and manage it.

4. Maintain and enhance vegetation corridors along streams and fencerows (especially in an east-west direction) to connect the natural areas within the Cramahe shorelands.

5. In developed portions of the shorelands, allow the shoreline to naturalize through reduced grass cutting and/or selective planting. This will help slow erosion, improve aesthetics and create wildlife habitat.

6. Choose native species for planting.

7. Ensure that shoreline erosion/flood protection works and in-water structures do not adversely affect aquatic habitat or obstruct fish passage. Where possible, opportunities to enhance fish habitat should be incorporated into the design.

8. Preserve the mouths of the cold water streams and the stream corridors (through planning and stewardship) to maintain their aquatic habitat functions.

9. Establish a long-term marsh-monitoring program for all the wetlands in the Cramahe shorelands. (See the Baseline Environmental Inventory (MTRCA, 1996) in Appendix E for specific monitoring techniques.)

6. SHORELINE HAZARDS

6.1 LAKE PROCESSES

The Cramahe shoreline falls within one main littoral cell , stretching from East Point (Scarborough) in the west to Presqu'ile in the east . Littoral cells are self-contained segments of shoreline which neither receive sediments from, nor contribute sediments to, adjacent littoral cells. Littoral drift may move in both directions within the cell under different wave conditions but usually has a long term net movement in one direction at a constant rate. The predominant movement along the north shore (Scarborough to Presqu'ile) is from west to east.

There are many subcells within a main cell which are either natural or man-made. The natural features contributing to the formation of littoral sub-cells consist of bays and headlands while the manmade structures include harbour jetties and artificial filling and piers (eg. Ogden Point). The features or structures that define sub-cells act as partial barriers to the alongshore movement of littoral sediments. The Lake Ontario Shoreline Management Plan (Sandwell, 1990) places Cramahe Township's shoreline within two primary sub-cells, which are further divided into secondary sub-cells.

Activities along the shoreline within the sub-cells may have an impact on other areas within the same cell. Shoreline development and erosion/flood protection work between Cobourg and Ogden Point may impact on the western end of Cramahe's shoreline, while activities east of Ogden Point could affect beach development in Popham Bay (Presqu'ile).

Coastal processes have various impacts on the shoreline, depending upon its orientation, the make up of the shore material and the nearshore bathymetry. The impacts of coastal processes on the Cramahe shoreline in terms of flooding, erosion and dynamic beaches are described below. The hazards have been quantified so that the Township and landowners can make wise decisions regarding shoreline development, planning applications and shoreline protection activities.

6.2 EROSION

6.2.1 WHAT CAUSES SHORELINE EROSION?

The shore zone is an extremely dynamic area, especially on a lake as large as Lake Ontario. As a result of natural shore processes, the boundary between land and water may undergo a shift in position with time. The rate at which shores erode or accrete depends on the composition of the shore zone and its exposure to erosive forces.

Erosion results from two basic causes: forces of nature acting along the shoreline and the actions of man. Structures created by man can interfere with the continuing shore processes in the following ways:

- interruption of littoral drift patterns (ie. the movement of sand by wave action and currents along the shore);
- the deflection of shore current patterns;
- the removal of sediments by dredging; and,
- the modification of wave regimes through reflection from and diffraction around structures.

Natural causes of erosion include:

- wind;
- waves;
- rain striking exposed bluff faces;
- ground and surface water movements;
- ice action;
- ground motion (slumpage);
- animal activities (eg. burrowing animals)

Each of these naturally occurring erosive forces are affected by:

- characteristics of the lake bottom topography
- width and slope of beaches fronting shore bluffs
- extent, type and maintenance of slope vegetation
- duration and frequency of prevailing winds
- direction of wind fetches
- shoreline alignment

By far, the most significant natural erosive force, along our shorelines, is wind-driven wave action. Waves are formed by wind blowing over the water's surface. The surface friction results in the transfer of energy from the wind to the water that causes waves to build up. As a result, the longer the fetch (over water distance) and the stronger the wind, the higher the waves will be.

As waves approach the shoreline and break, they cause downcutting of the lake bottom at the shoreline. The downcutting action is the primary cause of shoreline recession. Since wave action rarely meets the shore at right angles, beach material is pushed in one direction or another. This normally occurs in a zig-zag or sawtooth fashion.

Changes in water level affect erosion by changing the location where waves break on the shore. During periods of low water level, waves break offshore reducing the energy dissipated directly on the shoreline. During high water levels, the reverse is true and waves can break directly on the bank causing greater erosion.

6.2.2 Why Be Concerned about Shoreline Erosion?

Landowners with an eroding shoreline are concerned about shoreline erosion because it poses a risk to their property and safety. The municipality is interested in addressing landowner concerns and in ensuring that new development is not impacted by erosion.

- ***Provincial Policy Statement***

The Provincial Policy Statement recognizes shoreline erosion as a hazard and indicates that development should be directed to areas which are not impacted by erosion hazards. Where development is permitted within the erosion hazard lands, the development must meet a series of conditions relating to safety, environmental and hazard impacts.

- ***Municipal Planning Documents***

Municipalities have a responsibility to *have regard to* the Provincial Policy Statements. Therefore, municipal planning documents (ie the Official Plan and the Comprehensive Zoning By-Law) should include policies that recognize the hazards associated with erosion and provide appropriate setbacks.

- ***Shoreline Treatment Options***

Landowners with residences that are close to the water's edge, may be considering shoreline treatment. Careful consideration needs to be given to the long term costs and benefits of the project including maintenance costs, habitat and aesthetics benefits. Working with neighbours to develop consistent shoreline treatment over a longer reach is recommended and where possible, bioengineering techniques should be incorporated. Possible alternatives (can the building be moved?) should also be considered. Knowing the erosion hazards can help landowners make informed decisions.

6.2.3 Rates of Erosion

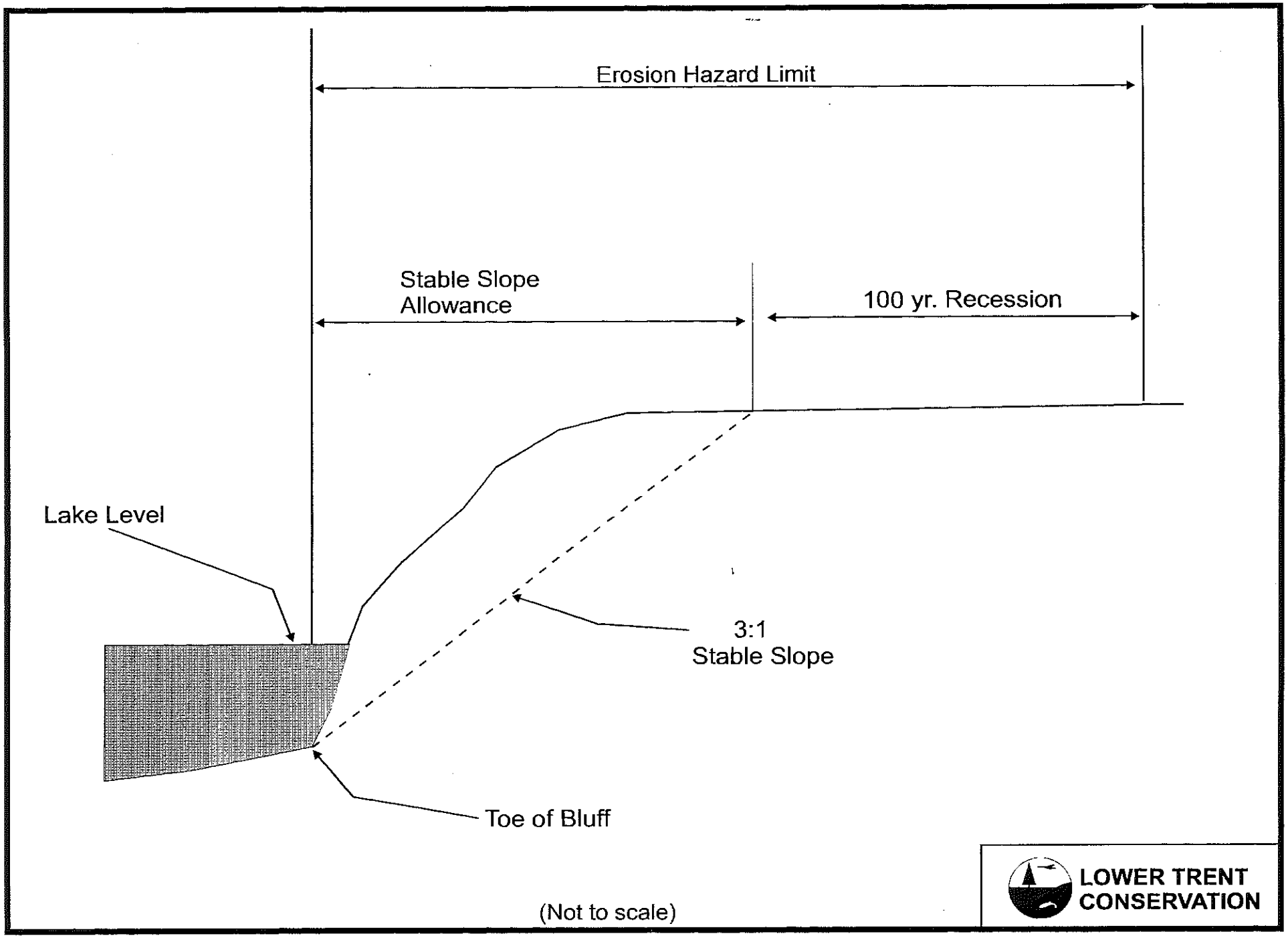
Three erosion monitoring stations were established along the Cramahe Township shoreline in the 1970's: Station 0-8-30 is located on the Cramahe/Haldimand Township boundary. Station 0-8-35 is located on the east side of Barnes Road and Station 0-8-40 is located at Union Road. Monitoring of these stations ceased in 1988. Annual shoreline recession rates were calculated using data from the Erosion Monitoring Station data (Sandwell, 1990) and presented in the 1990 Lake Ontario Shoreline Management Plan. Sandwell plotted each of the three Erosion Monitoring Stations in Cramahe Township and reviewed the profiles. The recession rate at the top of the bluff was then calculated for each profile. The recession rate calculated for most of the Cramahe shoreline was 0.2 metres/year.

Setback distances were calculated by adding the 100 year recession to the stable slope allowance (the distance required to establish a stable slope). The stable slope value of three times the bluff height was used (see Figure 7). Sandwell (1990) recommends a 45 metre erosion setback for most of the Cramahe shoreline.

The current project has allowed for a more detailed examination of portions of the shoreline, than was possible during the Sandwell study. The area of particular notation, is Victoria Beach. A small bay is currently forming, through erosion, between two headlands at this location. The Coastal Zone Atlas indicates that the shoreline in this reach eroded at a rate of 1.1 metres per year between 1953 and 1973. Based on this information, it is felt that the 45 metre setback is far from adequate in the most vulnerable portion of the Victoria Beach shoreline (Lots 27 and 28), and that a setback of 130 metres should be established (110

Determination of Erosion Hazard

FIGURE 7



metres recession plus 20 metres stable slope allowance). This setback may be reduced in accordance with site-specific engineering studies and, if required, implementation of engineered shore treatment works .

Long-term monitoring may prove that erosion rates have slowed in the Victoria Beach area and that the setback can be reduced. Until more accurate erosion data are available, the Conservation Authority recommends the use of a 45 metre setback (erosion hazard limit) for the entire Cramahe shoreline, except for the portion of Victoria Beach, where the 130 metres setback applies.

The erosion limit is demonstrated on a large scale map in Appendix G. It should be recognized that the 100 year erosion setback is not a static line, but moves back each time the shoreline erodes. Maps that show setback distances should be updated frequently and setbacks should be measured in the field from the toe of the bluff prior to development.

In order to determine more accurately the erosion rates along the Cramahe shoreline, the three erosion monitoring stations were re-established as part of this study and three new stations were set up in developed areas (Figure 4). Long term monitoring of these stations will help better define shoreline erosion hazards and setback requirements.

6.3 FLOODING

Flooding on Lake Ontario results from a combination of stillwater levels, wind setup and wave action. The flooding hazard limit is based on the 100 year flood level plus an allowance for wave uprush and other water related hazards.

The 100 year flood level is defined as the peak instantaneous stillwater level, resulting from combinations of mean monthly lake levels and wind setups, which has a 1% probability of being equalled or exceeded in any given year. The 100-year flood level for Lake Ontario at Cramahe Township is 75.7 m G.S.C.

In areas susceptible to wave action, shoreline flooding hazards include an allowance for wave uprush and other water related hazards that extends above and beyond the 100 year flood level. The wave action includes wave setup, wave run-up, wave spray and/or wave overtopping). Other water related hazards impact on the destructive nature of flood hazards, including but not limited to ice, ice piling and ice jamming.

6.3.1 WHY BE CONCERNED ABOUT SHORELINE FLOODING?

Shoreline flooding causes water related damage to shoreline properties. Some houses along the Cramahe shoreline are located within the 100 year flooding hazard limit. This is of concern to affected landowners because of potential damage to existing buildings, and to the municipality who wants to ensure that new development is not subject to flooding hazards.

- ***Provincial Policy Statement***

The Provincial Policy Statement recognizes flooding as a hazard. According to the policy, development will generally be directed to areas adjacent to the shorelines of the Great Lakes - St. Lawrence River system which are not impacted by flooding hazards. Where development is permitted within the flooding hazard lands, the development must meet a series of conditions relating to safety, environmental and hazard impacts.

- ***Municipal Planning Documents***

Knowing where the areas are that are subject to flooding is important to the municipality and shoreline landowners. Municipalities have a responsibility to *have regard to* the Provincial Policy Statements. It is therefore important that municipal planning documents (ie the Official Plan and the Comprehensive Zoning By-Law) include policies that recognize the hazards associated with flooding and identify areas of potential flooding. Through good planning, development can be restricted in areas that are subject to flooding risks.

- ***Shoreline Flood Protection***

Landowners want to make informed decisions about their properties. As part of this study, houses within developed areas that are subject to 100-year flooding hazards from the lake have been surveyed to determine the elevation of the lowest opening of the houses.

The results of this survey is presented in Appendix D--Flood Susceptible Areas Survey. The information indicates that 24 of the 28 houses surveyed were within the flooding hazard limit, but only seven of these had openings below the flood elevation (77.0 metres G.S.C.). This information will be useful to landowners in considering shoreline treatment options and future development of their properties.

6.3.2 Flooding Hazard Limits

The Provincial Policy defines the flooding hazard limit as the 100 year flood level plus an allowance for wave uprush and other water related hazards. Based on 1989 photography, Flood Damage Reduction Program mapping was completed for the Lake Ontario shoreline for the lower Trent region. This mapping was done at 1:2000 with contour intervals of 0.5 metres. (Map sheets 27 - 48 show the Cramahe shoreline). While the 100-year flood level (stillwater level plus wind set up) is shown on the maps, the plotted flood line does not include hazards associated with wave run-up. The flooding hazard limit was added to the maps as a result of this study.

The flooding hazard limit (including wave uprush) was calculated as part of the Lake Ontario Shoreline Management Plan (Sandwell, 1990). Run-up levels were calculated using the Hawkes method, using only 1 or 2 run-up profiles along the Cramahe shoreline. The flooding hazard limit was determined to range from 76.67 to 76.7 metres G.S.C. across the Cramahe shoreline. This elevation is approximately 1 metre above the 100 year water level

Nine new run-up profiles (Figure 5) were surveyed as part of the current project to provide detailed topographic information in the developed areas (Appendix D). These site-specific

surveys indicated that the beach profiles were steeper than the more general profiles used by Sandwell. A steeper profile does not provide as much resistance to waves and results in higher wave run-up values. The extent of wave run-up using the new surveys was calculated for the developed portions of the shoreline, and are shown in Table 1. Since this information is based on recent profiles in the areas of concern, it is recommended that the new elevations be used. The recommended flood elevations of 76.9 metres for Spencer Point and 76.8 metres for Popham Bay have been rounded up to 77.0 to provide consistency across the shoreline.

For the remainder of the shoreline, no new profiles were established. However, most of the natural shore slopes in the area are at a steeper grade, some as steep as 5:1. Based on the results of the surveys in the developed areas, it is likely that the Sandwell beach profiles were not steep enough (10:1), and therefore wave run-up was underestimated.

Table 2 shows a sample of run-up calculations for the expected range of shingle beach slopes using various techniques. If the Hunt formula is applied to a 7.5:1 profile (which is a more average representation of the beach profiles in the developed areas of the Cramahe shoreline) the run-up would be approximately 1.3 metres above the static 100 year water level (75.7 m). The flooding hazard limit (75.7 + 1.3) would be 77.0 metres.

The Conservation Authority recommends the use of this flood elevation 77.0 metres G.S.C. across the Township. (The flooding hazard may reach 78.0 metres in portions of the Victoria Beach area, but the water will not top the bluff in this area). A site specific analysis may indicate a lower run-up level and may be performed at the owner's expense to justify development within the flooding hazard limits.

Table 2 **WAVE RUN-UP ESTIMATES FOR SHINGLE BEACH SLOPES**

Wave Height (m)	Beach Slope 5:1		Beach Slope 7.5:1		Beach Slope 10:1		Beach Slope 20:1	
	Hunt	U.L.	Hunt	U.L.	Hunt	U.L.	Hunt	U.L.
1.5	2.07	2.58	1.38	1.72	1.03	1.29	0.52	0.65
1.3	1.92	2.4	1.28	1.6	0.96	1.2	0.48	0.6

U.L. = Upper Limit

Reduction Factor of 0.75 was applied in run-up calculations.

Source: Shoreplan Engineering Ltd, 1997.

Table 1 WAVE RUN UP ESTIMATES

Wave Height (meter)	Wave Period (seconds)	Reduction Factor	Slope (h : v)	Type	Depth @ Toe	Run Up							D.H.W.L. (m)	RunUp Elevation (m)	Recommende RunUp Elev. (m, GSC)
						Hunt	Aces	Walton	Losada	Upper Limit	Ahrens & McCartne	Losada & G. Curto			
Victoria Beach															78.0
1.30	9.00	0.90	2:1	Revetment	1.70	N.A.	3.09	3.75	2.34	3.75	2.26	2.21	75.7	78.0	
1.30	9.00	0.80	2:1	Revetment	1.70	N.A.	2.74	3.33	2.08	3.33	2.26	2.21	75.7	78.0	
1.30	9.00	0.70	2:1	Revetment	1.70	N.A.	2.40	2.92	1.82	2.92	2.26	2.21	75.7	78.0	
Loughbreeze															77.0
1.20	9.00	0.75	5:1	Cobble	1.50	1.85	1.89	2.26	1.85	2.31			75.7	77.6	
1.20	9.00	0.75	7.5:1	Cobble	1.50	1.23	1.23	1.53	1.23	1.54			75.7	76.9	
1.20	9.00	0.50	5:1	Cobble	1.50	1.23	1.26	1.51	1.23	1.54			75.7	76.9	
1.20	9.00	0.50	7.5:1	Cobble	1.50	0.82	0.87	1.02	0.82	1.03			75.7	76.5	
Spencer Point															76.9
1.30	9.00	0.75	6:1	Cobble	1.70	1.60	1.61	1.98	1.60	2.00			75.7	77.3	
1.30	9.00	0.75	8:1	Cobble	1.70	1.20	1.20	1.49	1.20	1.50			75.7	76.9	
1.30	9.00	0.50	6:1	Cobble	1.70	1.07	1.07	1.32	1.07	1.34			75.7	76.8	
1.30	9.00	0.50	8:1	Cobble	1.70	0.80	0.80	0.99	0.80	1.00			75.7	76.5	
Popham Bay															76.8
1.50	9.00	0.75	7:1	Cobble	2.00	1.48	1.48	1.83	1.48	1.83			75.7	77.2	
1.50	9.00	0.75	10:1	Cobble	2.00	1.03	1.04	1.28	1.03	1.28			75.7	76.7	
1.50	9.00	0.50	7:1	Cobble	2.00	0.96	0.99	1.22	0.98	1.22			75.7	76.7	
1.50	9.00	0.50	10:1	Cobble	2.00	0.69	0.69	0.86	0.69	0.86			75.7	76.4	

Source: Shoreplan Engineering Ltd., 1997.

6.4 DYNAMIC BEACHES

6.4.1 WHAT IS A DYNAMIC BEACH?

The dynamic beaches along the Lake Ontario shoreline have been created by the interaction of waves, wind and ice, with the physical characteristics of the shoreline--sediment size and supply, shoreline orientation, and the alongshore and the onshore-offshore form of the shoreline.

Dynamic beaches are unstable. Beach material may erode or accumulate in these areas, depending on the long-term supply of sediments provided by the adjacent shoreline and the orientation of waves during storm events and periods of high water. The easiest type of dynamic beach to visualize is the sandy beaches at Presqu'ile. This beach has very deep deposits of sand which grow or shrink in any given year. Beaches and onshore dunes can be eroded away, with the sand temporally deposited in offshore bars. Over time, the sand returns to the beach and the dune system. The dynamic beaches in Cramahe Township behave similar to the beaches at Presqu'ile, but most of them are formed of cobbles instead of sand.

A dynamic beach--according to the provincial definition--must have at least 0.3 metres (1 foot) of sediment and the beach width (above the IGLD elevation) should be greater than 10 metres . These guidelines are minimum values and should be applied over a length of shoreline exceeding 100 metres.

6.4.2 WHY ARE DYNAMIC BEACHES IMPORTANT?

The municipality and shoreline landowners need to know about dynamic beaches because these areas are extremely sensitive. The shoreline of a dynamic beach undergoes continuous change because of the removal, movement and deposition of material in the onshore and offshore. As such, dynamic beaches are not a suitable location for development.

The dunes and ridges that naturally form along the shoreline offer a high degree of natural protection against flood and erosion damages. Installation of shore treatment works in these areas, may interfere with beach processes on site and in downdrift areas. Caution needs to be exercised when undertaking shoreline treatment work in dynamic beaches.

- ***Provincial Policy Statement***

The Provincial Policy Statement recognizes the importance of restricting development in dynamic beaches and ensuring that development that occurs within the dynamic beach hazard limit is safe and creates no new hazards or adverse environmental impacts (see Section 3.1.3 of the Provincial Policy Statement, outlined under Section 7 of this report). An Environmental Impact Study would need to be completed to address these concerns.

- ***Municipal Planning Documents***

Municipalities have a responsibility to *have regard to* the Provincial Policy Statements. It is

therefore important that dynamic beaches policies be included in municipal planning documents (ie. the Official Plan and the Comprehensive Zoning By-Law) and that their location be known.

- ***Shoreline Treatment Works***

By their nature, treatment works interfere with the movement of sediment. This interrupts the alongshore (parallel to the shore) and cross-shore (perpendicular to the shore) transport of sediment. Material that is carried from the beach out into the water during a storm may be deposited as offshore bars that help to dissipate wave energy. Altering the long-term transport of sediment alongshore, affects the build up of beaches in the downdrift areas. For these reasons, extreme caution must be exercised should any shoreline erosion/flood protection works be proposed in or near dynamic beaches.

Work in dynamic beaches is a very complex undertaking and should be discouraged. The Ministry of Natural Resources will entertain work permit applications for shoreline work in these areas; however, all plans and designs are to be completed by a qualified professional engineer.

6.4.3 CRAMAHE'S DYNAMIC BEACHES

- ***Aerial Survey of Dynamic Beaches***

To assist Conservation Authorities with the identification of dynamic beaches, the Ministry of Natural Resources delineated the extent of dynamic beaches along the Great Lakes system using video tape coverage developed by Environment Canada. The Ministry recommended field verification of the beaches.

- ***Field Verification***

Lower Trent Conservation has undertook field verification of the dynamic beaches along the Cramahe's Lake Ontario shoreline as part of this Shorelands Project (Appendix B). Working with the coastal engineering firm (Shoreplan Engineering Ltd.), Lower Trent Conservation has determined that some of the dynamic beaches do not meet the definition criteria and that the lengths and classifications of others should be changed. This information will be useful to the Conservation Authority, so that it can provide recommendations to the Municipality on planning applications and to landowners so that they know the locations of the most sensitive portions of the shoreline.

- ***Dynamic Beach Limits***

The Provincial Policy Statement sets different polices for the *defined portions of the dynamic beach* and the *landward extent of the dynamic beach hazard limit.* It is therefore important to define both.

Defined portions of the dynamic beach

The *defined portions of the dynamic beach* are those portions which are highly unstable

and/or critical to the natural protection and maintenance of the first main dune feature and/or beach profile, where any development or site alteration would create or aggravate flooding or erosion hazards, cause updrift and/or downdrift impacts and/or cause adverse environmental impacts.

Most of Cramahe's dynamic beaches are backed by a wetland or a bluff. When this occurs, the *defined portions of the dynamic beach* will be as follows:

Where there is a wetland:

The dynamic beach processes will be modified by the wetland. The *defined portions of the dynamic beach* will extend only 30 metres into the wetland from the back of the bar.

Where there is a cohesive bluff:

The *defined portions of the dynamic beach* will end at the bluff. The erosion or flood standard will be applied to the cohesive bank shoreline to establish recommended setbacks.

Where there is no wetland or bluff:

The *defined portions of the dynamic beach* will include a 10 metre buffer beyond the backside of the beach deposit (cobble berm, sand dune). For sandy beaches, with no dunes, the *defined portions of the dynamic beach* will extend to the flooding hazard limit.

Dynamic beach hazard limit

The policy definition for the *landward extent of the dynamic beach hazard limit includes the flooding hazard limit plus a dynamic beach allowance.* Most of the Cramahe Township dynamic beaches are cobble and are backed by a wetland or bluff. Where there is no bluff the wave run-up (flooding hazard limit) tends to extend a considerable distance inland. The Conservation Authority believes that the flood limit provides adequate protection for the beaches and therefore recommends that the flooding hazard limit be used to define the dynamic beach hazard limit without an additional dynamic beach allowance.

- ***Dynamic Beach Locations and Descriptions***

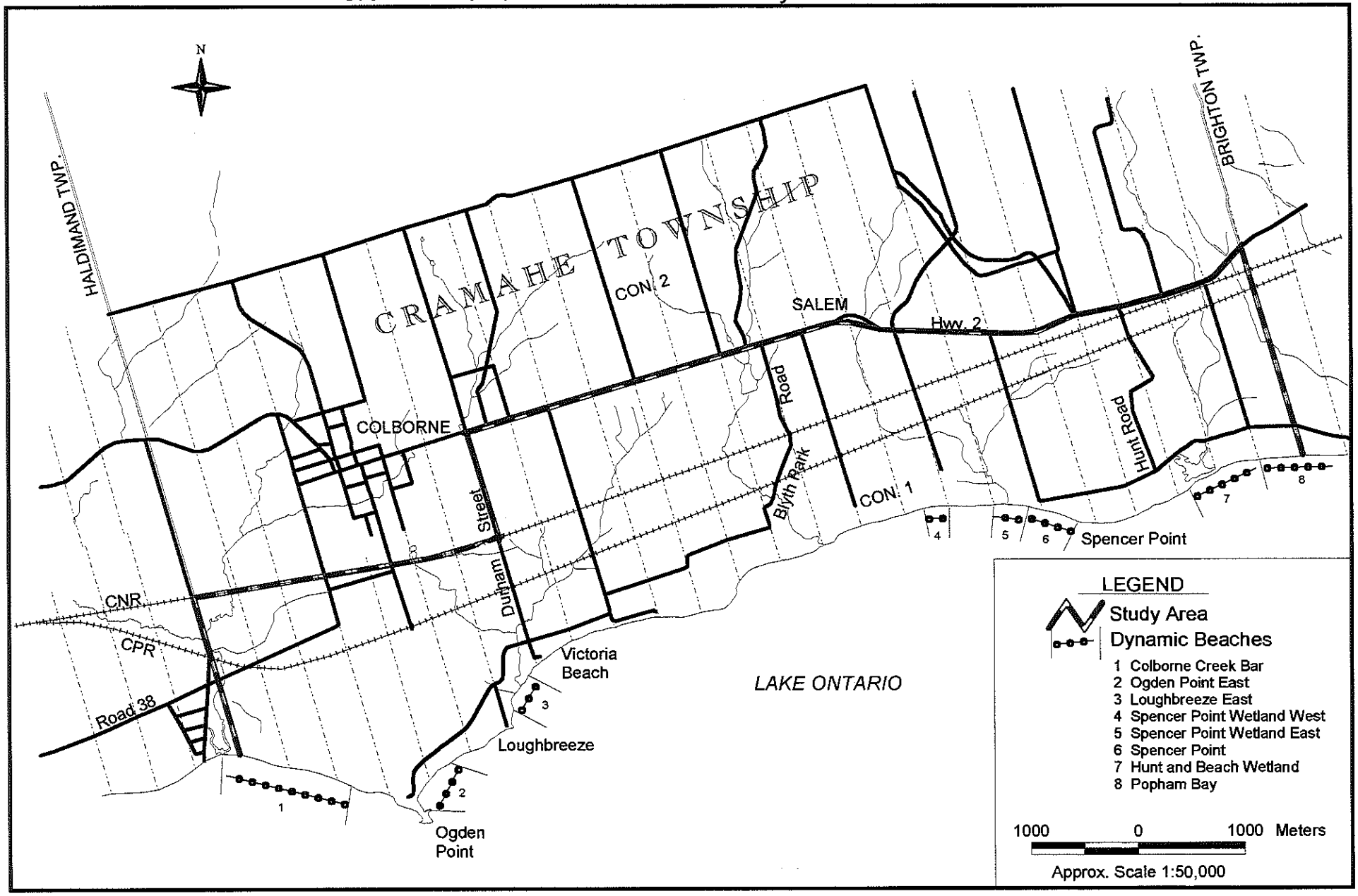
The location of Cramahe's dynamic beaches are shown in Figure 8 and on large scale maps in Appendix G. The following summary of the dynamic beaches includes the following:

Colborne Creek Bar (Lot 35 - 33)

The shoreline in this area is formed by a gravel and sand bar and is considered to be a dynamic beach. The beach separates the lake from the wetland on the north side. In the western end of the reach, the beach material is sand, mixed with a substantial amount of cobbles. Cobbles are dominant in the eastern half of the reach.

CRAMAHE SHORELANDS PROJECT - Dynamic Beaches

FIGURE 8



LOWER TRENT CONSERVATION

Steve Whitehead, 1997
File: d:\cramahe\(dynamic.view)

Since the dynamic beach in this area is backed by a wetland, the *defined portions of the dynamic beach* will extend only 30 metres into the wetland. In the most easterly part of the reach, the cohesive/bedrock bank marks the landward limit of the *defined portions of the dynamic beach.*

Ogden Point East (Ogden Point/Loughbreeze--Lot 32 - 31)

This shoreline reach is approximately 630 metres long. It consists of a sandy beach with high, filled areas in the backshore. The filled areas are the result of quarry operations. The deposit of sand is substantial, clearly qualifying it as a dynamic beach under the definitions in the policy.

The landward limit of the *defined portions of the dynamic beach* extends to the cohesive/rock bank or to the 100 year flooding hazard, which ever is closer.

Loughbreeze East (Creek East of Loughbreeze--Lot 29)

The shoreline within this reach is formed by a sand and gravel bar at the mouth of an unnamed creek. The beach has a relatively narrow width.

The landward limit of the *defined portions of the dynamic beach* extends 30 metres into the wetland. At the far west end, the bank will define the limit.

Spencer Point Wetland West (Lot 19)

The shoreline in this reach consists of a cobble beach. In lot 19, the beach trails off to a low field and wetland.

The landward limit of the *defined portions of the dynamic beach* extends 30 metres into the wetland and to the toe of the eroding bank in the east..

The 100 year flooding hazard marks the extent of the *dynamic beach hazard limit.*

Spencer Point Wetland East (Part of Lot 17)

The dynamic beach in this reach consists of sand and gravel and is about 10 metres wide. Evidence of minor dunes can be found at the edge of the vegetation.

The landward limit of the *defined portions of the dynamic beach* extends northward 30 metres into the wetland, and to 10 metres beyond the backside of the cobble berm or to the toe of the bank, whichever is closest on the east and west ends.

Spencer Point (Part Lot 17 and 16)

This dynamic beach is a continuation of the "Lot 17" dynamic beach The separate reach classification is due to a change in backshore profile from barrier to cliff/bluff. The beach

length is approximately 500 metres. There was very little evidence of sand along the beach at the time of field inspection: further monitoring would indicate if the beach should be classified as cobble rather than sand.

The landward limit of the *defined portions of the dynamic beach* extends 10 metres beyond the backside of the cobble berm or to the toe of the bank, whichever is closest.

Hunt and Beach Wetland (Part Lots 12 and 13)

The dynamic beach in this reach is approximately 680 metres long. The beach material consists of coarse pebbles and cobbles. It is backed by a wetland.

The landward limit of the *defined portions of the dynamic beach* would extend 30 metres beyond the beach into the wetland.

Popham Bay (Lot 11)

The dynamic beach in this reach is a continuation of the beach to the west. It is classified separately because of the difference in the backshore. The cobble beach in this area is backed by a low plain.

The landward limit of the *defined portions of the dynamic beach* extends 10 metres beyond the backside of the cobble berm.

Other Dynamic Beach Areas

A review of the aerial photographs and maps suggest that one additional dynamic beach may exist along the shore of Lot 21. A close review was not possible as access was denied at this location. Should development near the shore or alterations to the shoreline be proposed at this location, it is recommended that the applicant be responsible for undertaking a study to determine if there is a dynamic beach at this location.

6.5 ONSHORE-OFFSHORE FUNCTIONS

Currently there is very little shore treatment work along the Cramahe shoreline, and the erosion, flooding and dynamic beach hazards are the result of natural shoreline processes. As the shoreline evolves and headlands form, areas that are now subject to high recession rates may become more stable.

The erosion of backshore sand and gravel deposits between Ogden Point and Popham Bay may provide an important supply of sediment to Presqu'ile Beach. Therefore, minimal interference with shoreline processes is recommended. In the areas that have been developed, shoreline treatment may be desirable depending on the degree of risk and the cost-benefits of the proposed work.

In the undeveloped areas, the shoreline is best left in a natural state, with new development set back from the shoreline. This will allow natural processes to occur and help to reduce erosion and flooding hazards. It will also help provide natural linkages for wildlife. Linkages between onshore-offshore and upstream-downstream habitats should be maintained to facilitate fish migration. Shoreline barriers (eg. extended lakefill structures) should be discouraged. Any structures that are installed, should provide for open coast fish habitat.

By allowing the shoreline to function naturally, and protecting new development from shoreline hazards, the municipality and shoreline residents can enjoy the benefits of the natural coastal and aquatic features without the economic and environmental costs of extensive shore erosion/flood protection work.

6.6 RECOMMENDATIONS

1. Re-survey erosion monitoring stations every two years to verify recession rates.

2. Shoreline hazards should be recognized in the Official Plan and Comprehensive Zoning By-Law:
   a) The 77.0 m G.S.C. elevation should be used to identify the flooding hazard limit.
   b) A minimum 45 metre setback should be established along the Cramahe shoreline to recognize the erosion hazard limit. This setback should be increased to 130 metres in Lots 27 and 28 to allow for the higher erosion rates in this area.
   c) Where there is a dynamic beach along the shoreline, the dynamic beach hazard limit should be established at the flood hazard limit.

3. The municipality should encourage new development to be set back from the shoreline, outside the hazards limits. Should the proponent wish to undertake engineering studies to prove that the hazards can be safely overcome, development may be permitted.

4. Development should be prohibited within the "defined portions" of the dynamic beach described in this report

5. Construction of shoreline treatment works should be discouraged in dynamic beaches.

6. Should development or alterations to the shoreline be proposed at Lot 21, it is recommended that the applicant be responsible for undertaking a study to determine if there is a dynamic beach.

7. PLANNING RECOMMENDATIONS

By recognizing the sensitivities and hazards associated with natural features in planning documents, municipalities can ensure that the shorelands are protected for future generations to enjoy and that people develop their lands in a manner that respects the natural features and associated hazards.

Cramahe Township's municipal planning documents--the Official Plan and the Comprehensive Zoning By-Law--can both be valuable in achieving shoreline and natural areas protection. The Official Plan provides direction for a community's planning decisions. The Zoning By-Law is a legal document used by the municipality to regulate the use of land. It states exactly what land uses are currently permitted in the community and identifies detailed information such as types of uses and buildings that are permitted, lot sizes and setbacks.

As part of the Cramahe Shorelands Management Plan, general recommendations are provided for both the Official Plan and the Comprehensive Zoning By-Law. These recommendations are based on the Provincial Policy Statement and should be included in the municipal planning documents to ensure that the municipality is having regard for the provincial policies relating to natural heritage, water quality and quantity and public health and safety.

The natural features of interest in the Cramahe Shorelands include the Lake Ontario shoreline, Lake Ontario nearshore aquatic habitat, wetlands, watercourses, woodlands, valleylands, and wildlife habitat areas. The provincial natural hazards and/or natural heritage policies apply to these features.

Lower Trent Conservation recognizes that the Township has recently completed a draft of the Update to its Official Plan. The following discussion and recommendations are provided to assist with the further refinement and development of Official Plan policies. Recommendations are also provided regarding zoning, should the municipality wish to update portions of their Comprehensive Zoning By-Law.

In considering environmental goals and objectives in the Official Plan, Lower Trent Conservation recommends that the municipality include environmental goals or objectives such as the following:

a) The natural heritage features and their linkages perform essential natural functions as part of an overall ecosystem and should be protected.

b) Development should generally be directed away from natural hazards and significant natural heritage features.

c) Natural features, such as the Lake Ontario shorelands, should be viewed as part of the regional landscape and valued for their environmental, social and economic qualities.

d) In addition to effective Official Plan policies, private stewardship of land, community based actions and public education will also contribute to environmental health of the community.

The remainder of the recommendations are more specific and are provided under three major headings--Natural Heritage Features, Wetlands and Lake Ontario Shoreline.

7.1 NATURAL HERITAGE FEATURES

The Cramahe shorelands have undergone 200 years of land use change. The remnant natural heritage features include **valleylands**, **woodlands** and **wildlife habitat.** Each one of these features has inherent environmental and social values and are important as they perform essential natural functions. Streams also play an essential role in the hydrologic balance of a watershed, linking the water cycle, land use and wildlife habitat.

7.1.1 PLANNING CONSIDERATIONS

The following policies of the Provincial Policy Statement apply to streams, valleylands, woodlands and wildlife habitat.

2.3 Natural Heritage

2.3.1 Natural heritage features will be protected from incompatible development.

b) Development and site alteration may be permitted in:

- *fish habitat;*
- *significant valleylands south and east of the Canadian Shield;*
- *significant woodlands south and east of the Canadian Shield;*
- *significant wildlife habitat*

if it has been demonstrated that there will be no negative impacts on the natural features or the ecological functions for which the area has been identified.

2.3.2 Development and site alteration may be permitted on adjacent lands to
b) if it has been demonstrated that there will be no negative impacts on the natural features or on the ecological functions for which an area has been identified.

2.3.3 The diversity of natural features in an area, and the natural connections between them should be maintained, and improved where possible.

2.4 Water Quality and Quantity

2.4.1 The quality and quantity of ground water and surface water and the function of sensitive ground water recharge/discharge areas, aquifers and headwaters will be

protected or enhanced.

3.1 Natural Hazards

3.1.3 Development may be permitted within the hazardous lands provided that the following can be achieved:

a) the hazards can be safely addressed, and the development and site alteration is carried out in accordance with established standards and procedures;
b) new hazards are not created and existing hazards are not aggravated;
c) no adverse environmental impacts will result;
d) vehicles and people have a way of safely entering and exiting the area during times of flooding, erosion and other emergencies; and
e) the development does not include institutional uses or essential emergency services or the disposal, manufacture, treatment or storage of hazardous substances.

The following are Provincial Policy Statement definitions:

Valleylands *means a natural area that occur in a valley or other landform depression that has water flowing through or standing for some period of the year.*

Woodlands *means treed areas that provide environmental and economic benefits such as erosion prevention, water retention, provision of habitat, recreation and the sustainable harvest of woodland products. Woodlands include treed areas, woodlots or forested areas and vary in their level of significance.*

Wildlife Habitat *means areas where plants, animals and other organisms live, and find adequate amounts of food, water, shelter and space needed to sustain their populations. Specific wildlife habitats of concern may include areas where species concentrate at a vulnerable point in their annual or life cycle; and areas which are important to migratory or non-migratory species.*

Significant *means*

- *in regard to wetlands and areas of natural and scientific interest, an area identified as provincially significant by the Ministry of natural Resources using evaluation procedures established by the province, as amended from time to time.*

- *in regard to other features and areas in policy 2.3, ecologically important in terms of features, functions, representation or amount, and contributing to the quality and diversity of an identifiable geographic area or natural heritage system. Criteria for determining significance may be recommended by the province, but municipal approaches that achieve the same objective may be used.*

- *in regard to other matters, important in terms of amount, content, representation or*

effect.

7.1.2 OFFICIAL PLAN APPROACH

Recommendations:

1. To recognize the natural hazards and natural heritage features, water bodies, stream corridors and significant valleylands, woodlands and wildlife habitat should be identified on Schedule "A" as **"Environmental Protection"**.

2. The **"Environmental Protection"** policies of the Official Plan should address the following matters:
   a) The types of uses permitted: outdoor recreation/education activities, conservation/wildlife areas, existing agriculture, sustainable forestry, private/public parks

   b) Where mapped, the boundaries of the **"Environmental Protection"** designation should be approximate and it should be the intent of the plan that precise locations be delineated in the Comprehensive Zoning By-Law or at the time of the submission of development applications, through consultation with the local Conservation Authority.

   c) In areas designated as **"Environmental Protection"**, the placement or removal of fill, buildings and structures should not be permitted, except those required for flood, erosion and sedimentation control and conservation purposes.

   d) On lands adjacent to cold water streams, and significant valleylands, woodlands and wildlife habitat, an Environmental Impact Study (EIS) should be required to determine the appropriateness of a development proposal. Development permitted as a result of an EIS would not require an amendment to the Official Plan. It would however, require appropriate zoning. The minimum requirements for an EIS should include:
      i) a description of the existing natural environment that will be affected or that might reasonably be expected to be affected, either directly or indirectly;
      ii) the environmental effects that might reasonably be expected to occur;
      iii) alternative methods and measure for mitigation of potential environmental effects of the proposed development; and,
      iv) a monitoring plan to measure the effects on the environment.

   e) Best Management Practices for stormwater management should be

encouraged for new major development, and where possible redevelopment.

f) A site plan or development agreement may be used to implement the findings of the environmental impact study.

g) Any existing uses, together with an amount of land sufficient for the siting of such uses at their present extent, should be recognized a legal non-conforming uses in the Comprehensive Zoning By-Law. Minor extensions to, and/or the replacement of, existing buildings or structures could be permitted by minor variance or rezoning, subject to the regulations and approval of the local Conservation Authority.

7.2.3 Comprehensive Zoning By-law Approach

Recommendations:

1. a) In order to ensure that the municipality has regard for the above noted Provincial Policies, Lower Trent Conservation recommends that the **"Environmental Protection"** policies of the Official Plan be implemented through the Zoning By-law by placing stream corridors and significant valley lands, woodlands and wildlife habitat in a restrictive zoning category (such as **"Environmental Protection"**) which permits existing uses, farming, sustainable forestry and conservation uses.

b) On lands adjacent to streams and significant valleylands, woodlands and wildlife habitat areas, a 30 metre development setback should be established. The findings of an Environmental Impact Study may reduce this setback.

7.2 Provincially Significant Wetlands

Provincially Significant Wetlands *are lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface. In either case the presence of abundant water has caused the formation of hydric soils and has favoured the dominance of either hydrophytic plants or water tolerant plants. The four major types of wetlands are swamp's marshes, bogs and fens. Wetlands considered Provincially Significant have been identified as such by the Ministry of Natural Resources, using evaluation procedures established by the Province.*

Periodically soaked or wet lands being used for agricultural purposes which no longer exhibit wetland characteristics are ***not*** *considered to be wetlands.*

7.2.1 PLANNING CONSIDERATIONS

The following policies of the Provincial Policy Statement apply to Provincially Significant Wetlands located within the Cramahe shorelands area.

2.3 Natural Heritage

2.3.1 Natural Heritage features will be protected from incompatible development.
a) Development and site alteration will not be permitted in:
- *significant wetlands south and east of the Canadian Shield.*

2.3.2 Development and site alteration may be permitted on adjacent lands to a) if it has been demonstrated that there will be no negative impacts on the natural features or on the ecological functions for which an area has been identified.

2.3.3 The diversity of natural features in an area, and the natural connections between them should be maintained, and improved where possible.

2.4 Water Quality and Quantity

2.4.1 The quality and quantity of ground water and surface water and the function of sensitive ground water recharge/discharge areas, aquifers and headwaters will be protected or enhanced.

3.1 Natural Hazards

3.1.1 Development will generally be directed to areas outside of:
c) hazardous sites (lands that may be unsafe for development due to naturally occurring hazards such as unstable soils).

7.2.2 OFFICIAL PLAN APPROACH

Recommendations:

1. Provincially significant wetlands should be identified by a special tone, or a symbol (in addition to the "Environmental Protection (EP)" tone on Schedule "A".

2. A new subsection entitled **"Provincially Significant Wetlands"** should be included as part of the **"Environmental Protection"** designation policies in the new Official Plan. This subsection should address the following matters:

a) That the Ministry of Natural Resources is responsible for determining the provincial significance of wetlands.

b) That the municipality is responsible for determining the exact boundary of a provincially significant wetland.

c) That development within provincially significant wetlands is not permitted.

d) That any development proposal occurring in proximity to a provincially significant wetland (eg. within 120 metres) requires an analysis, which proves that the proposed development will have no negative impacts on wetland features or functions. *(Note: The environmental impact study and the "checklist" developed by the Ministry of Natural Resources have been used successfully in this regard in the past.)*

e) That a site plan or development agreement may be used to implement the findings of the environmental impact study.

f) Where the Ministry of Natural Resources and other agencies conduct studies to reassess or identify new wetlands or natural areas, public consultation should be undertaken.

g) When wetlands are identified as being provincially significant, they will be included in the Official Plan through an amendment.

7.2.3 Comprehensive Zoning By-law Approach

Recommendations:

1. In order to ensure that the municipality has regard for the above noted Provincial Policies, Lower Trent Conservation recommends that the wetland policies of the Official Plan be implemented through the Zoning By-law by placing provincially significant wetlands in a restrictive zoning category (such as "**Environmental Protection**") which only permits wetlands and uses that are compatible with the maintenance of wetland values.

2. On lands adjacent to provincially significant wetlands, setbacks for development will be determined on a site-specific basis, as a result of the Environmental Impact Study.

7.3 Lake Ontario Shoreline

While the shoreline is an attractive place to live, there are hazards associated with shoreline processes. Development of areas susceptible to Lake Ontario shoreland hazards such as flooding, erosion and dynamic beaches can result in extensive property damage, risks to public safety and detrimental impacts to the shoreline ecosystem. For these reasons, the Provincial Policy Statement sets out hazard policies that apply to the Great Lake shoreline.

The Lake Ontario shoreline is also an ecologically sensitive area. The nearshore and shoreline

areas provide habitat for many plant and animal species. In our desire to live near the lake, we need to be conscious of how human activities affect water quality and nearshore habitat.

The planning considerations provided below address the hazard concerns. Setbacks and appropriate designations and zoning are recommended to ensure that new development is not subject to erosion, flooding and dynamic beach hazards. Should specific studies be taken to reduce the setbacks or change the zoning to permit development, studies should be required to ensure that environmental impacts do not occur. Provincial policies relating to fish habitat and the quality and quantity of ground and surface water need to be taken into consideration.

7.3.1 PLANNING CONSIDERATIONS

Siting of development along the shoreline of Lake Ontario must take into consideration natural processes and hazards. The following policies of the Provincial Policy Statement have been developed to address this concern and applied to the Cramahe Shorelands area.

3.1 Natural Hazards

3.1.1 Development will generally be directed to areas outside of hazardous lands adjacent to the shorelines of the Great Lakes - St. Lawrence River system which are impacted by flooding, erosion, and/or dynamic beach hazards;

3.1.2 Development and site alteration will not be permitted within:

b) defined portions of the dynamic beach. (These are those portions of the dynamic beach which are highly unstable and/or critical to the natural protection and maintenance of the first dune feature and/or beach profile, where any development or site alteration would create or aggravate flooding or erosion hazards, cause updrift and/or downdrift impacts and/or cause adverse environmental impacts.)

3.1.3 Development may be permitted within the hazardous lands provided that the following can be achieved:

a) the hazards can be safely addressed, and the development and site alteration is carried out in accordance with established standards and procedures;
b) new hazards are not created and existing hazards are not aggravated;
c) no adverse environmental impacts will result;
d) vehicles and people have a way of safely entering and exiting the area during times of flooding, erosion and other emergencies; and
e) the development does not include institutional uses or essential emergency services or the disposal, manufacture, treatment or storage of hazardous substances.

Provincial Policy statement definitions that apply to shoreline area include:

Flooding hazards *means the inundation of areas adjacent to the shoreline and not ordinarily covered by water. Along the shorelines of the Great Lakes - St. Lawrence River System, the flooding hazard limit is based on the 100 year flood level plus an allowance for wave uprush and other water related hazards.*

Erosion hazards *means the loss of land, due to human or natural processes, that poses a threat to life and property. The erosion hazard limit is determined using the 100 year erosion rate (the average annual rate of recession extended over a hundred year time span), an allowance for slope stability, and an erosion allowance.*

Dynamic beach *means areas of inherently unstable accumulations of shoreline sediments along the Great Lakes - St. Lawrence River System. The dynamic beach hazard limit includes the flooding hazard limit plus a dynamic beach allowance.*

Quality and quantity (of water) *is measured by the indicators such as minimum base flow, oxygen levels, suspended solids, temperature, bacteria, nutrients, hazardous contaminants, and hydrologic regime.*

Fish Habitat *means the spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes.*

7.3.2 Official Plan Approach

Recommendations:

1. To recognize the natural hazards associated with the Lake Ontario shoreline, this area should be identified on Schedule "A" by a special tone or with a symbol in addition to the **"Environmental Protection"** designation tone.

2. Given that the shore zone is an ecologically sensitive as well as an extremely dynamic area, a new subsection entitled **"Lake Ontario Shoreline"** should be included in the **"Environmental Protection"** designation policies. In addition to the policies of the **"Environmental Protection"** designation, this subsection should address the following matters:

    a) That the extent of the **"Environmental Protection"** designation on the Lake Ontario Shoreline area is the furthest landward extent of the erosion hazard limit or the flooding hazard limit. (The dynamic beach hazard limits are less than the erosion and flooding hazards.)

b) That development should only be permitted when appropriate engineering studies have been undertaken that confirm that the hazards can safely be addressed to the requirements outlined in the Provincial Policy statement (3.1.3). Development permitted as a result of these studies would not require an amendment to the Official Plan. It would however, require appropriate zoning.

c) That no development should be permitted in the "defined portions of the dynamic beach." The exact limits of the dynamic beach will be determined by the municipality in consultation with the local Conservation Authority.

d) That any existing uses, together with an amount of land sufficient for the siting of such uses at their present extent, should be recognized as legal non-conforming uses in the Comprehensive Zoning By-Law. Minor extensions to, and/or the replacement of, existing buildings or structures could be permitted by minor variance or rezoning, subject to the regulations and approval of the local Conservation Authority.

7.3.3 Comprehensive Zoning By-law Approach

Recommendations:

1. a) The general provision addressing the setback from the high water mark of Lake Ontario should be changed to read as follows:
Along the Lake Ontario shoreline, no buildings shall be located within 45 metres of the toe of the slope or an elevation 75 metres G.S.C.[1] which ever is greater. Notwithstanding the foregoing, in lots 27 and 28, Concessions BF and 1, no buildings shall be located within 130 metres of the toe of the bluff.

b) A general provision should be added to the by-law that addresses existing uses. Existing uses, together with an amount of land sufficient for the siting of such uses at their present extent, may be recognized as legal non-conforming uses in the Comprehensive Zoning By-Law. Minor extensions to, and/or the replacement of, existing buildings or structures may be permitted by minor variance or rezoning, subject to the regulations and approval of the local Conservation Authority.

c) In order to ensure that the municipality has regard for the above noted Provincial Policies, Lower Trent Conservation recommends that the

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1 *The elevation of 75 m GSC is based on the long term mean water level for Lake Ontario for the month of June.*

"**Environmental Protection**" policies of the Official Plan be implemented through the Zoning By-law by placing the flooding and dynamic hazard limits in a restrictive zoning category (such as "**Environmental Protection**").

d) Setbacks can be reduced and/or restrictive zoning changed by way of minor variance or rezoning only when appropriate engineering studies have been undertaken and confirm that the hazards can safely be addressed to the requirements outlined in the Provincial Policy statement (3.1.3).

7.4 MAPPING

The planning recommendations are shown on the maps in Appendix G.

7.4.1 OFFICIAL PLAN

For the Official Plan, recommendations for revising the schedule in the draft Official Plan are provided.

The mapping showing Lower Trent Conservation's recommendations for EP designations includes:

- a band along the shoreline representing the greater of the erosion hazard limit and the flooding hazard limit (this area should be in a "special shoreline EP" tone/symbol)
- provincially significant wetlands (this areas should be in a "special wetland EP" tone/symbol)
- significant natural areas
- a 30 metre buffer along each side of the creeks

7.4.2 COMPREHENSIVE ZONING BY-LAW

For the Comprehensive Zoning By-Law, the following EP zones are recommended:

- a band from the lake to the 77.0 metre contour delineating the flooding hazard limit
- Provincially Significant Wetlands
- a minimum 30 metre buffer along each side of all watercourses in the Cramahe shorelands (this may be wider if it the adjacent lands appear to be low and wet)
- significant natural areas

In addition to EP zoning, the recommended 45 metre erosion setback is mapped. In Lots 28 and 27 the recommended setback is shown as 130 metres.

8. SHORELINE TREATMENT OPTIONS

Shoreline residents have expressed a concern about erosion and flooding along the shoreline and want to know what kinds of structural works could be installed to protect their property. As part of this project, the coastal engineering firm (Shoreplan Engineering Ltd.) reviewed the shoreline where concentrated residential development occurs and has made recommendations for shoreline treatment options. In some areas the loss of agricultural land to erosion is a concern to the landowners, but the economic benefits of shore treatment works would likely prove to be cost-prohibitive.

The shoreline treatment options prepared by Shoreplan Engineering Ltd. (1996) forms Appendix F and should be read prior to undertaking shoreline work. A summary of the key points is provided below.

The three developed areas for which preliminary erosion/flood protection works were designed are Victoria Beach, Spencer Point and Loughbreeze area. Comments have also been provided for the small developed area along Popham Bay.

Typical sections of shore treatment works using armour stone revetments and armour stone seawalls, where applicable, are provided in Appendix F. These types of structures provide the highest level of protection for the cost and represent the best value. Other types of structures, such as concrete seawall, steel sheetpile, cribs and others are possible, but are more costly and may increase the potential for environmental impacts.

Typical construction costs for the erosion/flood protection works are presented in Table 3. These are based on typical unit costs from recent contracts in southern Ontario. Prices vary depending on material availability, local labour conditions, site access conditions and a number of other factors. With the St. Lawrence Cement quarry located in the immediate vicinity, rock may be available at a reduced cost. The prices do not include any contingency allowance or the costs of any detailed design fees and other professional costs. It is recommended that an allowance of no less than twenty percent be added to cover all contingency costs.

Permits are required for shoreline work. The permitting process is discussed in Section 11 of this report.

8.1 VICTORIA BEACH AREA

Victoria Beach area is located on Lots 26, 27, 28 and part of Lot 29. The shoreline is approximately 1450 metres long. Because of variations in the shoreline and coastal processes, the area has been divided into three reaches.

Reach VB1 is located west of Durham Street and is approximately 200 metres long. Reach VB2 is located between Colton Street and Durham Street and is approximately 850 metres long. Reach VB3 is located along Lot 26 (west of Colton Street)and is approximately 400

metres long. Reach VB2 is the dominant and typical reach of the area. Reaches VB1 and VB3 are transitional reaches. Locations of these reaches are identified on Figure 9.

- ***Reach VB1 (Lot 29)***

Reach VB1 is defined by low cohesive bank with some existing erosion protection works. It is a point of land separating the lake and an inland wetland and leading up to a dynamic beach area to the west. The top elevation of the backshore varies from approximately 76.0 to 78.0 meters. With uprush levels of 77.0 metres, protection works may be overtopped during storms that occur when water levels are high. A combination of erosion/flood protection and flood proofing is considered to be most desirable to deal with the existing development in this area.

The recommended protection structure in this reach is an armour stone revetment with a top elevation of 78.0 metres. Flood proofing is also recommended where there is a lower backshore. The amount of flood proofing required can be gradually reduced as the land and protection elevations approach 78.0 metres. However, this reduction should be reviewed on individual basis by a professional engineer.

Typical sections of proposed protection works in areas with a lower backshore are presented on Figure 2 in Appendix F. Portions of the shore with backshore elevations above 78.0 m should be treated as described for Reach VB2.

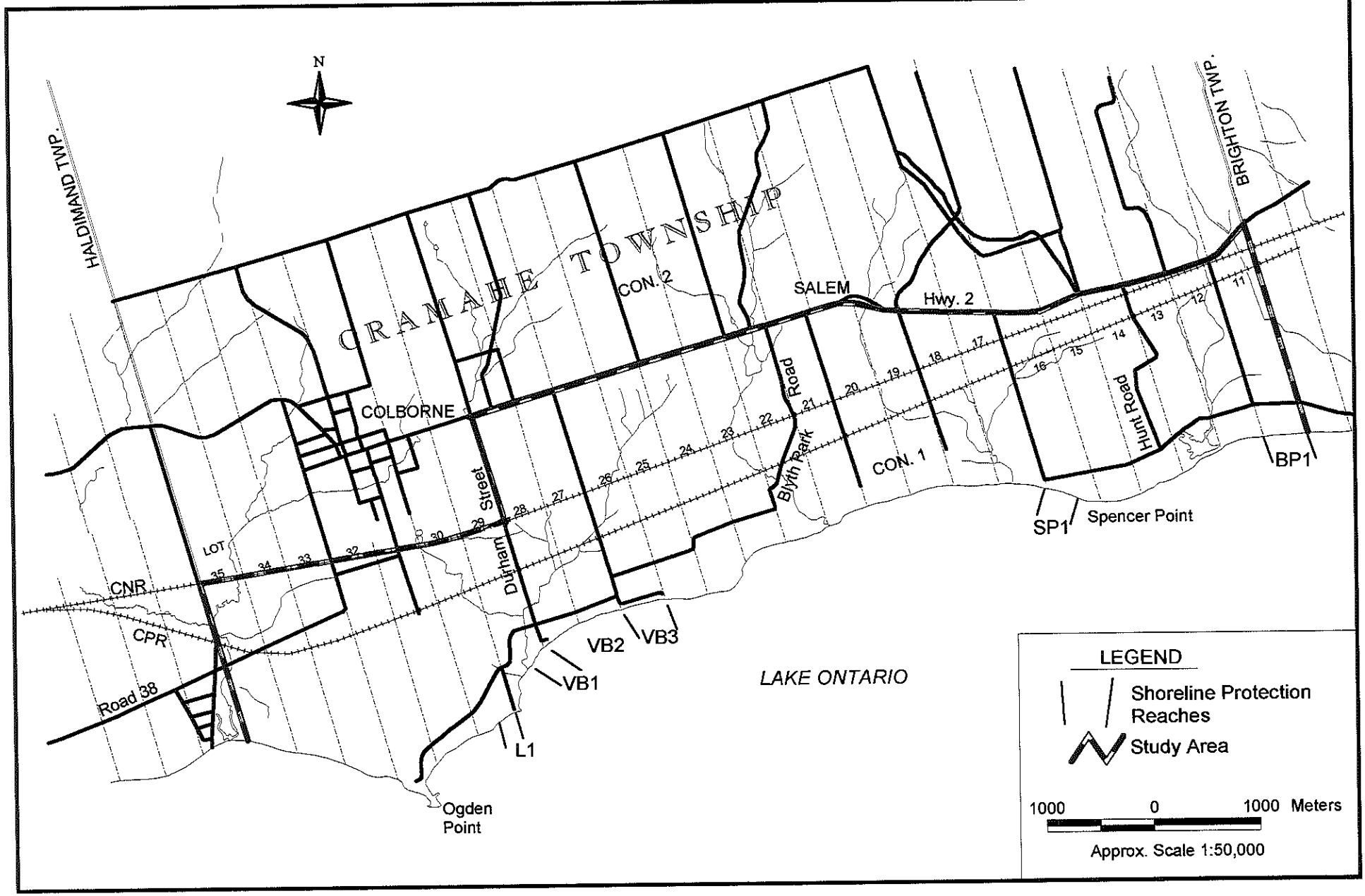
- ***Reach VB2***

This reach is the typical profile of Victoria Beach. It consists of a high bluff with a narrow sand and a cobble beach. The top of the bank is generally above 80.0 metres. There is no bank overtopping or lake related flooding above the top of bank in this reach. This part of Victoria Beach is likely to undergo the most notable erosion of the three reaches defined for the area due to its position within the log spiral of the beach. The Coastal Zone Atlas suggests an erosion rate of approximately 1.1 metres annually.

Coastal processes that form a bay between two headlands, such as the bay forming at Victoria Beach, are complex. The size of the bay is governed by the distance between the "non-erodible" headlands, the direction of net wave energy reaching the site and other coastal parameters. The bay is generally defined as having a log spiral segment on its updrift side and a tangent segment on the downdrift side. The greatest indent and highest rate of erosion in the bay occurs at the meeting point of the tangent and the log spiral portions of the bay. This occurs in reach VB2.

Typical recommended erosion/flood protection structures in this reach include an armour stone revetment or a seawall. Typical sections of these structures are presented on Figure 3 in Appendix F. Structures should be located as close to the existing bank as possible. The bank above the protection works should be graded at 3:1 or flatter. It is recommended that a site specific geotechnical investigation be undertaken for any locations within this reach

CRAMAHE SHORELANDS PROJECT - Location of Shoreline Protection Options FIGURE 9



LOWER TRENT CONSERVATION

Steve Whitehead, 1997
File: d:\cramahe\(shoreline protection.view)

where an armour stone seawall is being considered.

Implementation of shore treatment works is always more effective and cost efficient when a larger segment of a shoreline is protected. This is particularly true of a site with high cohesive banks and moderately high erosion rates, such as those within this reach. To provide proper protection, the ends of the subject property must be protected with the protection structure being tied well into the existing bank. The sides or the flanks of the property may need to be gradually protected with additional works as the surrounding lands erode.

Further development in this reach should be directed as far away from the shore of the lake as possible.

- ***Reach VB3***

The shore profile in this reach is very similar to that in reach VB2. The top of the bank gradually drops below elevation 80.0 but still above the top of recommended protection works. The recommended protection works in this reach are identical to those presented on Figure 3 for reach VB2.

The impact of protection works along this stretch of Victoria Beach on the costal processes and adjacent shores is expected to be minimal. It will be limited to a reduction of the sediment supply due to protection of the shoreline.

8.2 LOUGHBREEZE AREA

The Loughbreeze area is located on Lots 29 and 30. The shoreline within this reach is approximately 170 metres long. It consists of a low bank fronted by a narrow shingle beach. The location of the reach is identified on Figure 9.

The top elevation of the bank ranges from about 76.5 metres to approximately 76.8 metres. The nearshore is very shallow, approximately 1.5 metres deep at the toe of the beach under design water level conditions. The shore is formed by a steeply sloping cobble deposit fronting a cohesive bank. The surveyed sections indicate cobble slope varying between 5:1 to 7.5:1. The deposit appears to be anchored between a boulder headland on the east side and a bedrock outcrop on the west side. The origin of the boulder headland and pavement on the east side is unknown and could be natural or could be the remains of some former pier or a groyne.

The gradual slope of the cobble deposit will absorb some of the wave energy, but the run-up calculations indicate that the crest of the bank will be overtopped. The overtopping or wave run-up may extend up to elevation of approximately 77.0 m G.S.C., depending on the slope of the land and other obstructions in its path.

Site specific erosion data is not available for this reach, but the erosion rate is expected to be very low here. The erosion rate is likely controlled by the rate of erosion of the bedrock

outcrop immediately to the west. Based on other bedrock outcrops where erosion has been measured, this rate is likely in the neighbourhood of 0.1 metres per year or less.

Hardening of the shoreline is not recommended for this reach. However, should property owners wish to protect their property, shoreline treatment works may be installed landward of the cobble deposit to act as "last resort" protection. The cobble deposit would absorb much of the wave energy. Such a protection system could be achieved by burying an armour stone seawall or a rip rap and armour stone revetment in the backshore. Typical sections of these protection works are presented on Figure 4 in Appendix F.

While waves will penetrate between the stones in the exposed portions of the protection works, they will be broken and will have much reduced wave energy. Any development in the backshore should be flood proofed to not less than 0.3 metres above the ground level.

The impact of this type of shoreline treatment works is considered to be minimal. The works would not be exposed most of the time although their exposure may increase over time. Since the structures are buried, the protection works will not reduce the supply of sediment into the littoral system for a considerable period of time. In any case, the erosion rate is minimal and height of the bank very low.

The reinforcing of the "headland" by provision of protection in this reach may, in the long run, have a beneficial impact on the stability of the shoreline along Victoria Beach, as this reach forms the updrift headland on that bay. A consideration may be given to further assessment of the boulder headland at the east end of this reach and possible reinforcement may be considered. This may lead to increased stability of the shingle deposit along this reach and future benefit to the stability of Victoria Beach.

8.3 SPENCER POINT

The developed area at Spencer Point is located within Lot 16 east of Barnes Road (Figure 9). This reach is described as a dynamic beach.

The beach consists mostly of cobble material sloping at approximately 6:1 to 8:1. The top elevation of the beach matches the backshore elevation of approximately 76.5 metres. The backshore continues to rise very gently up to elevation of 77.0 metres.

The cobble deposits absorb some of the wave energy, but the run-up calculations indicate that the crest of the bank will be overtopped during the design storm. The overtopping may extend to an elevation of approximately 76.90 m G.S.C., depending on the slope of the land and other obstruction in the waves' path.

Since this area is located within a dynamic beach, hardening of the shoreline is not recommended. Should property owners wish to protect their property, shoreline treatment works may be established landward of the cobble deposit to act as "last resort" protection.

The cobble deposit would remain undisturbed and would absorb much of the wave energy. Such a protection system could be achieved by burying an armour stone seawall or a rip rap and armour stone revetment . Typical sections of these protection works are presented on Figure 6 in Appendix F. These are very similar to structures proposed for Loughbreeze.

Any development in the backshore should be flood proofed to an elevation of not less than 0.3 meters above the ground level.

The impact of the possible protection works is considered to be minimal. The works would not be exposed most of the time although their exposure may increase over time. Since the structures are buried, the protection works will not reduce the supply of sediment into the littoral system for a considerable period of time.

Relocation and flood proofing are the preferred methods of protection from coastal hazards in this reach. Protection works within the existing beach profile are not recommended, as these may impact the stability of the beach on adjacent properties.

8.4 POPHAM BAY

The developed area of Popham Bay is located on Lot 11 east of Beach Drive. This reach has been described as a dynamic beach,.

The beach consists of cobble material. The top elevation of the beach is approximately 76.5 m G.S.C. There appears to be a beach crest that is higher than the flat backshore elevation. The backshore elevation averages approximately 76.4 metres immediately landward of the crest of the beach.

Protection works are not recommended for this reach. This recommendation is based on a number of factors including the dynamic nature of the shoreline, no existing protection works at present, and likely very low erosion rate. The existing erosion data for this area (Station O-08-040) suggests that erosion may not be a problem along this reach. Changes in the bank position appear to be due to beach profile adjustments and the shore may not be receding. Further monitoring of the erosion profile will confirm the erosion rate of the shore.

Should any owners wish to construct shore treament works, the "last resort" approach suggested for Loughbreeze and Spencer Bay areas is recommended. This allows the existing beach to be maintained in front of the structure.

The most appropriate way of dealing with coastal hazards at this location is setbacks and flood proofing. Run-up calculations indicate that the crest of the beach shingles is approximately equal to the run-up elevation under design storm conditions. This would suggest only minor spilling of water into the backshore. Under these conditions flood proofing to approximately 0.3 metres above ground level is recommended.

It is also recommended that the crest of the cobble beach not be altered as lowering of the crest will cause greater flooding of the backshore and may increase erosion of cohesive materials in the backshore.

8.5 RECOMMENDATIONS

1. Protection from shoreline hazards is best achieved through planning; shoreline erosion and flood protection works are best reserved for existing development.

2. As for any waterfront development, it is a general recommendation that development should be directed to the least hazardous portion of the development property.

3. Shoreline erosion and flood protection works should be designed and constructed to have minimal impact on coastal processes and improve aquatic and terrestrial habitats (concepts of the ecosystem approach should be incorporated into the design).

4. Consider the aesthetics of the proposed work as well as access to the shore.

5. Prior to installing shore treatment works, consider the benefits of moving the threatened structure to a less hazardous location on the property.

6. Work with neighbours to ensure better erosion and flood protection of the shoreline along longer reaches. This reduces construction costs (the costs to treat the flanks can be shared) and reduces the long term maintenance costs (as the ends erode).

7. Landowners should be prepared to assume costs for maintenance of the shore treatment work (consider long term costs and benefits).

8. Shoreline erosion and flood protection works should be designed by a qualified coastal engineer.

9. WATER LEVEL FLUCTUATIONS AND CONTROL

Cramahe Township residents indicated a concern about water level fluctuations and control on the lake. While it is beyond the scope of this project to address this issue, a brief discussion is provided.

Fluctuation of water levels on Lake Ontario is not a new problem. Ever since the retreat of the last glaciers from the Great Lakes region some 10,000 years ago, lake levels have fluctuated with the climate.

The water level in each of the Great Lakes rises or falls according to the amount of water entering and leaving the lake. The amount entering a lake includes precipitation falling on the lake, inflow from upstream lakes and rivers, runoff including snowmelt from the surrounding area, and groundwater inflow. The amount leaving the lake consists of evaporation from the lake's surface, groundwater outflow and outflow at the lake outlet. Water levels rise when the amount entering the lake exceeds the amount leaving the lake. This happens every spring.

Seasonal and annual changes to water levels are natural occurrences and are related to climatic factors. High lake levels usually persist for a long period of time, as it takes several years for increases in precipitation to travel through the entire system.

Short term water level increases result form water "piling up" along the shoreline due to the wind blowing across the lake. This is known as "wind setup" and can persist from a few hours to a few days.

Today, both natural and human factors affect lake levels. Natural factors have the greatest impact, and include precipitation, evaporation, runoff, ice jamming, aquatic growth, wind and vertical uplifting of the earth's surface. Human factors have limited impact, and include dredging, diversions, water withdrawal and lake level regulation. Precipitation or lack of it is the main cause of long-term extreme fluctuations in lake levels. Of the human factors, lake level regulation (artificial control) of lake outflows has by far the greatest impact. Regulation of water levels in the Great Lakes takes place on Lake Superior and Lake Ontario.

9.1 LAKE LEVEL REGULATION

In order to regulate a lake, outflows must be modified. Two steps need to be taken before regulation can take place:

1) enlargement of the outlet river so that at times more water can be released; and
2) installation of structures capable of reducing the outflows when required.

The outflow from Lake Ontario has been regulated since the completion of the St. Lawrence Seaway and Power Project in 1958. The construction of the Moses-Saunders Power Dam and other regulatory works in the St. Lawrence River allow Lake Ontario outflows to be

reduced when Lake Ontario levels are low or flooding is occurring downstream at Montreal. These works are also used to maintain adequate depth for safe navigation in the St. Lawrence River (Environment Canada, 1993). The objective is to keep the lake level near its long-term average and to reduce the total range of fluctuation.

The fluctuation of Lake Ontario levels is largely dependent on the weather, with regulation having only limited control. Since Lake Ontario regulation began in 1960, water supplies to the lake have been higher than average due to generally higher than average precipitation on the Great Lakes basin. For this reason, the long-term mean levels since 1960 tend to be slightly higher than the average prior to 1960 (by 0.1 metres). (Lake Erie has experienced a similar increase, and it is not regulated.) Monthly mean values on Lake Ontario ranged from a high of 75.76 m to a low of 73.74 m between 1918 and 1959. In the post-regulation era (since 1960), the long-term mean value ranged from 75.73 m to 73.83 m (Environment Canada, 1995).

Lake Ontario level regulation is governed by the International St. Lawrence River Board of Control in accordance with the criteria in the International Joint Commission's (IJC) 1952 Order of Approval and its 1956 Supplementary Order. The Board is currently testing new plans.

9.2 Effects of Water Level Fluctuations

Water level fluctuations are not necessarily bad. In fact, they form a process which is natural to the fish and wildlife inhabiting the Great Lakes. Wetlands require fluctuating lake levels to enhance their productivity. Periodic flooding is necessary to maintain a variety of plant communities at different stages and to enhance the wetland's ability to support a diversity of fish and wildlife species. However, extreme or extended periods of high and low water levels can cause undesirable results. Recreational boating facilities are sensitive to fluctuating levels. Docks can be inundated or left high and dry. Low water levels can aggravate pollution problems by reducing the water's dilution capacity. High lake levels compound shoreline erosion and flooding, especially when storm induced waves pound the shoreline. Flooding and erosion are natural processes, but they can cause extensive damage to shore property.

A monthly publication entitled LEVEL*news* is produced by Water Issues Division, Environment Canada-Ontario Region. More information/copies are available at:

Great Lakes-St. Lawrence Water Level Information & Geomatics Office
867 Lakeshore Road
Burlington, Ontario
L7R 4A6
Tel. (905) 336-4580
e-mail: ralph.moulton@cciw.ca

9.3 RECOMMENDATIONS

1. Obtain copies of the LEVEL*news* publication to keep informed of water levels.

2. Ensure that new construction is well back from the shoreline beyond the area that is subject to flooding, erosion and dynamic beach hazards.

3. Remove unsecured items from flood and erosion prone areas during periods of high water and storms.

10. POLLUTION

In general, water quality problems in Lake Ontario are related to three broad groups of pollutants--persistent toxic substances, nutrients, and bacteria.

Toxic Substances

Toxic substances are a serious problem when they become concentrated in the food web and cause reproductive or other health problems in fish-eating species. Levels of most toxic substances have decreased dramatically since the 1970's in lake waters, fish flesh and wildlife species. Of the 41 organic contaminants measured in the Environment Canada offshore monitoring program in 1990, only PCBs remain above the provincial criteria for the protection of aquatic life. Continuing efforts are required to realize the goal of virtual elimination of persistent toxic substances from Lake Ontario (WRT, 1995).

Nutrients

Nutrients, such as phosphorus, are not directly toxic but can cause massive blooms of algae, which die off and decay causing oxygen depletion in deeper waters, taste and odour problems in drinking water, and aesthetic concerns along the shore. Total phosphorus concentrations in Lake Ontario peaked in 1972 and have decreased to meet provincial guidelines since 1986. Phytoplankton (very small, drifting plant organisms) in the open lake have also decreased by at least 50% as a result. In the central and western portion of Lake Ontario (from Oshawa to Burlington) nearshore phosphorus levels still exceed provincial guidelines because of tributary contributions and local inputs. Stormwater management and sound agricultural practices in contributing watersheds are required to reduce phosphorus loadings (WRT, 1995).

Bacterial Pollution

Bacterial pollution, usually related to sanitary sewage and stormwater, can result in beaches being posted to warn people of health risks associated with swimming. Ongoing efforts to reduce bacterial loadings in stormwater runoff, combined sewer overflows and from faulty septic tanks is required (WRT, 1995).

The 1987 Protocol to the Canada-U.S. Great Lakes Water Quality Agreement committed both countries to concentrate efforts in 43 Areas of Concern (AOC) in order to improve overall water quality in the basin. The Great Lakes Cleanup Fund has provided Environment Canada with $55 million dollars to help develop and demonstrate clean up and pollution prevention technologies, and implement clean up activities in the 17 Canadian Areas of Concern. One function of the Cleanup Fund is to work toward the virtual elimination of persistent toxic substances. Everyone can pitch in by learning about and adopting an environmentally-friendly lifestyle.

Cramahe Township Concerns

Cramahe residents indicated two specific concerns relating to "pollution" along the Cramahe shorelands: litter and the use of road binder.

Landowners noted that litter and garbage are strewn along the shoreline. Some of this may result from litter being left on the beaches by shoreline users. Windblown litter may also collect along the shoreline and garbage also washes up on the shore. This concern can only be addressed if everyone pitches in to reduce the amount of garbage generated and ensures that it is disposed of properly. Ongoing clean-up efforts can help control the problem.

Spreading road binder (black liquor) too close to the water was also identified as a concern. The concern relates to the low concentration of dioxins in the liquid. The application instructions for spreading road binder state that it should not be applied within 50 metres of a watercourse. Following these guidelines is a municipal responsibility. The production of black liquor is being phased out over the next 3 years.

10.1 RECOMMENDATIONS

1. Reduce, reuse, recycle.

2. Dispose of hazardous wastes only at designated Household Hazardous Waste Collection Sites.

3. Refrain from throwing scrap metal and household items over the bank.

4. Organize an annual "trash bash" or "adopt-a-beach" clean-up effort with a local school, community group, or with your neighbours.

5. Ensure that road binder is being applied in accordance with the application instructions (not within 50 metres of a watercourse).

6. Use environmentally-friendly products (eg. cleaners, exchange lead sinkers and jigs for non-toxic alternatives).

7. Adopt environmentally-friendly land use/lifestyle practices (reduce uses of fertilizers and pesticides, naturalize your lawn).

8. Ensure that sewage disposal systems are maintained properly (pump out septic tanks every 3 to 4 years, don't dispose of chemicals down the toilet).

11. PERMITS

The shoreline is a complex and dynamic area. Alterations to the shoreline can affect the way the shoreline buffers and absorbs wave energy from the lake and can have an effect on both aquatic and terrestrial habitats. Because of the broad range of issues, several agencies and pieces of legislation apply to shoreline work. The Waterfront Regeneration Trust has prepared A Guide to Great Lakes Shoreline Approvals in Ontario (Luste & Paley, 1996) that outlines the legislation and addresses and phone numbers you may be required to contact. While changes are currently being made (eg. approval agencies, legislation), this guide provides valuable background information regarding the shoreline works approval process.

Most projects along the shoreline require a permit under one or more of three basic pieces of legislation (Luste & Paley, 1996). These permits are the responsibility of the Ministry of Natural Resources. The Peterborough office (1-705-755-2001) is responsible for Cramahe Township.

Lakes and Rivers Improvement Act: If the proposed project is in, or connected to, a lake, river, or if it will hold back, forward or divert water, a permit may be required under this Act.

Public Lands Act: If the proposed structure will be in the water, and the bed of water is owned by the Crown, a permit may be required under this Act

The Fisheries Act: If the activity will result in the disruption or destruction of fish habitat then a permit will be required under this Act. (The Act is under the jurisdiction of the Federal Department of Fisheries and Oceans, but is administered by the Ontario Ministry of Natural Resources.)

Approval under other legislation (see Table 4) may be required for:

--work across navigable water
--dredging or filling activities
--work within designated fill lines
--certain construction activities (water works or sewage works)
--changes in land use
--removal of plant material

TABLE 4	LEGISLATION & APPROVAL AGENCY
LEGISLATION	**AGENCY**
Lakes and Rivers Improvement Act	Ministry of Natural Resources
Public Lands Act	Ministry of Natural Resources
The Fisheries Act	Ministry of Natural Resources (Fed. Dept of Fisheries and Oceans)
Navigable Waters Protection Act	Transport Canada
Aggregate Resources Act	Local municipality
Fill, Constr. & Alteration to Waterways Regulation	Conservation Authority
Environmental Protection Act	Ministry of Environment and Energy
Ontario Water Resources Act	Ministry of Environment and Energy
Planning Act (OP/ZBAs)	Local municipality
Municipal Act	Local municipality
Trees Act	Local municipality
Environmental Assessment Act	Ministry of Environment and Energy

Before undertaking any work in or near the water, landowners must ensure that they have approvals to proceed from the appropriate agency(ies). A copy of the WRT publication A Guide to Great Lakes Shoreline Approvals in Ontario (Luste & Paley, 1996) will be helpful in getting you started on your shoreline project. Copies are available by contacting:

Waterfront Regeneration Trust
Tel.: (416) 314-9490 Fax: (416) 314-9497 E-mail: info@wrtrust.com
or
Lower Trent Conservation
Tel.: (613) 394-4829 Fax: (613) 394-5226) E-mail: ltrca@connect.reach.net

Currently, several pieces of provincial legislation are under review through the Who Does What? and Red Tape Review Committees. Streamlining of the approval process may result from these reviews through revisions to applicable acts and regulations, the development of memoranda of agreements between agencies and municipalities, and by implementing a one-window approach to service delivery.

11.1 RECOMMENDATIONS

1. If proposing to undertake work, obtain a copy of A Guide to Great Lakes Shoreline Approvals in Ontario (Luste & Paley, 1996).

2. Ensure that the work is necessary--consider alternatives.

3. Make sure all approvals have been obtained before commencing work.

4. Conservation Authority staff should be contacted for direction, if the Township or landowners are unsure of what permits are required.

12. PRIVATE PROPERTY AND PUBLIC ACCESS

Cramahe Township residents have indicated that they appreciate their privacy along the lakeshore and expressed concerns for their rights as property owners. To address this concern in completing this project, Lower Trent Conservation obtained permission from landowners prior to entering onto any lands.

Some Cramahe landowners noted that their properties extend onto the bed of the lake. Landowners can verify this by checking their deeds/surveys. (Please note that land ownership does not alter the need to obtain approvals to undertake work in or near the water.)

No interest was expressed with regards to developing parkland or public access to the lake. Often, public access to the waterfront is an important consideration in developing an integrated shoreline management plan. It allows landowners and visitors to the area, opportunities to view the lake, view wildlife, swim, fish, or launch a boat. This human connection with the lake, increases public awareness of environmental issues, promotes a healthy lifestyle and stimulates economic activity. A public area on the waterfront can be community focal point and an economic draw for tourists.

The Waterfront Trail remains road-based in Cramahe Township and there are no public parks or beaches along the shoreline. There are some areas of limited access where the Township road allowance extends to the water. In addition, some landowners have permitted entry to their property for fishing in the mouths of the creeks. Access to the shoreline is available to the east (at Presqu'ile Provincial Park) and to the west at Haldimand Boat Launch and the Haldimand Conservation Area.

Other reasons for maintaining road allowances in public ownership include: access to the shoreline for emergency work and emergency rescues; ongoing surveying of the established Erosion Monitoring Stations located on the road allowances; and future access to the shoreline for utilities (water, sewer, storm sewers). While public access may not be a priority for Cramahe residents at this time, it may be in the future. By maintaining lands that are now in public ownership, the municipality can avoid the costs of land acquisition at market value, should access to the shore be needed in the future. For all of these reasons, Lower Trent Conservation recommends that the Township refrain from closing or selling road allowances that extend to the Lake. Through appropriate signage, public access onto adjacent private lands can be discouraged.

12.1 RECOMMENDATIONS

1. The Township should refrain from closing or selling road allowances that extend to the lake.

2. The Township and residents should consider the environmental, economic and social benefits of improving public access to the shoreline.

13. CONCLUSIONS

The Cramahe Shorelands is a good example of a healthy ecosystem. The natural features and rural character of the area, combine with the beauty of the lake to provide a significant landscape. Most of the shoreline is unaltered and provides a sharp contrast to the developed shorelands in the west end of the lake. If the natural features are protected and development occurs in an orderly, planned fashion, Cramahe residents and visitors to the area will appreciate and value the shorelands for years to come.

Small pockets of residential development are located along the lake. Many of the houses within these areas are subject to shoreline hazards (erosion and flooding). Included in this report are options for shoreline works that, if implemented, will provide some degree of protection for these houses. Planning recommendations have also been provided to ensure that further development is not subject to these same hazards.

For those portions of the shoreline that are not developed, erosion/flood protection work is not recommended. If large portions of the shoreline were hardened, impacts may be felt on the lake ecosystem. In any event, shore treatment works are rarely cost-effective in an undeveloped area.

13.1 MONITORING

Long-term monitoring will provide better information on shoreline processes and will provide a measure of ecosystem health. As a minimum, it is recommended that the Township have the erosion monitoring stations re-surveyed every two years. In addition, setting up a marsh monitoring program would provide an indicator of ecosystem health. This could be done by a local naturalist club. The local ratepayers group could take on the role of setting up a report card or preparing an annual newsletter to monitor changes to the shorelands and evaluate ecosystem health. The nine principles set out by the Waterfront Regeneration Trust for the Lake Ontario Waterfront may be helpful in this regard.

Lower Trent Conservation is prepared to act in an advisory role to groups that are willing to take on these roles. By working together, we can continue to enjoy the natural beauty of the Cramahe Township Shorelands and ensure that it remains healthy for the enjoyment of future generations.

REFERENCES AND SUGGESTED READING

The following is a list of reports and publications that were referenced in preparing this report and/or are recommended as a source of further information about shoreline processes and management.

ENVIRONMENTALLY-FRIENDLY LIFESTYLES

(The following publications provide suggestions for adopting an environmentally-friendly lifestyle. The appropriate agency should be contacted to determine the availability of these or similar publications.)

CLEAN & GREEN--CREATING A HEALTHY HOME AND GARDEN
Centre & South Hastings Recycling Board, 1994

ENVIRONMENTAL LIVING: PROTECTING THE ENVIRONMENT
Vol. 1....In Your Home
Vol. 2...In Your Yard and Garden
Vol. 3...When Building or Buying Your Dream Cottage
Vol. 4...At the Cottage
Vol. 5...In The Great Outdoors
Ministry of Environment and Energy

THE BLUE BOOK
Centre & South Hastings Recycling Board, 1994

THE COMPOST BOOK
Centre & South Hastings Recycling Board, 1995

NATURAL AREAS

BASELINE ENVIRONMENTAL INVENTORY FOR HUNT AND BEACH WETLAND, SPENCER POINT WETLAND AND SALEM CREEK MOUTH
Portiss and D. Moro, 1996: Metro Region Conservation

ENVIRONMENTAL SENSITIVITY ATLAS FOR LAKE ONTARIO'S CANADIAN SHORELINE
Environment Canada, 1992: Minister of Supply and Services Canada

WATERFRONT NATURAL AREAS --Part I
A Biological Inventory and Evaluation of 28 Natural Areas along the Lake Ontario Waterfront from Newcastle to Trenton
Brownell, 1993: Waterfront Regeneration Trust

WATERFRONT NATURAL AREAS--Part II
An Overview of Natural Areas along the Lake Ontario Waterfront from Burlington to Trenton
Brownell, 1993: Waterfront Regeneration Trust

WETLAND EVALUATIONS: Popham Bay, Spencer Point, Colborne Creek Wetlands
Ministry of Natural Resources, Peterborough, Ontario

WORKING AROUND WATER? (MNR Fact Sheets)
What You Should Know About Fish Habitat
What You Should Know About Fish Habitat and Work Permits
What You Should Know About Fish Habitat and Dredging Boat Channels and Swimming Areas
What You Should Know About Fish Habitat and Building Materials
What You Should Know About Fish Habitat and Controlling Aquatic Plants
What You Should Know About Fish Habitat and Docks and Boathouses
What You Should Know About Fish Habitat and Building a Beach
What You Should Know About Fish Habitat and Erosion Control
What You Should Know About Fish Habitat and Constructing Ponds
Ministry of Natural Resources, 1991 - 1996

PERMITS

A GUIDE TO GREAT LAKES SHORELINE APPROVALS IN ONTARIO
Luste and Paley, 1996: Waterfront Regeneration Trust

PHYSIOGRAPHY AND SOILS

PHYSIOGRAPHY OF SOUTHERN ONTARIO
Chapman, L. and D. Putnam, 1984: Ontario Geological Survey

THE SOILS OF NORTHUMBERLAND COUNTY, Report 42 of the Ontario Soil Survey
Hoffman, D.W. and C.J. Acton, 1974: Research Branch, Agriculture Canada and the Ontario Agricultural College

PLANNING POLICIES

IMPLEMENTATION AND TECHNICAL GUIDELINES (for planning policies)
Ministry of Natural Resources, various dates and drafts

PROVINCIAL POLICY STATEMENT
Province of Ontario, 1996: Queen's Printer

SHORELINE HAZARDS

BACKGROUND REPORTS (untitled--prepared for Cramahe Shorelands Project)
Shoreplan Engineering Limited, dated October 8, 1996 and January 24, 1997

BUYERS GUIDE TO SHORELINE PROPERTY--GREAT LAKES AND ST. LAWRENCE RIVER
Environment Canada, 1995

CANADA-ONTARIO FLOOD DAMAGE REDUCTION PROGRAM (Mapping for Lake Ontario)
Environment Canada and Ministry of Natural Resources

EROSION MONITORING STATION RECORDS for EMS0830, EMS0835, EMS0840
(on file at Lower Trent Conservation)

GREAT LAKES SHORE DAMAGE SURVEY (mapping)
Environment Canada and Ministry of Natural Resources, 1985

REGULATORY DYNAMIC BEACH DELINEATIONS (Memorandum re: Distribution of Technical Support Material)
Ministry of Natural Resources, March, 1995

SANDWELL SWAN WOOSTER LAKE ONTARIO SHORELINE MANAGEMENT PLAN (Prepared for Central Lake Ontario, Ganaraska Region and Lower Trent Region Conservation Authorities)
Sandwell, 1990

SHORE MANAGEMENT

LAKE ONTARIO GREENWAY STRATEGY
Waterfront Regeneration Trust, 1995

LAKE ONTARIO GREENWAY STRATEGY: NEXT STEPS
Waterfront Regeneration Trust, 1995

LAKE ONTARIO SHORELINE EROSION AND WETLANDS INVENTORY
Lower Trent Region Conservation Authority, 1985

SHORE MANAGEMENT OPPORTUNITIES FOR THE LAKE ONTARIO GREENWAY
Waterfront Regeneration Trust, 1996

SHORELINE MANAGEMENT PLAN (DRAFT)
Lower Trent Region Conservation Authority, 1990

WATER LEVELS

GREAT LAKES WATER LEVELS
Yee, Peter and Jim Lloyd, 1993: Environment Canada

LEVEL*news*
Environment Canada, 1995: vol. 3, no. 11, Nov. 6, 1995 (monthly publication)

WATER LEVELS Bulletins
Canadian Hydrographic Service, Canada Centre for Inland Waters, (monthly publication)