AUSABLE-BAYFIELD CONSERVATION AUTHORITY

SHORELINE MANAGEMENT PLAN

SECOND EDITION

2000

ABCA MISSION STATEMENT

The mission of the Ausable-Bayfield Conservation Authority is ~
to provide leadership and management in co-operation with the community
to maintain and enhance the watershed resources now and in the future.

SHORELINE VISION STATEMENT

The Shoreline Management Plan is based on a vision for the future
where continuing shoreline erosion,
the occurrence of severe storms and bluff failure
are not accompanied by unpredicted hardships to shoreline property,
where beaches exist along the shoreline,
where access to the lake is achieved,
and where the environment and natural landscape of the shoreline continuously improves.

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Cover Photo: Lake Huron shoreline (north of Grand Bend)
1999 photo by Patrick Donnelly

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ACKNOWLEDGEMENTS

The Ausable-Bayfield Conservation Authority (ABCA) would like to express its appreciation for the time and effort of everyone who contributed to the development of the Shoreline Management Plan (SMP). We would particularly like to acknowledge the help we received from the Shoreline Management Committee which was composed of the Project and Technical Committees. These dedicated individuals, representing many organizations, worked long hours to aid in putting this plan together. Below is a list of the individuals and the organization they represent.

Project Committee

Cornelius Brand	Township of Goderich
Lloyd Huffman	Village of Bayfield *(initial member was Ed Kelly)*
Richard Erb	Township of Stanley
Lionel Wilder	Township of Hay
Gary Eagleson	Township of Stephen
Phil Maguire	Village of Grand Bend *(initial member was Dennis Snider)*
Jack Lasenby	Township of Bosanquet *(initial member was Fred Thomas, followed by Peter Hegler)*
Dick Peever	Egerton Beach Cottage Association
Bill Buston	Cedarbanks Cottage Association
Una Amos-Brown	Norman Heights Cottage Association
Mathew Tuckey	Southcott Pines Association
Douglas Banks	Lake Huron Preservation Association *(participant as an observer after February 1993)*

Technical Committee

Steve Bowers	Ministry of Natural Resources, Wingham Office *(initial member was Ron Spurr)*
Brian Treble	Huron County Planning and Development Department *(initial member was Carol Leeming)*
Anne Marie Howard	Lambton County Planning Dept.
Terry Crabe	Pinery Provincial Park
Ed Harrison	Huron County Public Health Dept.
Dave Ward	Ministry of Natural Resources, Aylmer Office *(initial member was Wayne Rowe)*
Mark Law	Ministry of Natural Resources, Lands and Water Policy Section, Toronto
Geoff Peach	Maitland Valley Conservation Authority
Dave Sawyer	St. Clair Region Conservation Authority
Alec Scott	Ausable-Bayfield Conservation Authority
Terry Chapman	Ausable-Bayfield Conservation Authority
Patrick Donnelly	Ausable-Bayfield Conservation Authority

The original 1994 report was prepared by Patrick Donnelly, ABCA, with support from Dave Anglin and Bill Baird of Baird & Associates, Ottawa, and Snell and Cecile Ltd. (Environmental Consultants), Beard Winter and Associates (Law Office), and Geomatics International Ltd. (Geographic Information Systems).

EXECUTIVE SUMMARY

Observations of the Great Lakes shorelines made over a number of years clearly demonstrate two phenomena that are of considerable concern to landowners and organizations with planning responsibilities. These phenomena are that, at many locations, the shoreline continues to slowly change through a process of erosion or accretion, and that during storms — particularly those during periods of high water level — considerable damage occurs at the shoreline.

In response to these issues, and especially the latter issue of storm damage and flooding, the Ministry of Natural Resources (MNR) drafted guidelines for preparation of Great Lakes shoreline management plans with the objective of preventing recurrence of shoreline damage.

Responsibility for implementation of these guidelines was given to the Conservation Authorities, recognizing the local knowledge, interests and concerns of each Conservation Authority along the different shorelines of the Great Lakes. It also recognized the close involvement with the municipalities under which the Conservation Authorities operate.

This report describes the Shoreline Management Plan developed by the Ausable-Bayfield Conservation Authority for that section of the Lake Huron shoreline within its jurisdiction.

Recognizing the need for a plan which would be effective in its implementation and accepted by lakeshore users, project and technical committees were formed to provide local knowledge, expertise, direction and guidance to the creation of a SMP. These committees proved to be of great benefit to the development of the Plan.

In isolation, the Plan has no status. Its strength is contingent upon consensus of the various groups which form the Steering Committee. The Steering Committee was composed of two subcommittees: the Project Committee (with municipal and cottage association representatives as members) and the Technical Committee (with membership from County Planning Departments, Ministry of Natural Resources offices, Pinery Provincial Park and adjacent Conservation Authorities. The Plan is intended to implement provincial policy regarding lakeshore hazards. It is also written to assist other municipal, provincial and federal government agencies who, by nature of their work, focus on the lakeshore and its unique characteristics and hazards. Much of the data contained within this Plan is not new; however, it is collected and summarized into this document to provide a separate comprehensive planning guide specifically for the lakeshore.

A first step was to identify the principal concerns of the community that relate to the shoreline, as well as opportunities that a shoreline management plan could provide — while recognizing that the main thrust of the Plan was to be the prevention of damage through proper management. This was accomplished through a polling of landowners and interested persons who attended two Public Meetings (July 20, 1990 and July 26, 1991) on the topic of shoreline management. This was a valuable exercise that documented concern for shoreline stabilization and storm damage protection, the environment, water-dependent activities, improved public space and economic development.

Previous studies have described the dynamic nature of the shoreline, illustrated by the fact that many thousands of cubic metres of sand are transported along the shoreline to the south each year by wave action and that sections of the shoreline are eroding at rates varying from zero to greater than one metre per year.

The process of long-term erosion and accretion that has occurred to the shoreline was determined and erosion hazard areas were defined; this was completed using a 1935 shoreline survey and recent 1988 photogrammetric mapping. Lines were drawn on 1:2,000 scale maps to indicate the probable future shoreline position in 100 years, based on an extrapolation of the 1935-to-1988 shoreline comparison.

In the short term — typically during severe storms or during periods of high rainfall in the spring — severe damage may occur as a result of a localized bluff failure. During periods of high water levels, flooding and wave damage to structures built close to the shoreline may also occur. These damages are very site-specific and can best be avoided by either defining hazard areas or following improved design procedures for structures.

Bluff stability issues are addressed by defining a line set back from the base of bluff a distance defined by the intersection by a 3 (horizontal) to 1 (vertical) slope with the elevation of the top of the bluff. Within this area, there is a risk of sudden failure of the bluff. Limits of flooding are addressed by defining a line which is the limit that waves could reach during a water level event with a probability of occurrence of once in 100 years.

With this information, guidelines were drafted to direct development along the shoreline, consistent with the Provincial Policy Statement *(1997)*. This consisted of defining hazard areas on which new development should not occur and where redevelopment of existing areas should be scaled to the degree of hazard which exists.

Some of the dilemmas and issues to be faced in the development of a shoreline management plan became clear. These included:

- The bluff shoreline in many areas is naturally eroding and many riparian property owners want to stop that process and maintain their property.
- Erosion of the bluffs provides 1) the sand that makes up the beach at the base of the bluff, and 2) the sand that maintains the extensive beaches between Grand Bend and Kettle Point.
- If the shoreline and the area landward are effectively stabilized, the nearshore lake bottom may continue to erode, exposing the shoreline to more severe wave conditions.
- The cost of structures designed to stabilize the shoreline may be very high and incompatible with the value of the property.
- We must recognize that land adjacent to the shoreline is a natural hazard area where the shoreline may be eroding and there is risk of flooding, damage by storms and bluff failure. Along much of the shoreline, residences have already been built in this hazard area.
- Bluff failure is a complex phenomenon with many possible contributing factors.
- Ownership of the shoreline/beach at some locations is not clearly understood and requires verification to ensure that actions, such as the construction of protection structures, are completed subject to the necessary approvals.
- Groynes are shoreline structures that have been extensively used in some areas, either to provide a beach for recreation or as shore protection. In some cases, these structures have been claimed to be the cause of erosion to adjacent properties.

In response to the concern of shoreline owners with stabilization of the shoreline and prevention of damage during storms, the document, "Considerations for Shore Protection Structures" *(Baird, 1992)* was prepared as part of this shoreline management plan. These guidelines describe the shoreline process to be considered in designing structures, and provide examples of different designs. In general, this demonstrates that structures designed to stabilize the shoreline in areas where significant erosion is taking place will be extremely costly and it is unlikely that they will ever be built given the current political and economic climate. For these reasons, the most effective response to mitigating shoreline hazards in severely affected areas may range from structural measures to the relocation of the residence away from the shoreline.

In addition, the guidelines provide design considerations for specific shore structures. It is noted that continuing erosion of the shoreline is controlled by erosion of the nearshore lake bottom and, as very little is known about the lake bottom in terms of erosion rates or its composition, this should be further investigated. This design factor may make shore protection unfeasible and further substantiates that the recommendation of residence relocation be given consideration as a long-term solution.

The Shoreline Management Plan provides a detailed description of the shoreline, with maps that include lines marking flood limits, future erosion, stable slope allowances for bluffs and areas of beaches where the features are constantly changing in response to waves and wind. These limits form the basis for a policy to control development in order to prevent future storm-related damage. This policy is explained in detail.

In summary, the Shoreline Management Plan is based on a vision for the future where continuing shoreline erosion, the occurrence of severe storms, and bluff failure are not accompanied by unpredicted hardships to shoreline property owners, where beaches exist along the shoreline, where access to the lake can be achieved and where the environment and natural landscape of the shoreline continuously improve.

Ipperwash Beach, Town of Bosanquet 1993

CHAPTER ONE / INTRODUCTION

PHOTO: AUSABLE-BAYFIELD CONSERVATION AUTHORITY

SHORELINE MANAGEMENT PLAN

In the fall of 1986, the waters of the Great Lakes rose to record levels. Wave action during storms occurring in this period caused damage to thousands of lakeshore properties. To respond to public concern, the Province of Ontario appointed an advisory group to investigate, review and make recommendations concerning shoreline management. This group, called the Shoreline Management Advisory Committee, recommended that a pro-active approach to shoreline management be undertaken by the Conservation Authorities, which are existing organizations involved in resource management on a watershed basis.

Primarily on these recommendations, the Minister of Natural Resources delegated responsibility of shoreline management to the individual Conservation Authorities which have jurisdiction along the Great Lakes shoreline.

The principal objective of a Shoreline Management Plan is to reduce or eliminate damage that may occur to residences or development adjacent to the shoreline during severe storms in periods of high water and prevent new development from occurring in hazardous areas. To respond to this objective, a SMP typically:

- identifies areas associated with flooding, erosion, storm damage, bluff failure and blowing sand,
- establishes setbacks from the shoreline for new development, and
- provides shoreline management options, including protection, for existing developed areas.

In isolation, the Plan has no status. The strength of the Plan is contingent upon the consensus of various groups which form the Steering Committee. In this case, the Steering Committee was composed of two subcommittees: the Project Committee (with membership consisting of municipal and cottage association representatives) and the Technical Committee (with membership from County Planning Departments, Ministry of Natural Resources offices, Pinery Provincial Park and adjacent Conservation Authorities).

The Plan is intended as a reference document to direct changes to the land use planning documents of the lakeshore municipalities. It is also written to be of assistance to other municipal, provincial and federal government agencies who, by nature of their work, focus on the lakeshore and the unique characteristics and hazards it possesses. Much of the data contained within this Plan are not new, however; they have been collected and summarized into this document to provide a separate comprehensive planning guide specifically for the lakeshore.

In February 1988, the Ausable-Bayfield Conservation Authority (ABCA) became the lead government commenting agency for land use planning as it relates to the hazards of flooding and erosion along the Lake Huron shoreline, stretching from the north end in Lot 30, Concession 1, Goderich Township to the south, including the Village of Bayfield, Townships of Stanley, Hay, Stephen and the Village of Grand Bend to the southerly limit in Bosanquet Township at the community of Port Franks *(see Figure 1)*.

The ABCA was directed to prepare a Shoreline Management Plan to include these seven municipalities. Several background reports and data were gathered to support the development of a SMP. These reports included the "Lake Huron Shore Processes Study" *(Reinders, 1989)*, which addressed the entire southeastern shore of Lake Huron, an "Inventory of Erosion Control Structures" *(ABCA, 1990)*, "Considerations for Shore Protection Structures" *(Baird, 1994)* and detailed 1:2,000 scale mapping for the shoreline.

The Provincial Policy Statement was adopted in 1997. This land use planning document provides specific hazard criteria for the Great Lakes/St. Lawrence System including the Lake Huron shoreline. These hazards — described as flooding, erosion, and areas of dynamic beach — all apply to the specific shoreline described by this SMP.

SECTION 1.2 PROVINCIAL POLICY CONCERNING SHORELINE MANAGEMENT PLANS

On a lake-wide basis the role, components, objectives and principles of Ministry of Natural Resources policy with regard to shoreline management are stated in the "MNR Guidelines for Developing Great Lakes Shoreline Management Plans" *(MNR, 1987)*:

Role of Government

- To provide order and equity in the use/non-use of Great Lakes-St. Lawrence River shore lands; and
- To protect society, including all levels of government, from being forced to bear unreasonable social and economic burdens of unwise land use.

SHORELINE MANAGEMENT PLAN, CONTINUED

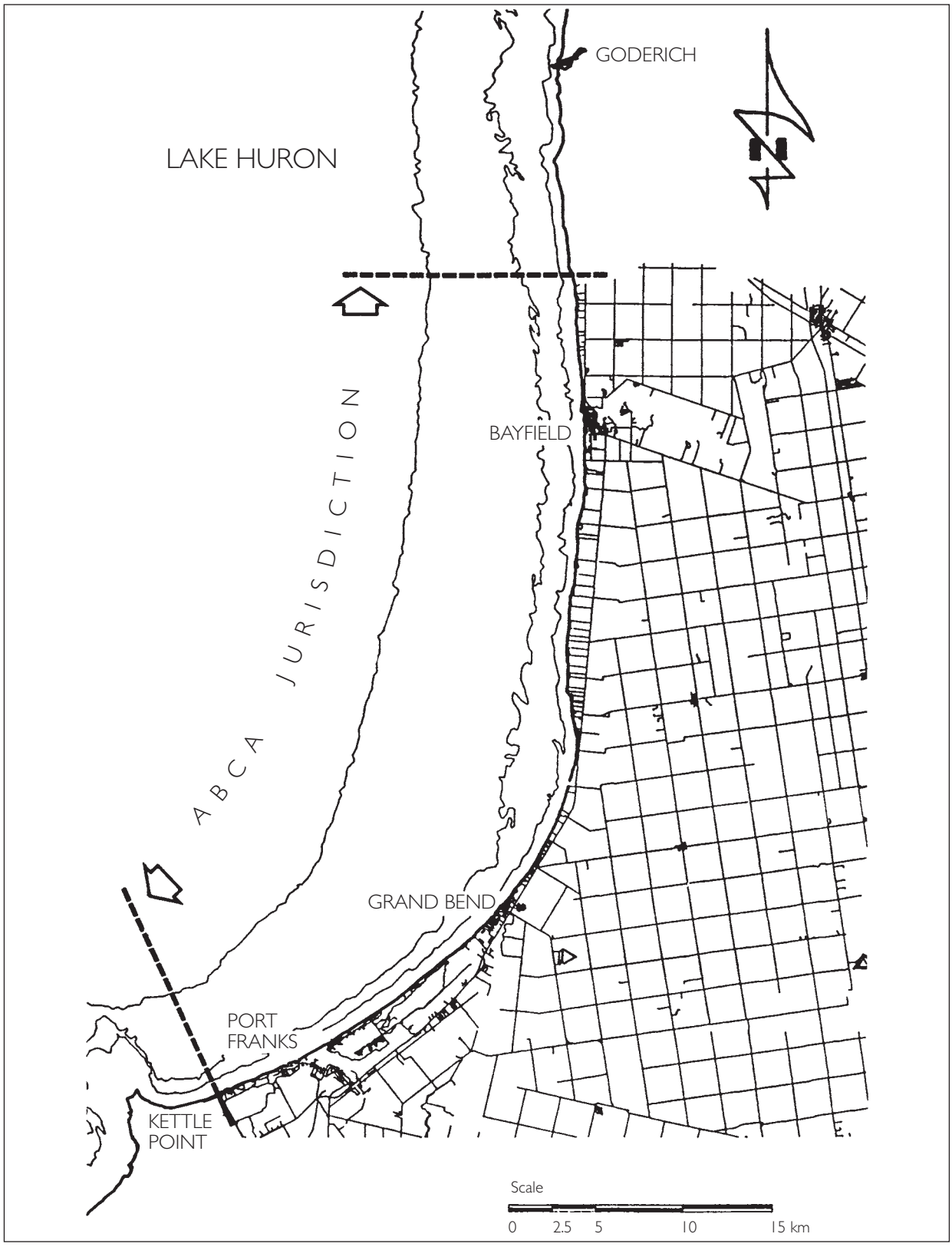


Figure 1 - Ausable-Bayfield Conservation Authority Area of Jurisdiction

SHORELINE MANAGEMENT PLAN, CONTINUED

Components of Management of Shores Susceptible to Flooding, Erosion, Storm Damage, Unstable Bluffs and the Action of Wind (Beaches)

Prevention — Land use planning, regulation development, and public awareness

Protection — Non-structural/structural measures and residence relocation

Emergency response — Flood forecasting/warning and flood/erosion disaster relief

Environment — Impact assessment of land use on the shoreline environment

Public information — Ensure public participation and input into creation and implementation of shoreline management

Monitoring — Monitor changes to local conditions affecting shoreline management and modify the SMP at appropriate intervals

OBJECTIVES of Ministry of Natural Resources Shoreline Policy

- To minimize risks to life, property damage and social disruption; and
- To encourage a co-ordinated approach in the wise use and management of lands susceptible to flooding and/or erosion.

PRINCIPLES of Ministry of Natural Resources Shoreline Policy

- Effective shore land management can only occur on the basis of a comprehensive littoral cell or shoreline sediment compartment with consideration to shore processes and updrift/downdrift effects of development;
- Local conditions, including geophysical, hydrophysical, environmental, economic and social characteristics vary from one reach to another and thus must be taken into account in the planning and management of flood and/or erosion susceptible lands;
- The degree of risk (threat to life and property damage) can vary from shore lands to shore lands; the potential for development to safely occur may exist in some shore land locations and may be too hazardous in other shore land locations;
- New development susceptible to flood, erosion, and/or other water-related hazards (including the dynamic nature of sand) or which will cause or aggravate flood, erosion and/or other water-related hazards to existing and/or approved uses and shore lands, must not be permitted to occur unless the flood, erosion and/or other water-related hazards have been addressed — *No development or site alteration is permitted within the defined portion of the dynamic beach*;
- Shore land development, where permitted, will be undertaken in an environmentally sound manner in recognition of other resource values;
- Shore land management and land use planning are distinct, yet allied, activities that require overall co-ordination on the part of municipalities, Conservation Authorities, the Ministry of Natural Resources and the Ministry of Municipal Affairs;

Provincial Policy Statement

The Provincial Policy Statement *(1997)* includes reference to shoreline-related hazards and the need for co-ordinated resource management initiatives under which Shoreline Management Plans can be described. The entire document is provided in Appendix B.

- In Section 1.1, Developing Strong Communities, it states: "…a co-ordinated approach should be achieved when dealing with issues which cross municipal boundaries, including…shoreline and riverine hazards;" *(Sec. 1.1.1 e.3)* and that…"Development and land use patterns which may cause environmental or public health and safety concerns will be avoided" *(Sec. 1.1.1.f)*.
- In Section 2.3, Natural Heritage, it states that development and site alteration are not permitted within specified wetlands and portions of habitat, and restricts development where fish habitat, wildlife habitat, woodlands, valleylands and areas of natural and scientific interest exist without eliminating negative impacts *(Sec. 2.3.1)*. Also under this section, the diversity of natural features and the natural connections between them should be maintained, and improved where possible *(Sec. 2.3.3)*.
- In Section 3.1, Natural Hazards, it states: "Development will generally be directed to areas outside of hazardous lands adjacent to the shorelines of the Great Lakes - St. Lawrence River Systems…which are impacted by flooding, erosion, and /or dynamic beach hazards *(Sec. 3.1.1.a)*.

"Development and site alteration will not be permitted within defined portions of the dynamic beach *(Sec. 3.1.2.a)*.

"Except as provided in policy 3.1.2, development and site alteration may be permitted in hazardous lands…provided that all of the following can be achieved:

SHORELINE MANAGEMENT PLAN, CONTINUED

a) the hazards can be safely addressed, and the development and site alteration are 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 terminology is defined in the PPS *(Appendix B)* and further explained in Chapter 3.3, Lakeshore Development Guidelines of this document.

The objective of this specific shoreline management plan is to:

- implement the Provincial Policy Statement and MNR policy guidelines while…
- considering the unique characteristics of the shoreline,
- the requirements of the community and
- the responsibilities of the Ausable-Bayfield Conservation Authority.

SECTION 1.3 OVERALL OBJECTIVES OF THE ABCA SHORELINE MANAGEMENT PLAN

Objectives of this plan are:

1) To prevent storm-related damage to residences adjacent to the shoreline by designating hazard areas and by implementing a policy that prevents development and significant reconstruction in this area; and by providing guidelines for the design of properly engineered shore protection structures to be built in relation to existing development that fully consider the dynamic nature of the shoreline and potential impact on adjacent properties;

2) To identify and document shoreland hazards and bring these facts to the attention of the shore community;

3) To improve the environment and quality of life in the area adjacent to the shoreline by designating environmentally important areas and by encouraging and supporting the implementation of existing regulations designed to conserve the natural environment;

4) To provide a basis for continuing economic development of the region through effective planning that maintains the high quality of the environment of the region;

5) To provide a plan for the future so that future generations can enjoy an improved quality of life in the region.

To meet these objectives, the shoreline management plan contains the following:

- detailed description of the shoreline and shoreline processes,
- 1:2,000 scale maps showing flood limits, calculated extent of future erosion, stable slope allowances (for bluffs) and dynamic beach limits (for sand dune areas),
- policy that controls development within the defined hazard areas,
- guidelines for the design of shore protection structures,
- identification of environmentally significant areas,
- emergency response considerations, and
- recommendations for future monitoring of the shoreline.

SECTION 1.4 IMPLEMENTATION OF THE ABCA SHORELINE MANAGEMENT PLAN

The implementation of this plan is to be achieved with the support of the groups and agencies involved in its preparation, including:

a) adoption of the plan by each of the seven municipalities which share lakeshore frontage;

b) support for the plan by individuals who represent the shoreline community on established steering committees;

c) incorporation of shoreline hazard policies by the Lambton and Huron County Planning Departments into their respective County Official Plans *(Lambton, 1998; Huron, 1999)* which will then be reflected in the lakeshore municipality's planning documents (e.g. zoning bylaws, secondary plans and official plans);

d) support by government agencies with an interest in the shoreline through legislation or regulations; and

e) review of the plan by the general public through open houses, news releases and bulletins during the spring and summer of 1993.

Grand Bend Beach, circa 1920

CHAPTER TWO / BACKGROUND

PHOTO: COURTESY OF LAMBTON HERITAGE MUSEUM

THE ABCA SHORELINE

The shoreline over which the ABCA has jurisdiction can be generally divided into three areas:

1) The northerly section of the shoreline (usually described as the bluff region north of Grand Bend) consists of till bluffs. The northern boundary of the ABCA jurisdiction ends in Lot 30, Concession 1, Goderich Township, almost mid-way between the Village of Bayfield and the Town of Goderich. Along most of the shoreline, adjacent to the top of bluff, are many cottages. A principal issue along sections of this shoreline is the continuing erosion of the bluff and nearshore lakebottom and the associated loss of land. Flooding from Lake Huron is not a principal issue as most development exists above flood elevations. However, surface water drainage problems do occur and aggravate inadequate road and lot drainage, as well as lakebank erosion.

2) The southerly section of the shoreline (generally described as the dune region) consists of the Grand Bend/Pinery/Ipperwash beach; a principal consideration is in maintaining the beach and dune system. The southernmost boundary of the ABCA jurisdiction is the Camp Ipperwash Military Reserve, south of the community of Port Franks.

3) Finally, there are the three river mouths at the communities of Bayfield, Grand Bend and Port Franks. Concerns in these areas include flooding, wind erosion and shoreline stabilization. Flooding in these areas is mainly associated with ice jamming problems or lake storm action, or a combination of both events.

The inland boundary of the shoreline will vary depending on the criteria used to define it. For example, if surface drainage and water quality concerns were used as criteria, then the headwaters of the shoreline gullies located adjacent to the Wyoming moraine (a long, elevated area parallel to the shore of Lake Huron) might be appropriate. For ease of definition, Highway #21 is generally regarded as the inland border for the purpose of this study.

SECTION 2.1.1 LITTORAL CELL MANAGEMENT

The shore area under the jurisdiction of the ABCA is completely contained within a littoral cell stretching from Goderich Harbour in the north to Kettle Point in the south. The value of managing the shoreline on a "littoral cell" basis was documented in the *Lake Huron Shore Processes Study (1989)*; therefore the SMP includes discussion of — and makes recommendations regarding — those locations which are within this littoral cell, but lie outside the ABCA's jurisdiction.

Active participation by the Maitland Valley Conservation Authority and the Chatham, Wingham and Alymer MNR offices in this SMP provided a consistent approach to shoreline managment within the entire littoral cell. The cell is viewed as a key component of the shoreline ecosystem and thus provides the overall boundaries on which to base discussions.

The impact of the Goderich harbour structures on the sediment transport along the ABCA shoreline was discussed in the previously mentioned *Shore Processes Study*. As part of that study, further analysis suggested that bypassing sand around the harbour structure would benefit the shoreline to the south *(Baird, 1992)*. The findings of the recent analyses are discussed in Section 3.2.5, Goderich Harbour Analysis.

SECTION 2.1.2 HISTORICAL SHORELINE SETTLEMENT

Native Settlement

Early history of native settlement along this section of Lake Huron shoreline is limited to archaeological data collected in the area now included within the Pinery Provincial Park and Port Franks area. This general area within the sand dune region formerly supported abundant numbers of wildlife and provided easy access to the lake for the resident natives known as the Attawandarons or "Neutrals". In addition, a readily usable supply of flint for tools and weapons was available from the bedrock outcropping known sometimes as "Stony Point" *(Dixon, 1963)*. Current Indian Reserve property is located near Kettle Point, comprising the Kettle Point/Stoney Point Indian Bands of Chippewas *(Wright,1986)*. Prior to World War II, the land currently occupied by the Ipperwash Military Camp was designated as a reservation for these two tribal councils.

THE ABCA SHORELINE, CONTINUED

Grand Bend (Brewster's Mill)

The present-day village was originally named after a settler who established a saw mill on the banks of the Ausable River. It was later renamed to reflect the course that the river followed as it flowed through this region, making an abrupt "bend" and flowing approximately 13 miles south to Port Franks.

In 1892, a channel was cut through the sand dunes to Lake Huron — as a result, the river mouth and harbour were artificially created at Grand Bend.

The Old Ausable Channel still runs south through the Southcott Pines and Huron Woods residential areas and eventually through Pinery Provincial Park *(Dixon, 1963)*. It is interesting to note that the Parkhill Creek — and not the Ausable River — now provides the flow of water through Grand Bend. *(Refer to the discussion on Port Franks which follows.)*

Bayfield

Named after an admiral in the British navy who undertook extensive surveys of the Great Lakes, the Town of Bayfield was created following the survey of the Bayfield River mouth area at the request of the Baron de Tuyll. This baron was working for the Canada Company during the late 1800s and recognized the area as a potential harbour and settlement. The town was surveyed in a similar fashion to the plan for the Town of Goderich, using a central town square with roads radiating out in a shape similar to spokes in a wheel.

St. Joseph

Although currently only a hamlet at the western end of Highway #84, this community was originally planned to be a major port, canal entrance and railway link to the interior. It boasted a brickyard, organ factory, winery, post office and a hotel, all constructed on the speculation that the site was to be a major transportation link. The architect of optimism was a resident named Narcisse Cantin who promoted the idea of a canal linking Lake Huron (at St. Joseph) to Lake Erie (at Port Stanley). So convincing was he that the federal government built a dock at St. Joseph in 1904; all the calculations were made as to the overall elevation difference between the two lakes and the distance saving that the new canal would make to the St. Lawrence Seaway project, which at that time was also being planned *(Dixon, 1963)*.

Port Franks

As previously mentioned, this area was the natural outlet of the Ausable River since the course of the river turned at Grand Bend and flowed south. However, this region has such an abundance of sand and such strong northwesterly winds that the river outlet has moved to numerous locations over its history — both naturally and due to human influence.

The most dramatic project in this area was the dredging of "The Canada Company Cut" (also known as "The Cut"), between 1873 and 1875, to outlet the Ausable River directly to Lake Huron without its flowing north, through the "bend" at Grand Bend and then back south to Port Franks. In the process, this resulting channel was used to drain the post-glacial lakes (now Thedford/Klondyke Marsh Area) named Lake George and Lake Burwell *(Dixon, 1963)*. The last remaining lake, called Lake Smith, was drained in the 1960s.

SECTION 2.1.3 GENERAL SHORELINE DESCRIPTION

This section provides a description of erosion processes from a less technical perspective in an attempt to forge a link between the necessary technical findings of this study and the visual observations of shoreline property owners on the Great Lakes. Examples of both bluff and sandy shores are presented. A description of the shoreline specific to the region under ABCA jurisdiction is provided in Section 3.2.

SECTION 2.1.3.1 COHESIVE SHORES (OR THE "BLUFF REGION")

In this section, some typical cohesive bluff shorelines are described. Examples have been selected from the shoreline of Lake Huron between Goderich and Kettle Point. Within this 80-kilometre length of cohesive till shoreline, the erosion of the bluff has varied from zero to 1.3 metres per year over the last 50 years. Three typical cohesive bluff shoreline profiles — representing low erosion, medium erosion and high erosion — are described, followed by a discussion of the changes to these shorelines which occur as water levels change.

THE ABCA SHORELINE, CONTINUED

Locations with Low Erosion

There are many sections of shoreline where there has been no significant recession of the bluffs over the last fifty years. The face of these bluffs is covered by extensive vegetation, including mature trees. Fronting the bluffs is a relatively wide beach: between the waterline and the bluff are 10 to 15 metres of **"visible" beach**. If one swims lakeward from the beach, one will observe that where the sand stops, the lake bottom is covered with rounded gravel and occasional boulders. This is a **lag deposit** formed as the glacial till lake bottom has slowly eroded and left behind the coarser material (gravel and boulders) that was contained in its soil matrix. *(A schematic cross-section is shown in Figure 2 on the following page.)*

During periods of low water levels, the beach becomes wider. The lower water level exposes more sand and there is less wave energy at the shoreline to transport sand along the shoreline. Sand will be blown by wind along the beach, particularly during fall storms, and a small dune of sand may form against the toe of the bluff. Swimmers will find that they can walk a significant distance offshore in the shallow water, and it can be difficult to bring boats in toward the beach without touching bottom. Also noticeable, offshore, is the stony lake bottom.

During periods of low or even average water levels, landowners in the past built boat houses, storage sheds, small patios and walkways on the beach at the toe of the bluff to provide a base for beach activities. Steps have often been built down the bluff face from the cottage to the beach at these locations.

During periods of high water levels, the visible beach becomes narrower because it is covered by the higher water level. In addition, greater water depths under these conditions allow more wave energy to reach the shoreline, resulting in an increase in the transport of sand along the shore, which may also reduce the beach width.

During storms at high water levels, wave runup onto the beach may reach the toe of the bluff where small structures such as boat houses and patios have been built, and where small sand dunes may have developed. At these times, small structures may receive considerable damage; also, the sand deposited against the toe of the bluff may be eroded and any vegetation on the sand may be lost.

Landowners may feel threatened by this situation; in response, some have tried to build shore protection structures. Groynes are often considered, since it is perceived that if a beach can be developed similar to that which existed during low water periods, the bluff will be suitably protected. Some observations have identified that the bluff has not receded during high water periods — and the shore protection structures that were built have prevented property damage only (i.e. to buildings, etc.), not erosion of the shoreline. In other cases, a combination of structures has inhibited wave erosion, but has not slowed surface erosion, which is caused by precipitation and land drainage.

In areas of low erosion, bluff stability may still be an issue. The shoreline and bluff were formed by wave action during a period of higher water levels prior to any recorded surveys; it is possible that the bluff last eroded during high water levels in the 1800s. The bluffs have remained relatively steep and are susceptible to sliding and slumping due to "land-side" influences such as an increase in surface or ground-water flow. There are reports of bluffs that have been stable for twenty years, suddenly experiencing slump failures as a result of extreme rainfall.

Clearly, landowners in areas of low erosion do need to be concerned with surface and ground water issues, such as agricultural practises, clearing of vegetation, drainage, etc. — regardless of water levels, wave action and shoreline erosion.

Locations with Medium Erosion

There are large reaches of shoreline where the long-term average recession rate, measured over fifty years, is less than 0.6 metres per year. Typically, these bluffs have some vegetation, consisting of grasses, small trees and bushes. Fronting the bluff is a small beach, about 5 to 10 metres wide. If one swims lakeward from the beach, one will observe that the lake bottom consists of clay, as well as rounded gravels and some cobbles. The clay tends to produce a lot of sediment and the lake bottom may feel slimy and have a soupy consistency during wave action. *(A schematic diagram of this situation is shown in Figure 3, on the following page.)*

Similar to low erosion conditions, the beach becomes wider during periods of low water and narrower during periods of high water. Also, residents may have built small structures at the base of the bluff during periods of low water levels.

During storms and high water levels, the beach may disappear, only to reappear once conditions return to normal. Regardless of whether some beach remains in place, wave runup reaches the base of the bluff. Some minor undercutting of the bluff may occur, often leading to limited slumping of the bluff.

THE ABCA SHORELINE, CONTINUED

Other contributing factors to bluff erosion may include surface runoff, groundwater flow, seepage and freeze-thaw action. In general, the resulting recession of the bluff is not large, and occurs only infrequently, primarily through storms during periods of high water level (e.g.1973-76, 1985-86). It is important to realize, however, that the nearshore lake bottom adjacent to and under the beach is continuing to slowly erode regardless of the water level — eventually leading to bluff erosion.

Bluff stability is a greater issue in this situation than in that of low erosion. Bluff recession that does occur tends to limit the growth of vegetation on the bluff and maintains a steep bluff base. Both these issues make the bluff more susceptible to major slumping with increased loading from larger groundwater flow. Given that higher water levels on the Great Lakes also result from increased precipitation, there may be an indirect correlation between high water levels and increased bluff failures.

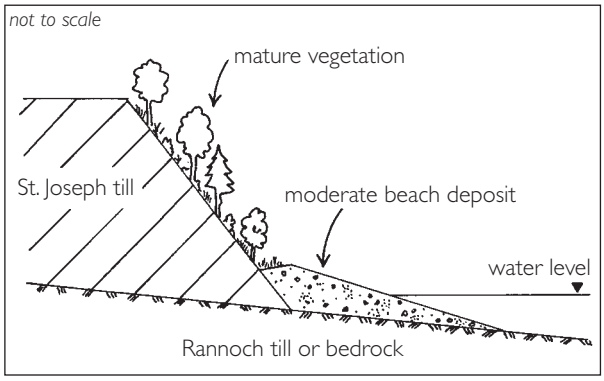


Figure 2 - Low Erosion SCHEMATIC CROSS-SECTION

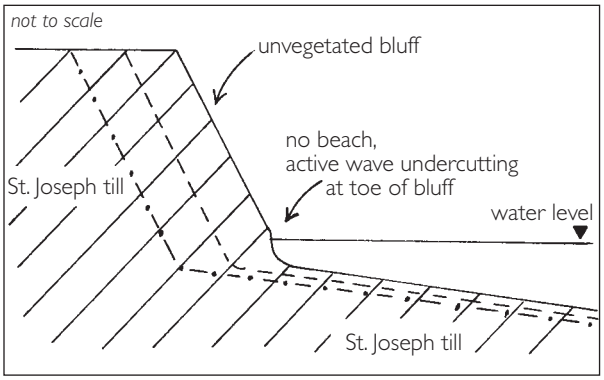


Figure 4 - High Erosion SCHEMATIC CROSS-SECTION

In order to stabilize the bluff, many landowners have attempted to stop wave action from reaching the toe of the bluff by building some form of shore protection at that location. In general, seawalls and revetments are utilized and are typically constructed of concrete rubble, gabion baskets, steel sheet piling and quarried stone, although other materials and types of structures have also been used. Commonly, these structures have been built despite the fact that the nearshore lake bottom in front of the structure will continue to erode and eventually undermine the structure.

However, because erosion of the nearshore lake bottom in these areas is relatively small, effective shoreline protection may be achieved for some time. If, in 20 years, the shore protection is replaced, it will require a larger structure because of increased water depths resulting from the ongoing erosion of the nearshore lake bottom.

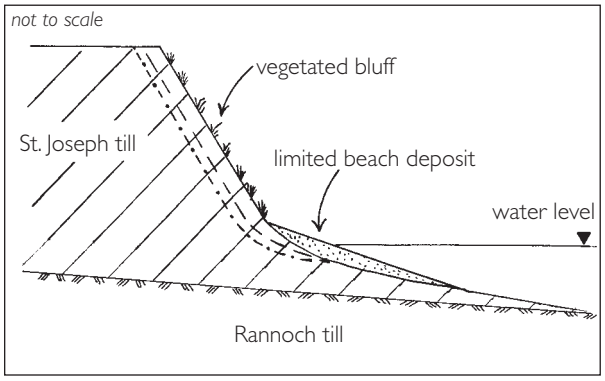


Figure 3 - Medium Erosion SCHEMATIC CROSS-SECTION

Locations with High Erosion

There are a few reaches of shoreline where high erosion — reaching a long-term average recession rate of 1.3 metres per year — has been experienced over the last 50 years. The bluffs have no vegetative cover and major slumps of the bluff are visible. In front of the bluff may be a very small beach, but frequently there is no beach at all. Water in front of the bluff is often very turbid because of suspended sediments; during wave action, it has a very soupy consistency close to the lake bottom. Water depths close to the shoreline are noticeably deeper than in the other two situations (low and medium erosion). The lake bottom consists of exposed till with very little gravel or other more resistant material. *(A schematic cross-section of this situation is shown in Figure 4 at left.)*

THE ABCA SHORELINE, CONTINUED

During periods of low water levels, a small beach may exist or the till bottom may be exposed. In either case, however, wave runup reaches the toe of the bluff. During periods of high water levels, the waves act directly on the bluff, causing undercutting at the toe of the bluff, oversteepening of the bluff face and, ultimately, failure of the bluff.

In most areas where high rates of erosion occur, the shoreline has not been developed — for obvious reasons. The design of shore protection structures in such areas must allow for continuing erosion of the nearshore lake bottom, which may be occurring at rates of 5 to 10 centimetres per year (vertical downcutting rate). As a result of this irreversible process, the water will get deeper and wave action at the shoreline will become greater over time. Consequently, any structure designed to stabilize the shoreline in areas subject to severe erosion will have to be very massive — and costly as well. In many instances, the cost of construction of such shore protection will not be compatible with the value of the land to be protected.

SECTION 2.1.3.2 SANDY SHORES (OR THE "DUNE REGION")

The processes which lead to erosion and deposition on sandy shores are related to the action of both water and wind. A wide range of beach conditions exist along this shore, from the wide and shallow beach at Ipperwash Beach (with several offshore sand bars) to the slightly steeper beaches to the north (Port Blake and Maple Grove). These beaches fall into the categories of **mainland beach** and **filet beach.** Almost all of the beaches in this area have historically featured wide and healthy backshore dunes. Many of these dunes still exist in their natural state; however, in some cases, buildings have been constructed on the dunes, and in other places, the dunes have been partly or entirely removed.

SECTION 2.1.3.3 THE DUNE - BEACH SYSTEM

As we develop a better understanding of nature, we realize the delicate balances involved in natural systems. Beaches are no exception. Waves generated during storms naturally erode the beach. At the beginning of a large storm, waves will be observed to break very near the beach; sand is removed from the upper part of the beach and deposited offshore — this sand, specifically, helps to build up the height of offshore bars. During the storm, as sandbarsare formed and shallower depths are created over them, waves will tend to break further offshore on these bars instead of closer to shore. Once the bars are able to thus intercept the waves, erosion near the shoreline will be reduced.

In this way, the natural beach has a built-in protection system, and erosion of the upper beach is a good indication of a healthy system at work. Smaller waves which follow in the hours and days after the storm will slowly reconstruct the beach, moving sand from offshore bars back onto the beach. In general, smaller waves tend to cause movement of sand toward shore; larger waves cause offshore transport.

From the explanation above, it may seem clear that storms occurring at higher water levels will lead to even greater erosion. As the water level rises, offshore bars become less effective at intercepting waves before they reach the shore. Due to the extreme rise of the water level in 1985 and 1986, a very large amount of sand was removed from the beach and dunes, building up offshore bars and intercepting the waves. When there is not enough sand on the upper beach to sufficiently build up the bars, the waves will begin to erode the dunes. The backshore dunes are, in effect, a secondary reserve of sand that is withdrawn only at times of severe storms and especially at high lake levels.

As observed in 1986, dunes continue to erode over several storms — because the duration of a single storm is not sufficient to build up the required offshore buffer to the waves. If high water levels were to persist, however, the beach would eventually stabilize — at least to the extent that only normal erosion would occur during storms (i.e. erosion of the upper beach and not the dune face).

Again, in time, eroded sand from both dune and beach will be replaced by natural processes. While the beach may recover quite quickly, the dune may take some time to build up again; perhaps not noticeably until water levels are lower. The dune rebuilds through transport of wind-blown sand; wider beaches associated with periods of falling water levels are required to provide ideal conditions for dune regeneration.

THE ABCA SHORELINE, CONTINUED

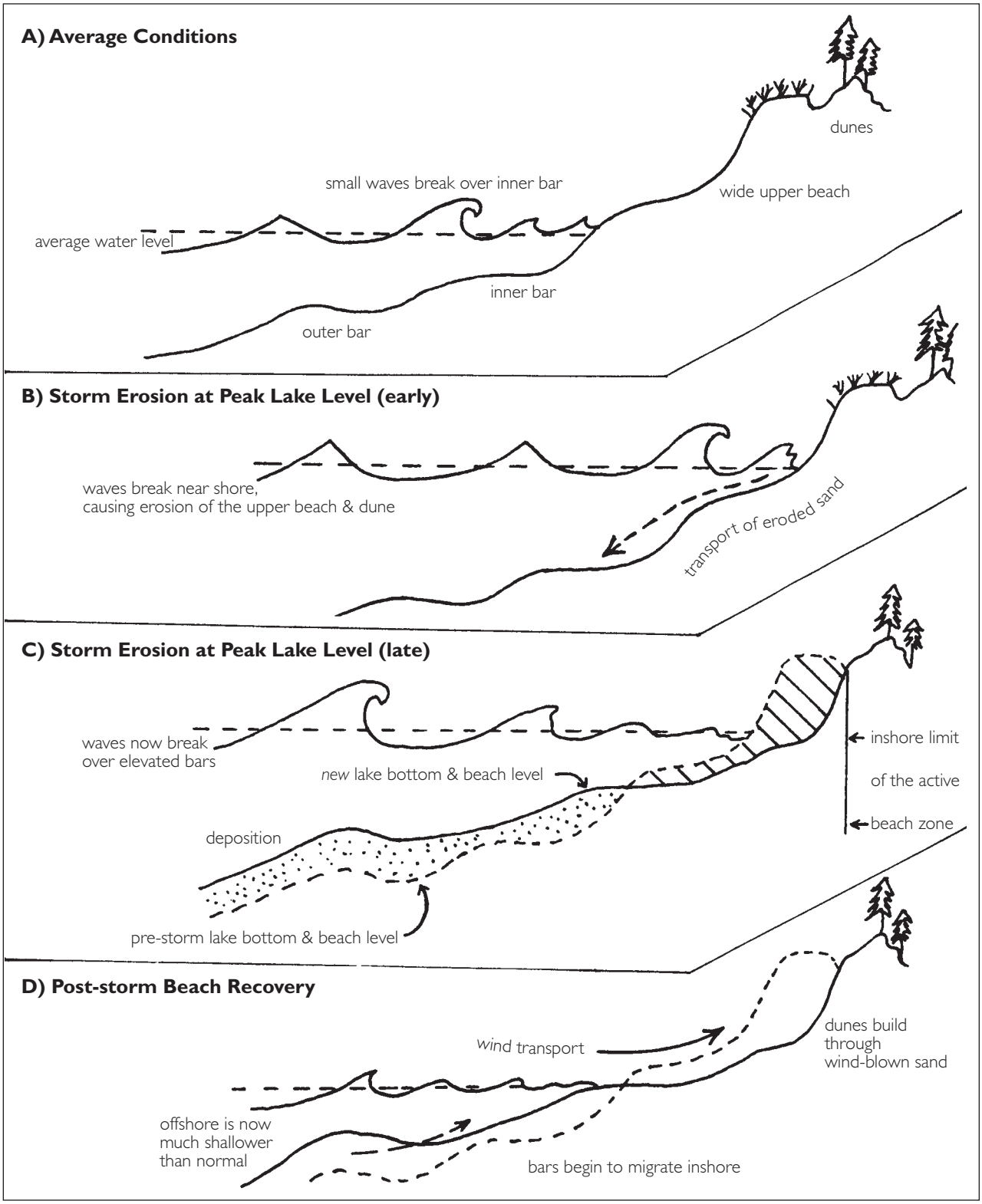


Figure 5 - Cycle of Dune-Beach Erosion

THE ABCA SHORELINE, CONTINUED

During periods of falling water levels, as occurred in the years following 1986, the water appears to be very shallow for some distance offshore; one is able to wade much further offshore than normally. This is because the wader is walking on the offshore buffer that nature constructed to protect the shore — as noted, this sand will eventually be returned to the upper (above-water) part of the beach.

The cycle of dune-beach erosion (including severe erosion at a peak lake level) is depicted in Figure 5 on the facing page. During pre-storm or average conditions, small waves break over the inner bar. There is a wide upper beach and healthy vegetated dunes. At the onset of a storm at a very high lake level, waves break violently very close to shore, causing erosion of the upper beach and dune; the eroded sand is deposited offshore, building the bars. Later in the storm, waves break over the elevated bars. The active beach zone limit corresponds to the maximum extent of erosion. As the water levels return to average, the bars begin to migrate onshore, bringing sand back to the beach. Wind-blown sand will also rebuild the dunes. Eventually, the beach will return to its original form and the cycle is completed.

Exceptions to this general description of the dune-beach system can arise. At some sites, erosion of **relict dunes** (i.e. dunes which are not actively building) may be followed by very slow or incomplete recovery. Also, at sites where the sandy supply has been depleted by updrift littoral barriers (e.g. harbour structures), recovery again may be incomplete.

Shore property damage occurs where landowners have inadvertently constructed houses, boathouses, etc. within the active beach zone. Along much of the Bosanquet Township shoreline, dwellings have been constructed behind the first row of dunes on the fringe of the active system. High water levels of 1972 and 1986 caused the upper beach to respond in a manner which brought it close to the inshore limit of its active range of positions.

Shore protection that may have been constructed in response to storms at more normal lake levels can be found inadequate at record high lake levels. Since shore protection (in the form of walls and sloping revetment) denies the offshore part of the beach the buffer sand it requires (by eliminating or reducing erosion), large waves are able to continually strike the shore. Under these conditions, much of the shore protection is either damaged or destroyed. However, even where shore protection exists, the beach will eventually rebuild. The speed at which the beach recovers will be greater in front of sloping shore protection; beach rebuilding is slower in front of vertical walls.

The following example demonstrates the importance of storm surges. In October and November, many damaging winter storms often occur before the shore ice has had a chance to build up and protect the beach. In October 1986,Lake Huron's water level was almost one metre above the long-term average for that time of year. However, the peak lake level during a storm is also partly due to the storm surge — and during the October storms of 1986, the peak lake level probably reached 1.5 metres above long-term average levels (0.5 metres from storm surge and one metre due to the average lake level conditions).

SECTION 2.1.3.4 ALONGSHORE SAND TRANSPORT OR LITTORAL DRIFT

The discussion above relates to perpendicular movement of sand across the beach, in an onshore-offshore (or cross-shore) direction. Sand also moves along the shoreline (parallel to the shore), referred to as **littoral drift** (or alongshore transport). In a natural open beach situation, alongshore sand transport is less noticeable than erosion caused by cross-shore transport. However, where there is either a natural or artificial obstruction to alongshore transport, sand will build up on the incoming (or updrift) side of the obstruction. The most common example, perhaps, is the sand build-up on one side of a groyne. The direction in which sand moves along the beach depends on the approaching direction of the waves — which may or may not be one predominant direction in a given year.

Wherever there is a dominant direction of sand transport (such as along the ABCA shoreline), the continual supply of sand from updrift is essential to beach stability. This transport occurs along the shore and to distances well offshore (especially over bars) and is generally invisible to the human eye.

Erosion problems arise when alongshore sand transport is blocked to some extent. While there may be a build-up of sand on one side of a groyne, there may also be erosion over some distance on the other side of the groyne. Larger problems occur where very large piers or jetties have been constructed to protect harbours. *(Refer to Section 3.2.5, Goderich Harbour Analysis.)*

WHAT IS A SHORELINE MANAGEMENT PLAN?

Since the objectives of a shoreline management plan are to develop and support solutions to current and future problems and issues along the shoreline, it is intended that this SMP:

1) work to minimize risks to life, property damage and social disruption by preventing storm-related damage to residences from flooding, erosion, storm damage, and bluff failure at the shoreline; and suggest protection of sections of shoreline in areas of existing development,

2) prevent new development in areas susceptible to significant lakeshore hazards,

3) work to bring about improvements to the area's environment and quality of life,

4) serve as a background document for economic development in the region, and

5) provide a framework for the wise management and use of shorelands so future generations may enjoy an improved quality of life, both environmentally and economically.

As discussed by Baird *(1991)* in a discussion paper on SMPs, these objectives are not unique to a SMP and they are, perhaps, the general objectives of many forms of official plans. Many plans, policies and regulations developed at many different levels of government apply in some way to the shoreline — often, these documents were prepared in isolation.

A SMP can integrate the public's principal concerns related to the shoreline, as well as adjacent land and water areas, into one comprehensive document to be adopted by all levels of government. As a consensus plan, the document should be supported by the public at large, and be subscribed to by all levels of government and all interest groups having jurisdiction over, or having an interest in the area.

The objectives of a SMP are not complex and are largely a matter of common knowledge. As stated in *MNR Guidelines for Developing Shoreline Management Plans (MNR, 1987)*, the objectives are prevention, protection, emergency response, public information, environment and monitoring. However, development of a consensus plan may become complex due to technical issues involved and because of diverse and conflicting demands put on the use of the shoreline by different groups.

Development of a plan must aim for clarity and simplicity in the final product. Implementation of such a plan requires the support of all levels of government, full participation at all stages, and resolution of any conflicts by means of open debate. Implementation can be achieved by fitting the plan into the existing structure of policy, regulations and acts governing activities in areas adjacent to the shoreline.

The Provincial Policy Statement requires municipal jurisdictions to have regard for the Great Lakes - St. Lawrence River hazard policies in local land use planning matters. A SMP should provide advice and recommendations regarding local implementation of these policies in the context of both the specific shoreline reach and community.

The conclusion being drawn by agencies developing SMPs is that while specific issues are important and should be addressed in detail, the well-being of the watershed's ecosystem adjacent to the shoreline should ultimately be improved and enhanced for the overall benefit of the community. The Plan should reflect periods of both high and low water levels.

It was agreed early on that effective representation from both the counties, all seven municipalities, MNR offices and cottage associations would be needed to provide the views and concerns of lakeshore stakeholders. A steering committee was formed to oversee and direct the project; this committee was formed of two groups: the Project Committee representing shoreline owners and the relevant municipalities, with each having equal vote, and the Technical Committee representing other current lakeshore regulatory bodies.

The Project Committee was formed with representation from each of the seven municipalities, four cottage associations, and Pinery Provincial Park (MNR).

The Technical Committee was formed with representation from Huron County Planning Department, Lambton County Planning Department, Huron County Public Health Department, Ministry of Natural Resources (Chatham, Wingham and Aylmer Offices as well as Lands and Water Policy Section, Toronto), Maitland Valley Conservation Authority and St. Clair Region Conservation Authority *(refer to acknowledgement page of this report)*. Wide representation on these committees was intended to provide a diverse background for comments on the creation of the plan.

Specific issues for the ABCA shoreline are discussed in the following section.

WHAT IS A SHORELINE MANAGEMENT PLAN?

The principal focus of the ABCA Shoreline Management Plan is to address the danger to life and property damage that may occur during severe storms, especially during periods of high lake water levels, through preventative means as well as protection. In doing so, it must consider processes, particularly shore erosion and long-term recession.

In addition, a wide variety of lakeshore users, landowners, government agencies, and non-government organizations (NGOs) were polled during public meetings (July 20, 1990 and July 26, 1991 at the Stanley Township Complex), and their input on lakeshore processes and management issues was requested in subsequent mailings.

Issues identified through public consultation were collected and ranked by the SMP Steering Committee *(see Table 1, ABCA Shoreline Management Issues, on following page)*, and form the scope and priority of issues included in the ABCA Shoreline Management Plan.

SECTION 2.3 SPECIFIC ISSUES

Issues specific to the shoreline within the ABCA jurisdiction, as determined by the Steering Committee of the SMP, are discussed below and illustrated in Table 1 on the following page. They cover a wide range of topics and include those listed as components of a SMP by the MNR guidelines.

Although the scope of the SMP was broadened to include issues relevant to this section of the Lake Huron shoreline, it was necessary to set priorities to acknowledge the mandate of the Conservation Authority and limitations in project funding.

High-priority issues will result in new initiatives proposed through implementation of the SMP and support to existing applicable policies or regulations.

Medium-priority issues will consider new initiatives, but emphasis will be on supporting existing policies.

Low-priority issues will be included within the plan; however, no new initiatives are proposed.

It should be noted that considerable overlap between issues and the intended approach to dealing with them through implementation of the SMP may result in many of the low-priority issues being dealt with indirectly.

The issues are explained in the following sections and their priority in the SMP is indicated.

SPECIFIC ISSUES, CONTINUED

Table 1 - Shoreline Issues (ranked)

DETAILED ISSUES *(identified and sorted by heading)*	**GENERAL ISSUES**	**OBJECTIVE**	**GOAL**	**SMP RESPONSE** *(priority)*
Storm Damage • Water levels • Frequency of storm occurrence • Prediction of storm occurrence • Setbacks • Right to protect land • Ownership • Relocation of structures	Property & shoreline damage Threat to life Loss of land	Storm damage response (short-term)	Damage prevention	New policy setback identified *High-priority*
Structures • Water levels • Design methodology • Maintenance • Adverse impact of structures • Cost • Ownership • Recreation on beach • Impacts of access	Bluff erosion (loss of land) Beach erosion (loss of sand)	Shoreline stabilization (long-term)	Protection/stabilization of shoreline	New policy areas identified *High-priority*
Access • Beach use (recreational) • Ownership • Noise • Impact on private cottagers	Adequacy of access for protection installation & maintenance (for marine emergencies, building relocation and pedestrian access)	Access (to lake and shoreline)	Increase or improve general access	New policy and support existing *Medium-priority*
Development • Road closings • Beach use • Beach ownership • Zoning changes • Water levels • Storm water management • Cottage conversion/additions • Septic tank servicing • Standards for structural changes • Land prices • Strip development	Lake access Bluff erosion/shoreline damage Water quality Development considerations	Regulation of shoreline development	Improve development planning (prevention)	New policy and support existing *Medium-priority*
Environment • Development control • Wetlands • Dredging/dredge disposal • Sand dune systems • Bird migration • Woodlots • Karner Blue Butterfly area • Zebra mussels • Fisheries	Environmental degradation Water quality Loss of habitat Loss of environmentally significant areas	Regulation of shoreline development	Improve development planning (prevention)	New policy and support existing *Medium-priority*
Water Use • Marine capacity • Boat holding tanks, pumpout facilities • Boat launches • Storm warning • Storm refuge • Noise • Bank erosion	Lack of access to and use of Lake Huron	Water-dependent activities	Increase access to water-dependent activities	No specific initiative Support existing policy *Low-priority*
Green Space • Wilderness areas • Trails • Park areas • Tree-planting • Heritage issues • Historical issues	Lack of recreational facilities Lack of maintenance of public areas Lack of improvements to public areas	Recreational, aesthetic & environmental improvement	Improved quality of life	No specific initiative *Low-priority*
Economy • Maintain share of tourist $ • Municipal taxes from shoreline properties • Business park planning	Economic future	Economy of the region	Vibrant economy	No specific initiative *Low-priority*

SPECIFIC ISSUES, CONTINUED

SECTION 2.3.1 STORM DAMAGE REDUCTION (HIGH-PRIORITY)

The reduction of storm damage reduction and any threat to life is a primary objective and is a high priority of this SMP. The principal hazard along the northerly section of this study area is bluff instability and future bluff erosion, and the threat they pose to existing residential structures built close to the top of the bluff. The hazard along the southerly section is the dynamic nature of sand dunes and their proximity to adjacent residential development which was built within this dynamic zone.

The issue of shore protection from storm damage is a common objective of shoreline management. In a discussion of coastal management alternatives for reducing the impact of storms, Wood *(1990)* concludes that "management alternatives for reducing storm impacts at a coast should have the following objectives:

1) to protect life and property from loss due to direct and indirect storm impact effects. This objective may be met through the concept of delineated risk-related zones;

2) to transfer economic costs of storm-related loss in designated risk zones from the federal and state (provincial) taxpayer to the property owner at risk;

3) to discourage or prohibit inappropriate development from occurring in designated risk zones; and

4) to encourage improvements in redevelopment practices (e.g. the review of variances to existing land use planning criteria) in designated high-risk zones."

This plan responds to all four objectives stated above. Mapping of erosion-prone areas and development of setbacks are included in the mapping section *(see Section 3.1)*. Setbacks for new development were calculated from analyses of historical shoreline change, and setbacks based on lake flooding effects were also completed. *(These setbacks are further discussed in Section 3.3.)*

SECTION 2.3.2 SHORELINE STABILIZATION (HIGH-PRIORITY)

This issue is the loss of land that is naturally occurring in some areas due to shoreline erosion, particularly severe during or after extreme storms throughout periods of high lake levels. Storm damage (as discussed earlier) may also be encompassed — if the shoreline is stabilized, storm damage to property may also be eliminated. This isunlikely, however, due to the impracticality of stabilizing long reaches of unstable shoreline and resulting impact on the overall sediment budget of the littoral cell.

Shoreline stabilization is an issue in most urban areas adjacent to the Great Lakes shorelines, often undertaken when the value of land and municipal infrastructure being lost by erosion exceeds the value of structures required to stabilize the shoreline.

In many areas of the world, where shoreline consists of a large sand beach on which the region's economy and way of life depend, very specific shoreline management plans have been developed to stabilize the beach. For example, significant effort is given to stabilizing and maintaining beaches of Florida and the Gold Coast in Queensland, Australia. On a smaller scale, the Village of Grand Bend is also seeking advice as to how to best manage the sand along its beaches.

Along this section of Lake Huron, past erosion of shore and bluff has been identified as part of a process that includes and has an impact on a much larger area. The eroding shores and bluffs provide a supply of sand and gravel to the nearshore system; this material is transported alongshore by wave action, resulting in a narrow beach along the shoreline. This beach provides a valuable recreational resource, as well as some natural bluff protection. Alongshore transport continues to carry sand toward the south, where it is finally trapped in the Grand Bend/Pinery/Ipperwash beach area. New sand arriving here replaces natural losses of sand from the beach system (such as wind-blown transport to the dunes and offshore transport to deep water) and assists in maintaining this complex feature. This overall process is the subject of *Lake Huron Shoreline Processes Study (Reinders, 1989)*. Clearly, if shoreline erosion is stopped and the sand supply eliminated, consequences of increased recession of the southern sand beaches and dunes must be considered.

This SMP addresses shoreline stabilization by describing design considerations for structures to protect the shoreline and procedures for supplying alternative sources of sand to the shoreline, also known as **beach nourishment** *(see Section 3.4)*. It should be noted that effective long-term protection to a shoreline is a complex technical issue, as is a procedure for artificially supplying sand to the shoreline. While these objectives can be achieve — and there are many precedents for these solutions — the cost and difficulty of implementation and maintenance would be major considerations.

SPECIFIC ISSUES, CONTINUED

SECTION 2.3.3 ENVIRONMENTAL PROTECTION (MEDIUM-PRIORITY)

Environmental issues, while very important to the region, are seen as a secondary focus of this SMP and are addressed by emphasizing existing regulations and policies as they affect the shoreline and not by developing new regulations.

The objective of many levels of government, environmental protection is the subject of many acts and regulations relating to the shoreline and adjacent land and water areas.. This document's objective is to identify and inventory environmentally sensitive and significant areas *(see Figure 6)*, and to ensure protection through zoning regulations, restrictions on development and construction, and possibly the purchase of hazard lands where feasible and when they become available. This includes highlighting policies described in existing acts that are intended to protect the shoreline environment. Environmental protection with regard to the shoreline is a policy of the MNR, as stated below:

"To ensure that existing and future shoreline land use recognizes the coastal process which take place in the coastal zone and consider the impact to the coastal ecosystem and the principles of sustainable development." (MNR, 1993)

Resources such as fish and wildlife habitat, fish spawning areas, bird habitat during migratory fly-overs, wetlands, beach/dune systems and woodlots are all important to preserve and enhance wherever possible. An example of environmental protection through existing legislation is taken from the Fisheries Act, regarding fisheries habitat. It has the objective of a net gain of productive capacity for fisheries resources, guided by a "no net loss" principle. Thus, any proposed development which may adversely affect fish habitat could be rejected, or possibly accepted if suitable mitigation is provided (i.e. habitat replacement).

A secondary role can also be achieved if the SMP is viewed as a document to encourage habitat development and creation. Maintenance or establishment of green corridors along the lakeshore and gullies will enhance many environmental aspects, including fish and wildlife habitat and water quality. This goal is also reflected in the *Watershed Management Strategy (ABCA, 1995)* which identifies the shoreline as a potential vegetated corridor for rehabilitation. A natural heritage framework was proposed in the watershed management document, including the shoreline corridor which has since been incorporated into the Lambton County Official Plan *(Lambton County Planning Dept., 1998)*.

SECTION 2.3.4 WATER QUALITY (MEDIUM-PRIORITY)

Since more than 90 percent of the ABCA watershed is agricultural, a principal environmental concern is water quality — dictated at least partly by agricultural use. Water quality was a primary concern of cottage residents polled by ABCA staff during public meetings and open houses on the topic of lakeshore processes and management. For this reason, water quality is discussed separately in the following section.

The issue of water quality was identified by almost every group responding to the ABCA inquiry; concerns include agricultural runoff into rivers, streams and the lake, contamination from septic systems, and water quality in the Ausable River at Grand Bend. Agricultural runoff is a continuing issue with the Authority and extends the scope of this SMP beyond the shoreline to include the adjacent upstream areas.

A community-based initiative, called SOL-VE, was initiated in 1997 by local agencies and citizens to focus on bacterial sources necessitating beaches to be posted advising bathers of health risks. This organization has evolved into the Huron County Water Quality Coalition, comprising many agricultural organizations and local community agencies, whose mandate is to protect and improve water quality within Huron County. Nutrient management plans became popular in 1999 as a possible solution to the disadvantages of intensive farming techniques.

With respect to septic systems, new systems are regulated through the Building Code Act, with responsibilities delegated to the building official, Public Health Department or an agent such as the Conservation Authority acting for the municipality. However, existing systems which were installed before these regulations, or which have deteriorated, will have an effect on water quality. Mandatory requirements for routine maintenance of these systems is one possible approach to ensure water quality standards are met (i.e. a maintenance certification program). Other approaches are being investigated through work undertaken by the Clean Up Rural Beaches (CURB) Program and the Rural Servicing Study *(Huron County Planning Dept., 1992)*.

SPECIFIC ISSUES, CONTINUED

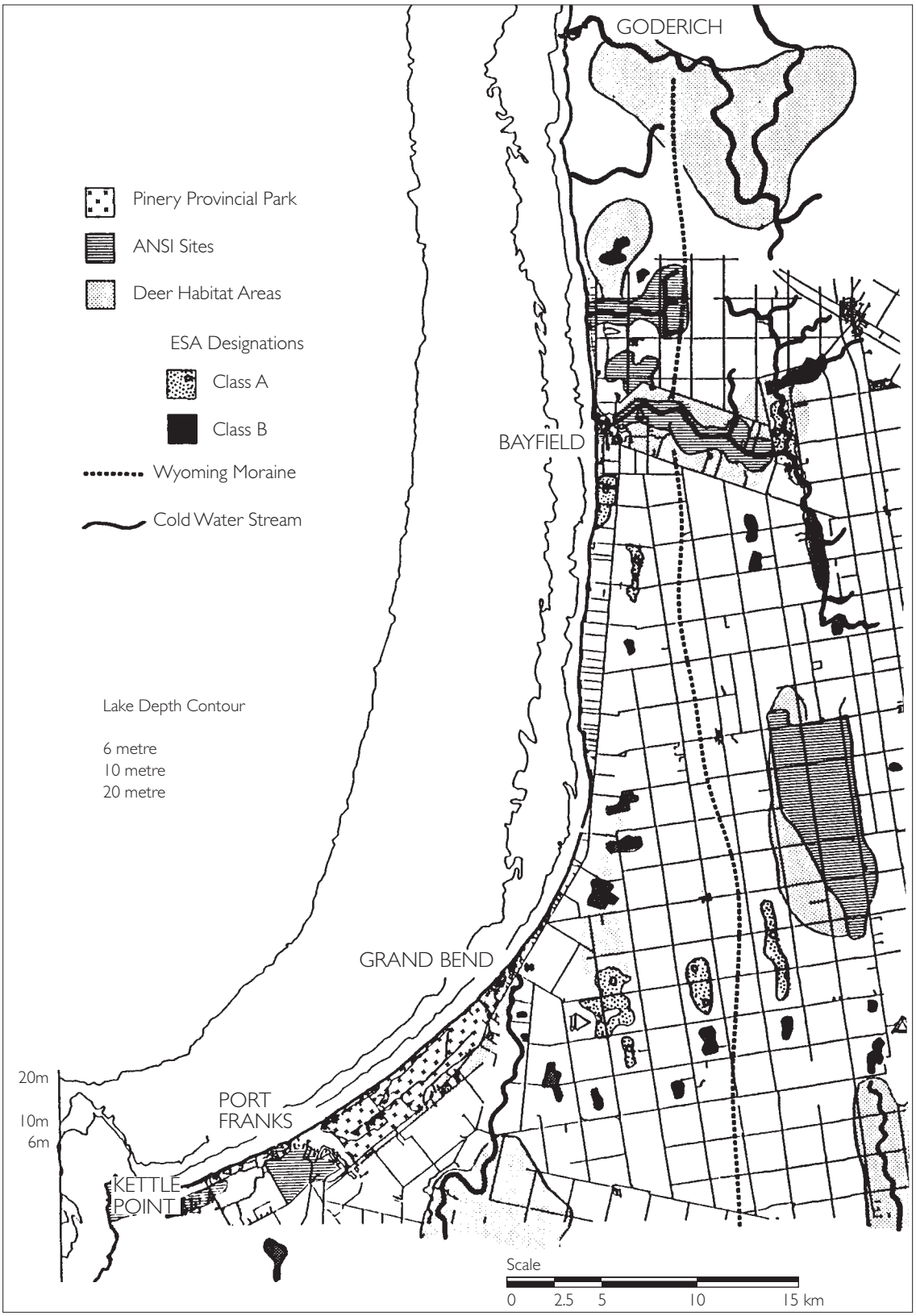


Figure 6 - Environmental Features

SPECIFIC ISSUES, CONTINUED

SECTION 2.3.5 DEVELOPMENT PRESSURE (MEDIUM-PRIORITY)

The shoreline has an inherent attraction for development proposals for additional residential lots; as a result of increased demand, greater activity has generally occurred. Preliminary review of past proposals provides an overview of the number of potential and available lots for seasonal residential use along the shoreline. Some of this increased development and the rise in cottages converted to permanent homes can be attributed to extension of Lake Huron Water Supply north along Highway 21 to service the shoreline. Extended in 1989 and 1990 to include Hay and Stanley Twps., this pipeline provided uninterrupted water supply to these seasonal areas. A current concern is that existing septic systems may be subject to failure due to increased water usage.

Due to concerns of the cumulative impact of new systems, in 1990 the MOEE implemented a pause on all new residential development relying on individual septic systems for sewage disposal. In co-operation with MOEE and due to Ministry concerns, Huron County Planning Department completed a *Rural Servicing Study (Huron County Planning and Development Dept., 1992)* to advise the County on this issue.

As in shoreline cottage areas, the communities have also experienced development pressure. The Village of Bayfield may be the exception to this trend, although this may be due to lack of available land. Adjacent lands of Goderich Twp. and Stanley Twp. have seen limited development (Harbour Lights Development Ltd. north; Robinson and Smith subdivi-sion proposals to the south).

The hamlet of St. Joseph has changed considerably, both within the existing community and east along Highway #84. An attempt was also made in 1987 to expand the "urban" designation within the secondary plan southward to include the Bayview Subdivision area. If successful, this would have permitted or recognized year-round use of residences and effectively extended the boundary of the hamlet south by 1.5 kilometres. The application for an official plan amendment was denied and an appeal was never filed.

Grand Bend and the adjacent area within Bosanquet Twp. has undergone perhaps the most development in terms of new subdivisions and multi-unit developments. Construction of the condominium complex on the beach is the most notable recent development — also likely the most controversial. The area south within Bosanquet Twp. has also had proposals for development of about 800 residential lots. In 1993, the Village expanded the urban boundary to incorporate parts of Bosanquet and Stephen Twps. as part of a boundary adjustment application. Sewage treatment is also being reviewed in anticipation of the need for expansion of existing facilities.

Port Franks and surrounding areas have had fewer development proposals. A trailer/modular unit park was built in 1991 along Northville Crescent. This site, although not directly on the shoreline, is within the backdune region, near an Environmentally Significant Area known to contain habitat of the Karner Blue butterfly, an endangered species which is protected by the Endangered Species Act.

SECTION 2.3.6 SHORELINE ACCESS (MEDIUM-PRIORITY)

Shoreline access focuses on three main factors:
1) physical constraints of the shoreline bluff and dune features and obtaining access over these features;
2) ownership of the shoreline (public versus private) and resulting constraints on access;
3) existing density of development along the shoreline and pressures for new development on vacant lakefront properties (what few remain), or expansion of development inland on adjacent areas.

There are a number of access problems related to existing lots. Many second-tier, vacant lots will require access to the lake once development occurs, involving both legal and practical shoreline access. Areas such as Armstrong East cottage area have legal access by unimproved road allowances, but gain actual access by boat by crossing the Ausable River.

Increasing public access when new development occurs is a common approach in other management plans; numerous examples in the U.S. can be found *(Baird, 1991)*. Locally, however, the question of private versus public access into cottage areas is under debate as more development proposals utilizing existing "private" roads are being considered. It appears that interpretation of both the Surveys Act and the Road Access Act is required to understand who may seek access over such roadways *(Donnelly, 1991)*.

Access must also be considered to enable equipment to install and maintain shoreline protection, to access the lakebank for remedial drainage, tree-clearing and earth-moving for bank stability projects, and for use in relocating buildings. It is also needed for such marine emergencies as search and rescue operations and contaminant spill clean-up at beach level *(Environment Canada, 1994)*.

SPECIFIC ISSUES, CONTINUED

SECTION 2.3.7 WATER-DEPENDENT ACTIVITIES (LOW-PRIORITY)

Further development of water-dependent activities (including commercial and sport fishing, recreational boating and swimming) is a low priority of the SMP. In 1990, access down the bluff for boat launching was investigated by Hay Township Council, who determined that existing road access at St. Joseph was the most appropriate location between Bayfield and Grand Bend and that creation of a new access in the vicinity was not economically feasible.

The SMP objective is to support controlled development of water-dependent activities, for the purpose of economic benefits to the community, providing service to the community and protecting the environment.

Much discussion on this topic is linked to the previous section regarding access. The SMP should recognize existing policies and regulations of various agencies such as Small Craft Harbours of the Department of Fisheries and Oceans and the Ministry of Tourism and Recreation, which reflect these common goals.

SECTION 2.3.8 'GREEN SPACE' IMPROVEMENT (LOW-PRIORITY)

Implementation of recreational, aesthetic and environmental improvements to the shore zone is not a primary focus of this SMP. However, the need to carefully consider the capacity of the shoreline to absorb both increased residential development and use of the shoreline resource is a medium priority of this Plan. The objective here is to improve quality of life within the region by encouraging, supporting and regulating factors such as:

- development control *(see Section 3.3)*,
- use of vegetative buffers between land uses,
- increased occurrence of 'green space', especially in the form of linear corridors along the lakeshore and along gully channels,
- regulatory controls over appropriate building setbacks,
- land designation for hiking trails, wilderness areas…,
- improvements to public areas to provide quality recreation, and
- standards of environmental protection and promotion for all new development.

Statements such as "clean, green and diverse" are part of the *ABCA Conservation Strategy* and *Watershed Management Strategy (ABCA, 1995)*, which guides management of the entire watersheds for the next 25 years. This document provided a natural heritage framework suggesting locations to rehabilitate green corridors, including the Lake Huron shoreline.

Other SMPs in the U.S. recognize the importance of balancing economic growth with maintenance of open space and scenic vistas *(Baird, 1991)*. Similar recommendations have been made by the Royal Commission on the Future of the Toronto Waterfront in their report, *Regeneration*, in which they identify key words to direct the future of Toronto's waterfront, including "clean, green, usable, diverse, open, accessible, connected, affordable, and attractive" *(Crombie, 1992)*.

SECTION 2.3.9 ECONOMIC DEVELOPMENT (LOW-PRIORITY)

Although economic development is a low priority of this SMP, many authors of SMPs have noted that effective shoreline management is important to a region's economic development. In addition to other planning activities specifically designed to encourage regional economic development, it is clear that successful communities will develop in areas where environmental protection is practised. This is especially true where eco-tourism activities are becoming more frequent and families are seeking more environmentally friendly approaches to enjoying the outdoors. Such activities are becoming more common along the shoreline, especially in the Grand Bend/Bosanquet region where Pinery Park provides a significant hub of similar activities.

It is interesting to note that Travis *(1990)*, in describing the experience of the San Francisco Bay Conservation and Development Commission — which has the objectives of preventing unnecessary filling and improving shoreline access and aesthetics — states that "environmental protection is the foundation of a strong economy." He attributes San Francisco's flourishing economy to the healthy environment in which it exists, and the quality of life it provides to its residents. Economic development can be encouraged by supporting the tourist industry through provision of boating facilities and shoreline access and by making Lake Huron's shoreline an environmentally attractive area.

COTTAGE COUNTRY - THE CHANGING DEMANDS

When a shoreline traverse was completed along Lake Huron in 1935 by a team of Ontario Land Surveyors *(discussed in Section 3.1, Mapping)*, many of the areas were already shown as cottage areas.

Cottage areas such as Egerton Beach, Stanley Twp., Beach O'Pines, Bosanquet Twp. and Turnbull's Grove, Hay Twp. were already being used for seasonal use. As noted by Authority staff and outlined in *Shoreline Management: A Conservation Authority Perspective (Donnelly,1990)*, the shoreline cottage community has undergone many changes, among them:

1) The original cottages along much of the shoreline (typically single-storey, wood structures built on cement blocks or slabs) are being replaced with larger, more permanent, year-round residences. The conversion of cottages to permanent use frequently occurs as they are renovated or rebuilt and such improvements as insulation and general "winterizing" occur. This concept is not unique to the ABCA shoreline; it is discussed further in *Great Lakes Shore Management Guide (Strelchuck, 1981)*. This trend has been addressed by some municipalities in their development agreements for new Plans of Subdivision by including a warning registered on title that the subdivision is within an area zoned for seasonal use and without a full complement of services by the Township. Further investigation into this issue must focus on requirements of the building code which does specify a minimum criteria for seasonal cottage construction *(Building Code, 1997 - Section 9.36)* — but does not stipulate maximum criteria to differentiate from permanent residences.

2) Original cottage "communities" were often made up of families or extended families with "gentlemen's agreements" or accepted arrangements regarding access, beach use, communal water systems and sometimes even lot line locations. The "family-style fabric" of these areas is quickly becoming obsolete; today there is a need to formalize previous arrangements.

3) In some cases, the original cottage areas were not planned for a more concentrated use by residences (second and third rows of cottages), all requiring beach access, road access and additional space for septic field loadings into the subsoil.

4) The original cottage areas were not planned with consideration for erosion of the lakebed and lakebank. Increased drainage methods of inland areas (the result of recent agricultural practises) have not always been compatible with existing cottage development.

5) The original cottage developments had very little impact on the shoreline and on littoral drift due to limited technology for shore protection and a limited need for such protection. Municipal assessment criteria for properties within Lambton and Huron Counties were recently changed to reflect 1988 fair market assessment. This update, from 1980 and 1984 values respectively for the two counties, occurs periodically and generally increases values in keeping with recent property value trends. As a result, lakeshore properties have recently experienced an increase in assessment (generally by approximately 40 percent). This factor, plus the general increase in open market prices reflected by the assessment increase, will create additional pressure on the desire to "protect" the land from the lake's erosional forces as well as further pressure to increase services to these cottage areas.

In summary, due to increased population and greater disposable income, development pressure along the shoreline is increasing; careful consideration of regional capacity to maintain such growth is needed. Investigations such as the *Rural Servicing Study* completed by Huron County and standard review of Official Plans for all lakeshore municipalities should be undertaken — otherwise, the result could be a long linear community from Port Franks to Goderich. Such a community would severely stress shoreline resources; without careful planning, results could be devastating.

Research related to the *Huron County Official Plan (Huron County Planning Dept., 1999)* revealed that, taken as a separate community, the lakeshore has the largest population in the County. While difficult to categorize, this shoreline community and related population base appear to be more permanent and less seasonal than when first developed. The term "cottage" is therefore no longer applicable in all areas.

PUBLIC CONSULTATION

Public and municipal input to the Shoreline Management Plan were achieved by these methods:

1) Public Meetings

2) Steering Committee

3) Publications

4) Open Houses

Public meetings were held at the Stanley Township Community Centre on July 20, 1990 and July 26, 1991 to discuss shoreline issues and to introduce initial concepts of shoreline management. More than 200 people attended each of the two meetings, both held on Friday evenings to enable landowners — especially cottagers arriving at the lake for the weekend — the opportunity to attend. Those who attended were asked to list the issues which they felt were important and needed to be addressed in any subsequent shoreline management plan *(see Section 2.2 and 2.3 for a discussion of these issues)*.

The inaugural meeting of the **Steering Committee** for the SMP occurred on December 11, 1990. Since that time the Shoreline Management Committee, composed of two sub-committees, (the Technical and Project Committees), met a total of 25 times to provide local knowledge, expertise, direction and advice on the creation and adoption of the SMP. The membership of the committees is listed in the acknowledgements section *(page iv)*.

In May 1992, a **direct mailing** was sent to the 2,500 lakeshore residents advising them of the creation of a first draft of the SMP and where to obtain more information. Second and third mailings (February and May, 1993) were sent to residents, answering common questions about the SMP and advising them of the completion of the second draft of the document. These mailings were supplemented by factsheets on shoreline matters (e.g. water levels, shore erosion and the shoreline history), news releases and information packages (including all drafts of the SMP) to each of the 65 cottage/ratepayer associations. Mailings also advised residents of a schedule of open houses planned for the summers of 1992 and 1993 *(see Appendix C)*.

In all, five **open houses** were held at various locations along the shoreline, all on Saturdays throughout the summer in 1992, to display information, provide copies of the draft SMP and explain to residents the methods used to analyze the shore environment. More than 500 people attended these sessions and, when asked for written comments on the plan, more than 300 participated. Their comments were considered by the Steering Committee, answers provided where requested, and revisions made to create the SMP's second draft released June 1, 1993, again for public scrutiny.

Two public meetings were held in June, 1993 to provide information and answer questions regarding the second draft. The document was first released to cottage associations/ratepayers on May 21, 1993 in a special meeting for group representatives. Both forums included a formal presentation which was not part of the program of previous open houses in 1992.

Considerable opposition to the SMP was encountered throughout the process. Initially, much opposition related to concerns about the information being provided, the intent of the SMP and how it would be implemented. It should be noted, however, that the Committee has tried to address many of the concerns in providing a final version of the SMP. The ABCA Committee suggested changes to reflect concerns of groups such as the Lake Huron Preservation Association, other lakeshore property owners and the lakeshore municipalities.

Extensive public involvement was viewed by the Steering Committee as crucial to the project's success. The Committee recognized the need to raise the level of understanding of shoreline residents to the natural processes occurring along the shoreline, to raise the awareness of lakeshore residents as to how their individual property fits into the overall shoreline system, and to improve the extent of information contained in the SMP by consulting long-time shoreline residents. Their assistance was invaluable in bringing new information to the SMP and verifying the results of analysis completed throughout the SMP.

SHORELINE OWNERSHIP

The entire Lake Huron shore in Huron County was considered by MNR to be public property because the original patent to the Canada Company specifically reserved to the Crown all beds of all navigable waters and portions of the banks of navigable waters.

As further discussed in Section 4.2.5, a court case involving the Grand Bend beach in June 1990 confirmed this assumption but only after the first decision by the trial judge *(Chilcott, 1990)*, in favour of private ownership, was overturned by the Court of Appeal *(Brooke, Finlayson, Carthy, 1996)*. The Chilcott decision stated that certain letters patent issued by the Crown to the Canada Company are "void for uncertainty" since it was impossible to find the original "bank" of Lake Huron as described in the original Crown Patent for the land in 1836. This decision dealt with the north beach (between Main Street and the Ausable River mouth) in the Village of Grand Bend and was overturned in an appeal to the Supreme Court. The case was further complicated by the fact that the beach at Grand Bend is an accretional feature (termed a "filet beach") formed due to the construction of harbour protection structures. The only other similar filet beach in the study area lies to the north of Bayfield harbour protection and is assumed to be in private ownership.

Due to varying interpretations of Crown reserves and patents, it is imperative to examine each one individually to determine ownership status of a specific lot which includes the foreshore region. There is also a need to determine if any reservations are stated and if they can be determined. Next, the village or township survey should be reviewed to determine if the lakeward border of the survey is a straight line or irregular, matching the irregular nature of the shoreline. Surveyors' notes, if available, can also assist in determining whether a reserve was indicated along the shore; then the property title must be examined to assess whether it is subject to a right-of-way or easement in favour of a third party *(Strelchuck, 1981; Winter, 1991)*.

The research described above will assist in determining where the location of the lot's lakeward boundary; there are also these factors to consider:

1) If the property is truly riparian and extends to the water's edge, then it will accrete and recede with water level changes; another term for this is an **ambulatory property line**.

2) The definition of **high water mark** is not clear in legal documents and could have several interpretations, including **water's edge** (also known as **wet bank**) and **mean high water mark** (also known as **dry bank**).

3) The property title is a combination of the actual grant of land and how the land is used; this not only applies to use by the owner, but by all predecessors in title.

4) Related to the land use previously mentioned, the common law concept of **adverse possession** is where a person, without legal title, may gain title to land registered in the name of a third party. It is defined as the "*continuous, open, notorious and adverse use of land by a person or a continuous line of persons, none of whom have registered claim or paper title to the land in question*" *(Winter, 1991)*. The time span of claimed "use" is a critical component to this claim and varies in length depending on whether the land claimed is public or private.

5) Lastly, ownership of land can revert to, or escheat to, the Crown. This is the case when there are no heirs to an estate or when a limited company which owns lakeshore property is dissolved without dealing with the land in question. In both cases the Crown re-establishes ownership.

The beds and banks of a lake or watercourse are not defined in any Ontario statute *(Lambden and de Rijcke, 1996)*. It is therefore up to shoreline landowners and coastal managers to carefully consider the implications and complications presented by this situation. Micheal Smithers summarized his article, titled *Minding the Waterline — Is it yours, or is it mine?*, by saying, "It is evident from the foregoing…that there is no element of certainty with respect to the influence and/or direct ownership of the beach on the shore of any of the Great Lakes." *(Municipal World, December, 1999)*

Ipperwash Beach, Town of Bosanquet, 1972 (St. Patrick's Day Storm)

CHAPTER THREE / PLAN COMPONENTS

PHOTO: COURTESY OF LONDON FREE PRESS COLLECTION OF PHOTOGRAPHY NEGATIVES, D.B. WELDON LIBRARY, UNIVERSITY OF WESTERN ONTARIO, LONDON, ONTARIO N6A 3K7

PLAN COMPONENTS

To fulfill requirements of the guidelines for creating Shoreline Management Plans *(see Chapter 1, Introduction)*, certain components need to be addressed. These have been augmented by issues of concern which the SMP Steering Committee recognized as critical to this length of shoreline. The issues *(referred to in Table 1)* are incorporated under the general headings of the components.

Subsections of the plan are briefly described; MNR-required components [in brackets] are:

1) **Mapping**: identification of lakeshore hazards which occur in the shoreline region and the methods used to determine severity of the erosion hazard [Prevention].

2) **Shoreline Description**: description of the shoreline by specific reach (a section of shoreline which possesses similar characteristics) to recognize common problems (related to hazards, existing development, beach access, the environment, drainage and other factors). This responds to many of the issues priorized by the SMP Steering Committee [and in part addresses many of MNR's components such as Protection].

3) **Lakeshore Development Policy**: the recommended approach to managing existing development and new development within the lakeshore region, referred to by MNR as Regulatory Shoreland Zone [Prevention].

4) **Shore Protection**: a summary of the document prepared to support the SMP, which recommends protection alternatives and protection types dependent on shoreline characteristics [Protection].

5) **Environment**: an overview of the lakeshore ecosystem and management options to protect — and, where possible, enhance — the existing environment [Environment]. Many of the issues identified by the SMP Steering Committee are included within this discussion.

6) **Emergency Response**: a description of the existing response plan used by the ABCA and how additions to the plan can be made to address lakeshore hazards [Emergency Response].

7) **Future Monitoring**: direction on how future monitoring of the shoreline can assist in the recognition of changes to the shoreline and verification of the extent of hazards involved. Recommendations on how, where and what to monitor to ensure a more complete understanding of the lakeshore environment are presented [Monitoring].

These components form the bulk of discussions within the SMP, and are provided in the following sections.

SECTION 3.1 MAPPING

SECTION 3.1.1 INTRODUCTION

Mapping is an integral component of any land use management project. In the coastal zone, it is essential to be able to detect shoreline position change to make estimates of erosion and accretion. As described in Anders and Byrnes *(1991)*, these data are used for many purposes, including developing sediment budgets, examining geomorphologic variations in the coastal zone, studying the role of natural processes and human alteration to shoreline positions, establishing setback lines, and predicting future shoreline change. Shoreline mapping is therefore a major component of this shoreline management study.

Prior to 1988, complete mapping for the shoreline area was limited to the relatively small scale coverage of the 1:50,000 scale National Topographic Series (NTS) maps *(updated in 1985)*, or 1:10,000 scale aerial photographs taken as part of the Coastal Zone Atlas *(1975)* project. The Coastal Atlas was a federal/provincial government initiative intended as a planning tool for managing the Canadian shorelands of the Great Lakes. Although adequate for a provincial scale analysis, more specific shoreline management projects were limited in the detail which could be achieved. Detailed mapping of the shoreline was restricted to specific sites; such mapping was completed for a variety of reasons and illustrated different features (i.e. subdivision plans, harbour protection plans, township zoning bylaw maps), depending on mapping objectives.

The Flood Damage Reduction Program (FDRP) shoreline mapping project is a federal/provincial government initiative to identify shoreline hazard areas at a scale of 1:2,000. Preliminary shoreline mapping for the ABCA shoreline (based on 1988 aerial photography) was used as a basis for comparison of shoreline location with a historical land survey *(completed in 1935)* for the entire shoreline region. Using this shoreline comparison spanning 53 years, future projections of shoreline positions were determined and zones of hazard or caution were identified.

MAPPING, CONTINUED

The shoreline mapping was then used as a base map for plotting other data sources (i.e. development area constraints, environmentally significant areas, drainage courses, land use inventory) to provide direction for land use management decisions. However, the identification of hazard areas due to flooding, erosion and dynamic beach effects is a primary factor when formulating management options. The methodology used in comparing the 1935 historical shoreline survey to the 1988 shoreline mapping involved transferring the paper copy of the 1935 information into a digital (computer) format to allow direct comparison with the digital 1988 mapping. This comparison was undertaken on a computer-based Geographic Information System (GIS). The following section details the data sources and procedures used in this comparison.

SECTION 3.1.2 METHODOLOGY

The historical shoreline survey from 1935 provides an invaluable tool for comparison to more recently acquired data to illustrate shoreline location change. The shoreline 1:2,000 scale mapping produced from 1988 aerial photographs provided the basis for such a comparison. These data and the comparison methodology are described in the following discussion.

1935 Shore Traverse Survey

During the summers of 1934 and 1935, survey crews from the Department of Lands and Forests, Province of Ontario, traversed the shoreline from Sarnia to Kincardine, documenting shoreline features. The shoreline between Kettle Point and Goderich was surveyed in July and August of 1935.

The survey incorporates a traverse line which follows the beach between the toe of the bluff and the water's edge (north of Grand Bend) or between the dunes and the water's edge (south of Grand Bend). Along this traverse line, offset measurements and angles were taken to significant features such as water's edge, high water mark/toe of bluff and, where possible, top of bluff.

In general, offsets to the water's edge and high water mark/toe of bluff were taken every 80 metres, while offset measurements to the top of bluff were taken irregularly and at greater spacing (likely due to difficult access from the beach to the top of the bluff). Cross-sections of the beach and part way up the bluff were also measured, generally at a spacing of 400 metres.

In addition, survey check-points or tie-ins were established by measuring from the traverse line to fixed features along the traverse (i.e. corners of buildings, survey monuments or iron survey bars). This enabled the traverse line to be relocated with respect to physical features in existence at the time of the survey. *(Figure 7, opposite, illustrates the type of data shown on this historical survey.)*

1988 Shoreline Mapping

This mapping, based on April, 1988 aerial photography, was completed in both digital and paper copy format. Preliminary copies of both formats were available during this project and were used for comparison with the historical shoreline survey. The shoreline mapping was completed at a 1:2,000 scale, and physical shoreline features such as toe of bluff, water's edge and top of bluff are readily identifiable from the mapping.

The maps portray the shoreline in a continuous strip with full contour detail (one metre contour interval with 0.5 metres interpolated) from the shoreline to a minimum distance of 250 metres landward from top of bluff. Where gullies occur, they are mapped a minimum distance inland to Highway 21, with topographic detail measured 50 metres back from top of bank. *(Figure 8, on page 26, shows an example of shoreline mapping and Appendix D provides maps at a reduced scale. These smaller scale maps show the area affected by the Regulatory Lakeshore defined in Section 3.3, Lakeshore Development Guidelines.)*

MAPPING, CONTINUED

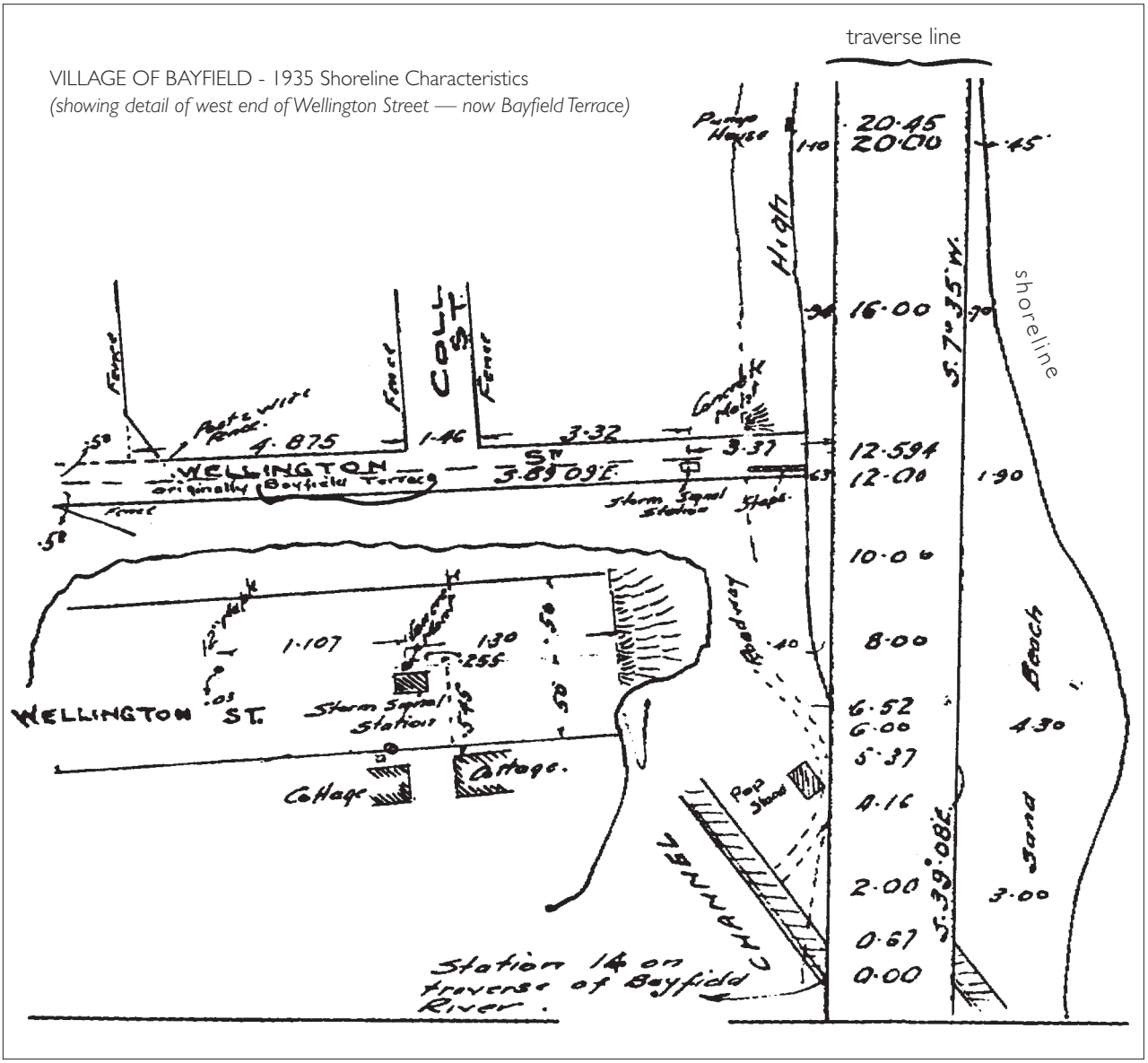


Figure 7 - 1935 Shore Traverse Survey

MAPPING, CONTINUED

Figure 8 - 1988 Shoreline Mapping

MAPPING, continued

Shoreline Change Determination

A method was needed to enable a direct comparison of the 1935 shore traverse survey to the 1988 shoreline mapping. It was determined that due to the length of shoreline (over 60 kilometres), the method would need to incorporate the effects of the curvature of the earth. The method would also need to allow for geodetic referencing the historical survey into map projection co-ordinates — either latitude/longitude or the Universal Transverse Mercator (UTM) system — used in the shoreline mapping.

After considerable discussion with consultants and representatives of the MNR, Lands and Water Policy Branch, an appropriate method was determined. The method utilized a Geographic Information System (GIS) called SPANS, and involved transferring the 1935 shoreline traverse data from its original paper copy format into a digital file to allow direct comparison with the 1988 shoreline mapping. Initial geodetic referencing of the 1935 survey (i.e. tying it into the UTM co-ordinate system) was provided by control points on the harbour structures at Goderich, Bayfield and Grand Bend, as well as at a road intersection near Kettle Point. These control points were easily identified on both sets of mapping, and were supplemented by secondary tie-ins, as discussed later, in order to improve the accuracy of the 1935-1988 shoreline comparison.

The 1935 traverse line and offset measurements to the different shoreline features were manually entered into a digital file and subsequently converted to UTM co-ordinates using a data editing program called COGO, which is a component of ARCINFO, another type of GIS. These data were reviewed and verified to eliminate data input errors, as well as several errors apparent on the original paper copy of the 1935 survey.

Upon conversion to UTM co-ordinates, the 1935 survey was transferred into the digital FDRP file to allow a direct comparison of the shoreline features in 1935 and 1988. The overlay of the two surveys, using the control points discussed above, showed excellent agreement to the north of Bayfield, but suggested that an error was present in the 1935 survey south of Bayfield. An extensive review of available data was undertaken to locate and correct this error. However, it was only possible to determine that the error (or errors) likely existed between Bayfield and St. Joseph. To provide an improved overlay of the two surveys, 22 secondary tie-ins were utilized at various locations along the shoreline, including:

1) the centre of Hwy. #21 (the Bluewater Highway),
2) survey monuments and iron survey bars,
3) cottage structures and buildings which existed in both 1935 and 1988,
4) harbour features such as Public Works benchmarks (Grand Bend) and the storm signal station — now removed (Bayfield).

All these features were identified on the historical survey and were relocated in the field at the present time (except the location of the Bayfield storm signal station which was confidently re-established using adjacent building locations). Using these additional tie-ins, the 1935 shoreline traverse was "fitted" to the 1988 shoreline mapping. *(A discussion of the accuracy of the resulting shoreline comparison is presented in Section 3.1.3.)*

To compare water's edge locations, values were adjusted to reflect the difference in average water levels between July/August 1935 and April 1988 (water levels were approximately 0.7 metres higher in 1988). Comparison of the location of the toe of the bluff was generally based on the high water mark from the 1935 survey (this feature is representative of the toe of bluff along most of this shoreline). Only localized comparisons of the top of bluff locations were possible due to the limited offsets to this feature measured in 1935. Finally, an additional comparison at mid-slope on the bluff was undertaken at locations where the bluff cross-section was measured in 1935, in order to assess changes in the location of the bluff face without the localized short-term effects of slumped material at the toe, or exaggerated top of bluff recession due to surface runoff effects. This mid-slope location was determined to be best represented by the 180-metre contour. *(An example of the shoreline comparison is shown in Figure 9.)*

MAPPING, CONTINUED

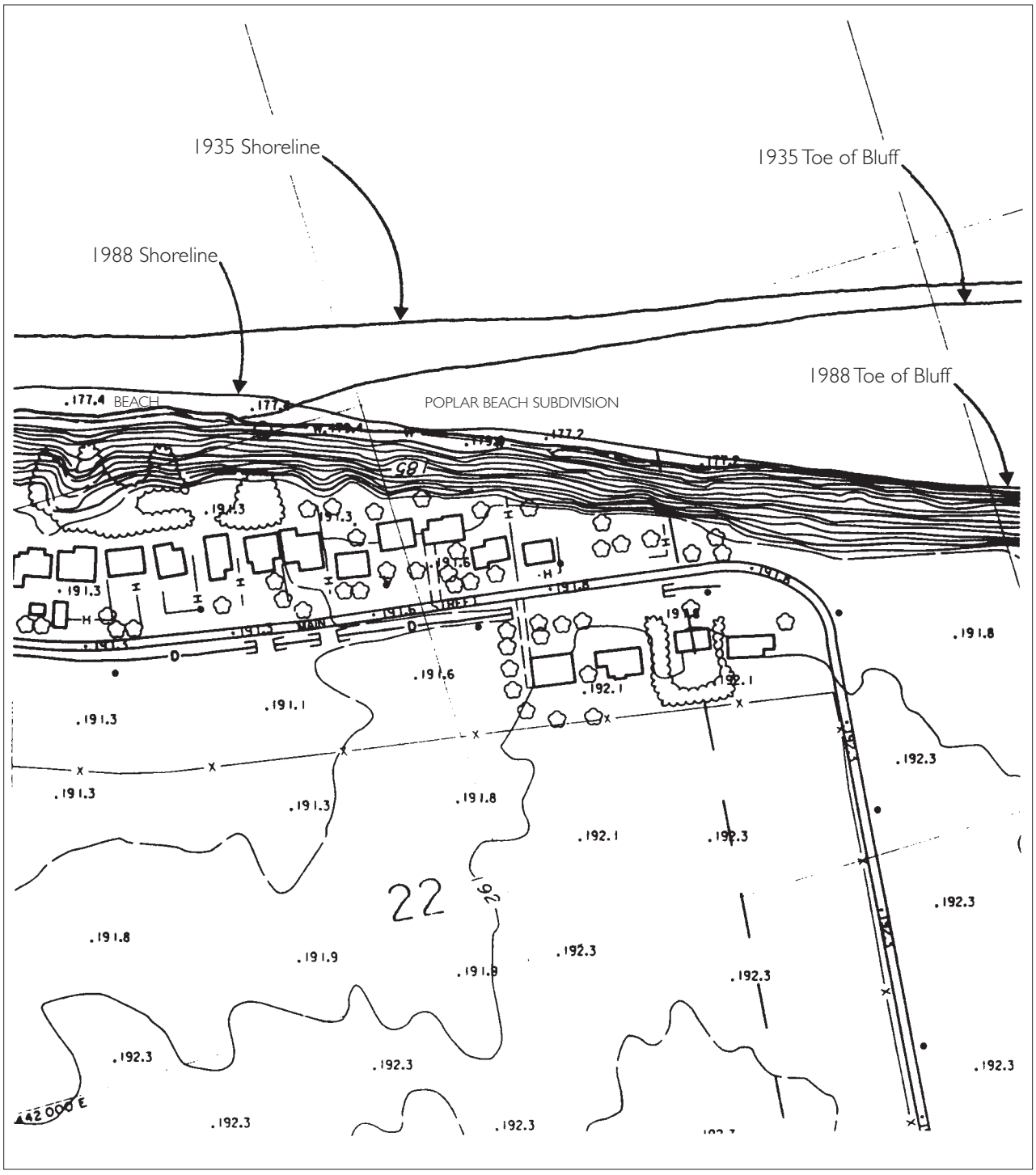


Figure 9 - Example of Shoreline Change Comparison

MAPPING, CONTINUED

SECTION 3.1.3 ACCURACY DISCUSSION

Calculation of shoreline location change has been achieved by comparing several different data sources: aerial photography, mapping and land surveys. Since modern-day mapping is generally produced from aerial photos, topographic maps are generally considered the finished product of such projects. Each data source is discussed below with reference to accuracy.

1) Aerial Photographs

Photography used in producing FDRP shoreline maps was completed in strict compliance with guidelines for FDRP mapping *(Schedule "C" of the Canada-Ontario Flood Damage Reduction Program, January 1985, and Floodplain Management in Ontario - Technical Guidelines, MNR)*. In general, the scale of photography — defined by flight altitude and camera lens — plus flight date and conditions are critical components necessary for accuracy. These photos were taken at a scale of 1:8,000 on April 20, 1988.

Historical aerial photographs for the ABCA shoreline were used mainly for verifying certain locations and features. Often the scale of such photography limits their usefulness for other applications. As an example, the *Coastal Zone Atlas*, completed in 1975 by the federal and provincial governments, includes photo maps produced at a scale of 1:10,000 which can only be used for broad-scale analysis of features.

2) FDRP Shoreline Mapping

This mapping, completed at a scale of 1:2,000, is produced under strict compliance with standards set by both the Ontario and Canadian government mapping agencies — MNR, Surveys and Mapping Branch, Toronto, and Energy, Mines, and Resources (EMR), Ottawa. Accuracy standards are detailed in Schedule "C" *(January 1985)* of the *Canada-Ontario Flood Damage Reduction Program*, and *Floodplain Management in Ontario - Technical Guidelines, MNR*. In general, accuracy can be described as 0.3 metres in elevation and 0.6 metres planimetric. Aerial photography is also completed to these specifications to enable strict compliance with EMR mapping standards.

3) Historical Shoreline Surveys

As discussed above for both mapping and photography, accuracy depends on the standards under which data are collected. Assuming standards are maintained, ground surveys completed by qualified personnel are very accurate. The fact that this historical survey was completed by Ontario Land Surveyors (OLS) — whose work appears elsewhere along the shoreline involving property surveys — lends credibility to the accuracy of work completed in 1934-1935.

Historical land surveys usually involve limitations which should be considered when used as a basis for comparison *(Anders and Byrnes, 1991)*. However, the 1935 shoreline survey benefitted by occurring over a short time span of one month, conducted by two survey parties who maintained a high level of accuracy (measurements made in chains and recorded to three decimal places or to an accuracy of 0.8 inches). Offset measurements along the traverse line were taken at regular intervals (every 4 chains = 264 feet = 80 metres), with periodic measurements taken to the top of the bluff. These factors enabled a shoreline comparison with recent information and provided an accurate depiction of shoreline changes.

4) Shoreline Location Comparison

The method used in comparing the two data sources is the final consideration regarding accuracy. Historical survey information was entered into the GIS system, along with digital shoreline mapping information. Comparison was made utilizing GIS software.

Summarizing accuracy of the shoreline comparison between 1935 and 1988, it was determined that the alongshore (i.e. north-south) length of the 1935 traverse between control points at Goderich and Bayfield was within 1.5 metres over this distance of approximately 20 kilometres. Due to this high level of accuracy, and based on intermediate tie-ins to specific features along the length of shoreline, the cross-shore (i.e. east-west) positional accuracy of the 1935 shoreline features is considered to be about two metres — representing accuracy of 0.04 m/yr if divided over the 53-year comparison period (1935 to 1988).

It is more difficult to quantify accuracy of the comparison south of Bayfield, due to an apparent error in the 1935 survey between Bayfield and St. Joseph, and the requirement to "fit" the 1935 survey to the 1988 shoreline mapping with intermediate tie-ins at locations along the shoreline between Bayfield and Kettle Point. In effect, the fitting procedure stretched or shrank the alongshore shoreline traverse to fit between adjacent tie-ins. Based on results of this analysis, and on additional tie-ins not used in the fitting procedure, it is considered that the cross-shore (perpendicular to shoreline orientation at any location) positional accuracy of 1935 shoreline features for the entire shoreline within the context of this SMP is about three metres (or 0.06 m/yr over the 53-year comparison period).

MAPPING, CONTINUED

The only exception is the area between Bayfield and St. Joseph where the apparent error (or errors) in the 1935 survey exist(s). In this area (shoreline map sheets 32 through 38), cross-shore positional accuracy at the 1935 shoreline features may be more in the order of 7 to 10 metres (or 0.13 to 0.19 m/yr over the 53-year comparison period).

Caution is therefore advised in interpreting historical shoreline location in this area. Any attempts to improve accuracy of the 1935 survey data within this region of Stanley Twp. would require re-establishing ground control points and separating the survey into smaller segments. In this way, the problem area may be isolated and the 1935 survey error may become more apparent. This suggestion is included in Section 5.3, Recommendations.

SECTION 3.1.4 SUMMARY

In their discussion on the accuracy of shoreline location change when comparing maps and aerial photographs, Anders and Byrnes *(1991)* state that three important factors must be considered when quantifying shoreline change:

1) original data sources and techniques to extract information must be of high quality so accuracy is not jeopardized;

2) large-scale maps and air photos have the greatest potential for providing reliable shoreline change measurements; and

3) the time period spanned by two sets of shoreline position information must be significant relative to potential errors in mapping procedure, so that the magnitude of measured change is larger than any inherent errors. Credibility of recorded shoreline change is improved the larger the time span between data sets.

The ABCA Shoreline Management Plan addresses all of these considerations in that:

a) data and techniques are original and of high quality;

b) scale of analysis exceeds recommended map base scale *(from Anders and Byrnes, 1991)* of 1:10,000 (the SMP uses 1:2,000 scale mapping); and

c) time period involved is significant (53 years), when considering that it spans three periods of record high lake levels (1953, 1973 and 1986) and two periods of record low lake levels (1937 and 1964).

The historical shoreline location change has been plotted and an example is illustrated in Figure 9. Verification of changes has been undertaken using additional data sources where available. These include:

- Canada/Ontario Great Lakes Flood and Erosion Mapping *(1978)*
- Great Lakes Erosion Monitoring program data *(1981)*
- Land Registery surveys (including original, cottage area surveys)
- Sequential aerial photographs (vertical and oblique angle)
- Hydrographic field sheets
- Quaternary geology and bedrock maps
- Great Lakes shoreline erosion survey, University of Waterloo *(1986)*.

In the bluff areas of the shoreline, the change in shoreline is determined for the bluff features and a corresponding rate of recession is determined (total distance receded / 53 years = calculated average annual recession rate). This rate is then used to establish an erosion setback as described and illustrated in Section 3.3, Lakeshore Development Standards.

In summary, the high degree of data accuracy and the long length of record which the comparison of shoreline spans make this analysis as complete and detailed as any shoreline comparisons for the Great Lakes (either in the U.S. or Canada).

ABCA SHORELINE DESCRIPTION

SECTION 3.2.1 INTRODUCTION

The Ausable-Bayfield Conservation Authority has jurisdiction over the 60-kilometre length of Lake Huron shoreline between Sideroad 30 in Goderich Township, north of the Village of Bayfield, and Port Franks (approximately) as shown in Figure 1. This includes the shorelines of a portion of Goderich Township, the Village of Bayfield, Stanley Township, Hay Township, Stephen Township, the Village of Grand Bend, and a portion of Bosanquet Township (including the community of Port Franks). Pinery and Ipperwash Provincial Parks and the Ipperwash Military Reserve are all outside the ABCA's jurisdiction, but have been included in the following discussion of the ABCA shoreline due their location within its general limits. In addition, parts of Goderich and Bosanquet Townships are also outside ABCA jurisdiction; however, they are included in descriptions of the shoreline since they are located within the overall littoral cell (management unit) discussed within Section 2.1.1, Littoral Cell Management.

SECTION 3.2.2 GENERAL BACKGROUND

As a result of this area's glacial history, the entire region is covered by deep glacial deposits. A schematic cross-section through the eastern shoreline of Lake Huron is presented in Figure 10, and indicates the presence of bedrock overlain by Rannoch till, which in turn is overlain by St. Joseph till.

Figure 11 presents a longitudinal section along the ABCA shoreline which indicates approximate elevation of the interfaces between these different materials, as deduced from available well and borehole records. It is important to note that these records are generally located landward of the shoreline, and that similar variations to those indicated in the alongshore direction may also occur in the cross-shore direction. Thus, the longitudinal profile presented in Figure 11 will not accurately represent conditions in the nearshore area, but it does provide a general indication of the variation in stratigraphy along the ABCA shoreline and how it influences the shape of the shoreline (e.g. headlands and bays).

The tills contain differing proportions of sand and gravel in the soil matrix. The **Rannoch till** is very resistant to wave action as a result of its relatively high gravel content, and has significantly affected the evolution of the Lake Huron shoreline: the Rannoch till is believed to form submerged resistant shelves throughout this area, acting like bedrock when lag deposits of coarse gravel armour the exposed surface of the lake bottom. These shallow shelves cause waves to break and dissipate their energy offshore, thus reducing the exposure of the shoreline to wave-induced erosion, and resulting in the development of a headland as the adjacent shorelines continue to erode.

The **St. Joseph till** contains a smaller proportion of gravel than the Rannoch till, and is thus significantly less durable than the Rannoch till. Most of the exposed bluffs in this area consist of St. Joseph till, which is readily eroded by wave action. Although wave action at the shore is the dominant force in the evolution of the shoreline, the response of the shoreline to wave action depends on soil composition at the shoreline and on the nearshore lake bottom. The presence of exposed Rannoch till on the nearshore lake bottom and at the base of the bluff results in a relatively stable (non-erodible) shoreline, while the presence of St. Joseph till on the nearshore lake bottom and at the base of the bluff results in an eroding shoreline (both the bluff and the nearshore lake bottom). It is believed that shore erosion is controlled and limited by the more resistant Rannoch till along much of the ABCA shoreline. Rocky Point and Dewey Point are examples of relatively stable headlands where the Rannoch till layer rises to an elevation close to the mean lake level *(refer to Figure 11)*.

Erosion of the bluffs and nearshore lake bottom supplies sediment (clay, silt, sand and gravel) to the shore zone. These materials are transported by wave action and currents (also referred to as **littoral drift**). Finer sediments (clay and silt particles) are carried in suspension and tend to deposit offshore in deep water, while coarser sediments (sand and gravel) are transported along the shoreline and form beaches, dunes and nearshore bars. The extent of these beaches and bars depends on several factors, including the supply of sand and gravel to a particular location, and the nearshore wave climate and water depths.

ABCA SHORELINE DESCRIPTION, CONTINUED

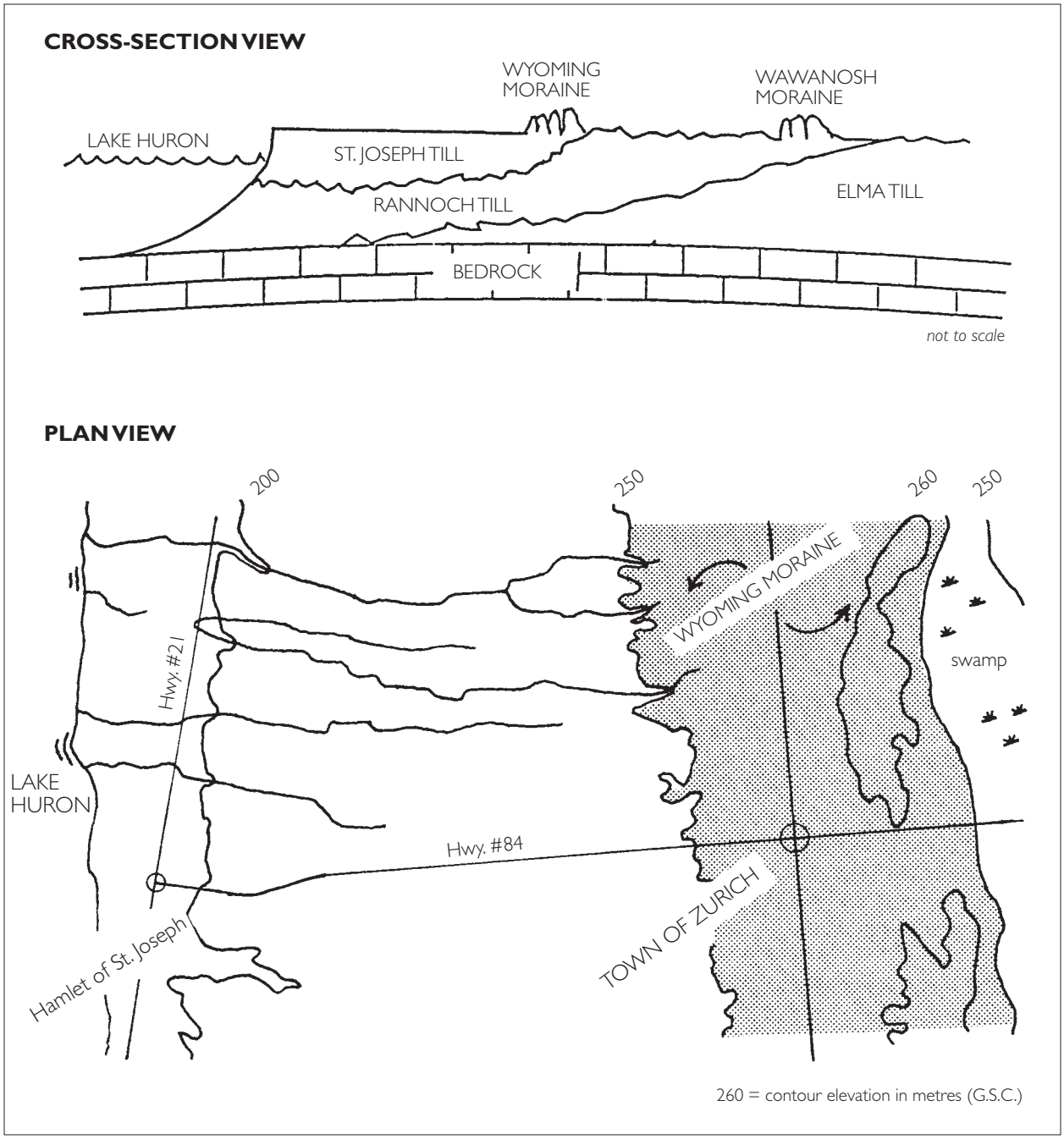


Figure 10 - Geology Cross-Section

ABCA SHORELINE DESCRIPTION, CONTINUED

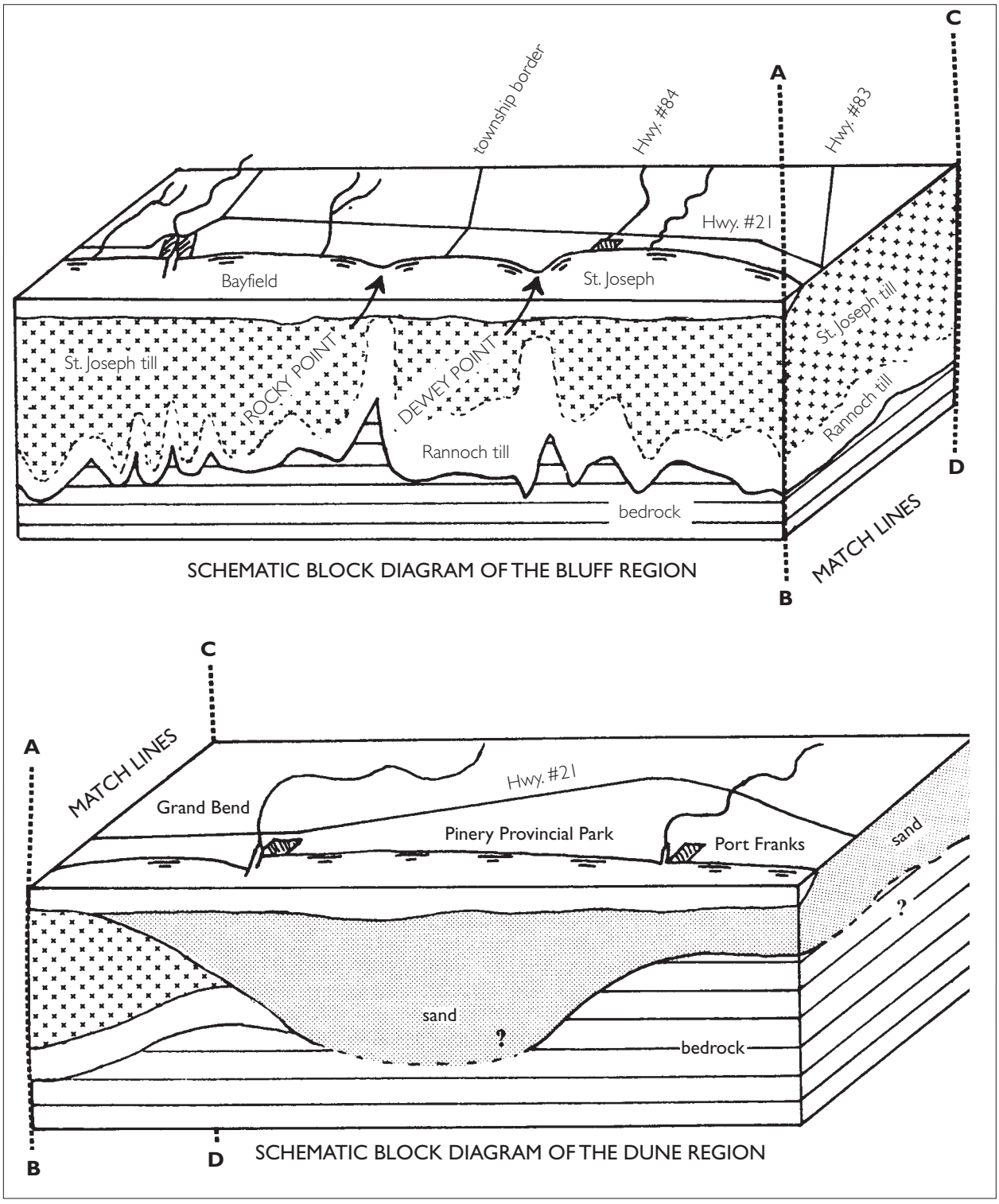


Figure 11 - Waterfront Cross-Section

ABCA SHORELINE DESCRIPTION, CONTINUED

SECTION 3.2.3 ABCA SHORELINE CHARACTERISTICS

The ABCA shoreline can be generally classified into the bluff region north of Highway #83 where erosion commonly occurs, and the dune region south from Highway #83 to Kettle Point where deposition commonly occurs. The different characteristics of these two areas are summarized below, followed by a brief description of development along the shoreline.

North of Highway #83, the shoreline has a north-south orientation and consists of narrow sand beaches fronting till bluffs of moderate height (12 to 18 metres). Bluff height decreases to the south (about six metres high at Highway #83) until the bluffs disappear completely within the Maple Grove cottage area of Stephen Township.

Along this section, many gullies exist due to surface runoff; they may be stable or actively eroding. Historically, the bluffs have been eroding due to wave action undercutting the toe of the bluffs, eventually leading to bluff instability and slumping. Short-term erosion can be affected by drainage conditions and improper management practises along the bluff area. The extent of erosion varies; in recent years, some sections have eroded at rates of 1.0 to 1.3 m/yr, while others have been relatively stable. Long-term erosion rates have been calculated for the entire length of ABCA shoreline by comparing a detailed shoreline traverse from August 1935 with photogrammetric mapping from April 1988 *(refer to Section 3.1)*. These long-term erosion rates are illustrated in Figures 12 and 13 which show the shoreline location; they are summarized in Table 2 for the ABCA shoreline north of Hwy. #83.

Only two reaches of shoreline had long-term erosion rates greater than 0.6 m/yr during this 53-year period: the Melena Heights and Lakewood Gardens/ Sunny Ridge/Poplar Beach areas. During this period, most of the shoreline had long-term erosion rates of less than 0.3 m/yr.

As discussed above, bluff erosion is preceded and controlled by a slow, continuing erosion of the nearshore lake bottom. Although most of the visible erosion (i.e. bluff erosion above the water line) occurs during periods of high water levels, the controlling process of nearshore erosion continues during low water periods. Distribution of erosion rates across the nearshore zone, however, may vary with fluctuating water levels. Erosion of the bluffs and nearshore lake bottom along this section of shoreline, as well as gully erosion and creek and river sediment transport, provide materials to the nearshore area. Of particular interest is the coarser material — sands and gravels — which can form beaches and bars along the shoreline and thus provide some shoreline protection as well as recreational benefits. Along ABCA shoreline north of Highway #83, it has been estimated *(Reinders, 1989)* that approximately 72 percent of the supply of sand and gravel to the nearshore area comes from bluff erosion, 10 percent from gully erosion, 17 percent from lake bed erosion and 10 percent from creeks and rivers. This material is transported along the shoreline by waves and wave-induced currents. The magnitude of this transport is a function of wave conditions (mainly wave height and direction), water depth close to the shoreline and availability of sediments. Transport rate is usually limited by supply of sand to the shoreline, although wave energy has the potential to transport much greater quantities; this situation is typical along Great Lakes shorelines. Due to wave climate and shoreline orientation in this area, net transport is from north to south, although short-term reversals do occur in response to individual storms. Wind-generated sand movement occurs in the bluff region where bluff height is small and beach sand accumulates: in the southern extent of bluffs where a transition region exists, and gradually forms dunes at the toe of the bluff which decreases in height as we proceed south.

To the south of Highway #83 and Grand Bend, the shoreline orientation changes from north-south to northeast-southwest, and the shoreline characteristics change from cohesive till bluffs to sand dunes. Due to change in shoreline orientation, the sediment transport rate decreases significantly and, historically, deposition of sand along the shoreline has occurred. This transition region from till bluffs to sand dunes continues (e.g. Kingsmere and Maple Grove areas) until the bluffs are no longer apparent and the filet beach at Grand Bend dominates the shoreline. Over thousands of years, sand deposition has caused development of an extensive beach-dune system along the Grand Bend/ Pinery/Ipperwash shoreline. Sand deposition here is offset to some extent by wind-blown (aeolian) losses from the beach to the dune and offshore losses to deep water. Of importance to shoreline management in this area is the fact that the stability of this beach-dune system depends on the supply of sand provided by updrift erosion processes, particularly bluff erosion between Grand Bend and Goderich. Dune stability may become a consideration where wave and wind action may physically alter the dune shape.

ABCA SHORELINE DESCRIPTION, CONTINUED

Development along the ABCA shoreline includes 63 cottage areas, as well as the hamlet of St. Joseph, the Village of Bayfield, the Village of Grand Bend, and Port Franks *(ABCA, 1990)*. In general, the residential subdivisions are located on the tableland behind the top of the bluff, although there are isolated cases where development has taken place on a beach terrace lakeward of the base of the bluff.

The subdivisions range in size from six to 60 residences and mainly consist of a row parallel to the top of the bluff, with varying building setbacks; in many cases, additional rows of development have also been constructed inland of the first row. Many of these subdivisions have installed shoreline protection structures of varying type and quality. Groynes and seawalls are the predominant structures, although revetments have been built at some locations. Shoreline protection tends to be more extensive in the vicinity of the villages, where development along the shoreline is more intensive. Finally, there are a few areas with less intensive development (conservation areas, municipal parks and trailer parks), as well as some undeveloped areas, but they are the exception. A summary of the protection structures found along the ABCA shoreline is contained in the *Inventory of Erosion Control Structures (ABCA, 1990)*.

Table 2 - Bluff Shoreline Erosion (1935-1988)
(based on long-term bluff erosion rates)

MUNICIPALITY (shore length)	**HIGH** > 0.06 m/yr.	**MEDIUM** 0.3 to 0.6 m/yr.	**LOW** < 0.3 m/yr.
Goderich (5,220 m)	Birchcliff Melena Heights	Salvation Army Pt. Lot 40, Conc. I	*remaining areas*
• *Shore length*	390 m	1,230 m	3,600 m
Bayfield (2,730 m)	N/A	Bruce Cres., Pioneer Park	*remaining areas*
• *Shore length*	0 m	180 m	2,550 m
Stanley (10,985 m)	N/A	Crystal Springs Gammage Baron de Tuyll Huron Church Camp Snowden Acres Durand Huronview	*remaining areas*
• *Shore length*	0 m	760 m	10,225 m
Hay (13,710 m)	Lakewood Gardens Sunnyridge Poplar Beach	Vista Beach Driftwood Trailer Park Pt. Lot 9, LRW Conc. Bayview	*remaining areas*
• *Shore length*	1,850 m	1,310 m	12,350 m
Stephen (1,500 m)	N/A	N/A	*entire area*
• *Bluff region Shore length*	0	0	1,500
TOTAL	**2,240 m (2.2 km)**	**3,480 m (3.4 km)**	**30,225 m (30.2 km)**

ABCA SHORELINE DESCRIPTION, CONTINUED

SECTION 3.2.4 SHORELINE PROCESSES

A description of shoreline processes on Lake Huron between McRae Point and Sarnia is provided in Reinders *(1989*), which documents the alongshore movement of sand within each of four littoral cells on the lake. Each littoral cell is a "self-contained coastal system, where the ongoing shoreline processes are not affected by the processes of the neighbouring cells". As such, shoreline management of one cell can proceed independently of any other cell; sand, in particular, is not transported between cells.

The ABCA shoreline is entirely within the littoral cell defined by Goderich harbour to the north and Kettle Point to the southwest. The large harbour structures at Goderich and the rock headland and shelf at Kettle Point act as barriers to sand transport at these locations. This littoral cell has been further subdivided into four subcells in order to describe the sediment transport rates along the shoreline, with boundaries to the subcells located approximately at Goderich harbour, St. Christopher's Beach, Bayfield Harbour, Maple Grove subdivision (2 km north of Grand Bend harbour) and Kettle Point.

Subcell 1:
Goderich Harbour to St. Christopher's Beach
(Reach G in Reinders, 1989)

Between Goderich harbour and St. Christopher's Beach (this subcell is outside ABCA jurisdiction), the shoreline and bluffs are protected by a combination of exposed bedrock in the nearshore zone, beaches and shoreline protection structures, resulting in no significant bluff erosion. Limited erosion of the lake bottom supplies approximately 1,000 m3/yr of sand to the nearshore area *(Reinders, 1989)*. Sediment transport is negligible here due to very limited supply and the sheltering effect of the Goderich har-bour structures.

Subcell 2:
St. Christopher's Beach to Bayfield Harbour
(Reach H in Reinders, 1989)

Between St. Christopher's Beach and Bayfield harbour, the shoreline consists of cohesive bluffs fronted by narrow sand beaches. Within ABCA jurisdiction (i.e. south from Lot 30, Concession 1), approximately 30 percent *(ABCA, 1991)* of the shoreline has been protected to some extent, generally using groynes and/or seawalls.

A comparison of 1935 and 1988 bluff locations indicates that bluff erosion in this area ranges from zero to 0.9 m/yr, with the highest calculated erosion in the Melena Heights area. Reinders *(1989)* estimated that bluff erosion supplies an average of 13,100 m3/yr of sand to the nearshore zone, and that gully and lake bed erosion supply approximately 4,100 and 2,800 m3/yr respectively.

Along this section of shoreline, a unique feature has developed as a result of construction of Bayfield harbour structures in the late 1880s. Due to their impact on alongshore transport processes, historical accretion of sand has occurred to the north of these structures, creating a relatively wide filet beach extending from the jetty north to the Jowett's Grove area. Provided that land-side influences on the bluff are controlled, the general condition of the bluff behind the filet beach is stable as evidenced by historical cottage development and bluff conditions. However, this beach has achieved equilibrium and sand now bypasses Bayfield harbour and is transported further south into the next subcell.

Subcell 3:
Bayfield Harbour to Maple Grove subdivision
(Reach I in Reinders, 1989)

Between Bayfield harbour and Maple Grove subdivision, the shoreline again consists of cohesive bluffs fronted by narrow sand beaches. About 40 percent *(ABCA, 1991)* of this reach of shoreline has some protection, with groynes and/or seawalls being the predominant structures. Bluff erosion ranges from zero to 1.3 m/yr, with the most extreme erosion in the Lakewood Gardens/Sunny Ridge/Poplar Beach area. Bluff erosion supplies an average of about 32,600 m3/yr of sand to the nearshore zone, while gully and lake bottom erosion supply approximately 4,200 and 7,400 m3/yr respectively *(Reinders, 1989)*.

Unique features along this section of shoreline include Rocky Point and Dewey Point, both of which are headlands projecting into the lake relative to the adjacent shorelines. As noted earlier, long-term stability of these points relative to the adjacent sections of shoreline is due to the presence of hard Rannoch till on the nearshore lake bottom rather than soft St. Joseph till *(refer to Figure 11)*. Of particular interest to shoreline management in these areas is the fact that some cottage development is located on a beach terrace at the base of the bluff in addition to the more typical development on tableland, inland from the top of the bluff.

ABCA SHORELINE DESCRIPTION, CONTINUED

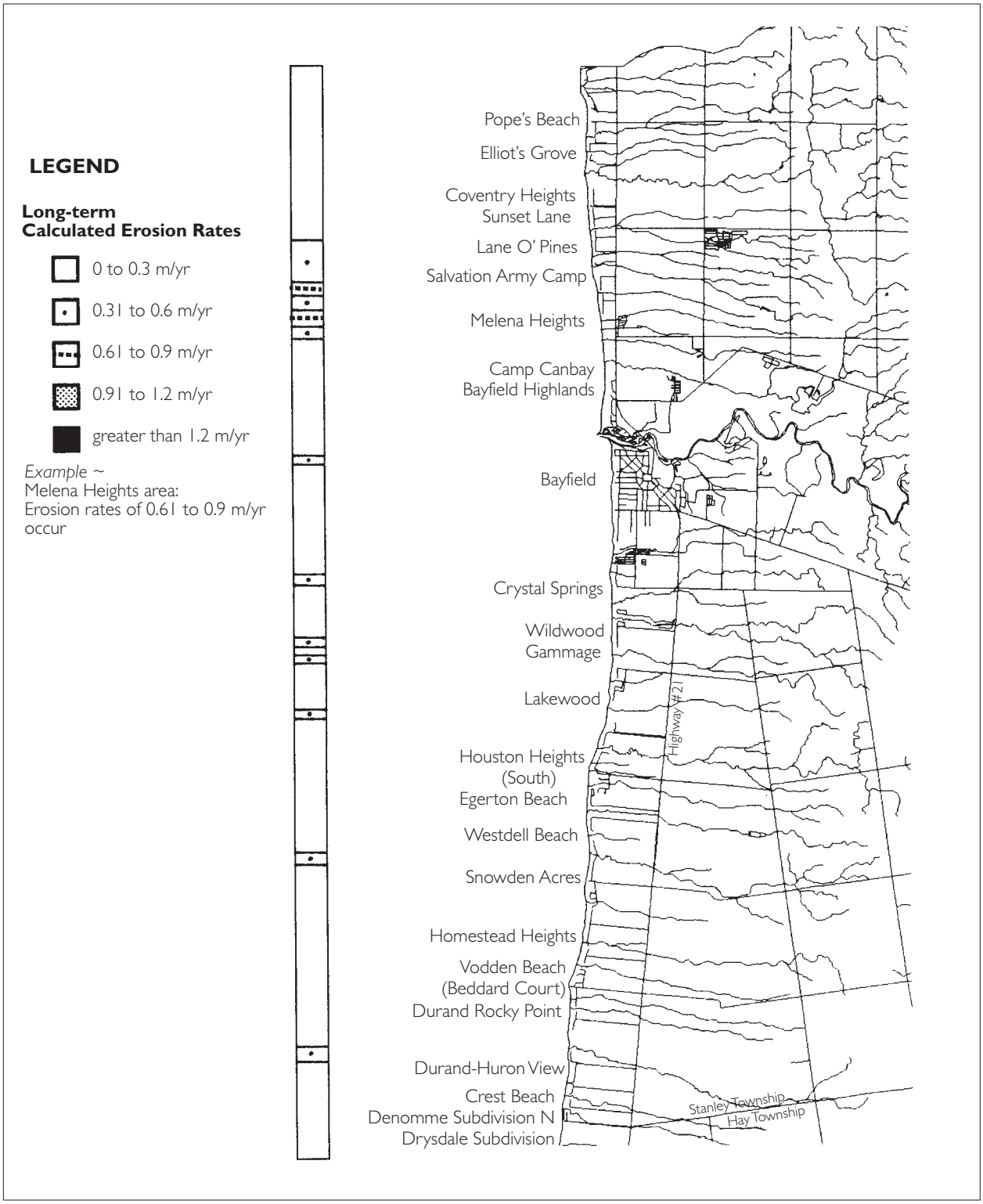


Figure 12 - Shoreline Erosion Rates (Bayfield to Rocky Point)

ABCA SHORELINE DESCRIPTION, CONTINUED

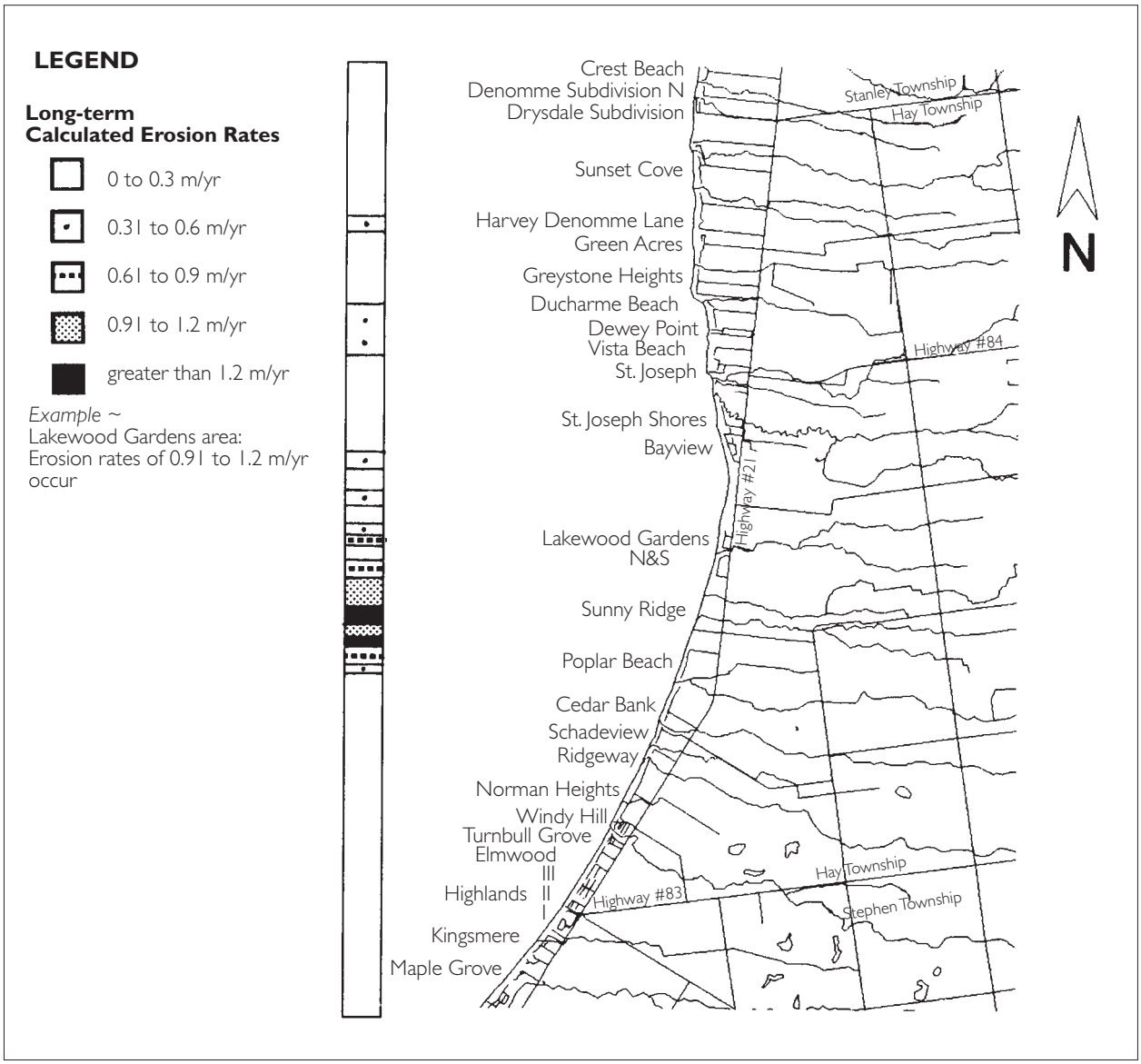


Figure 13 - Shoreline Erosion Rates (Rocky Point to Port Blake)

ABCA SHORELINE DESCRIPTION, CONTINUED

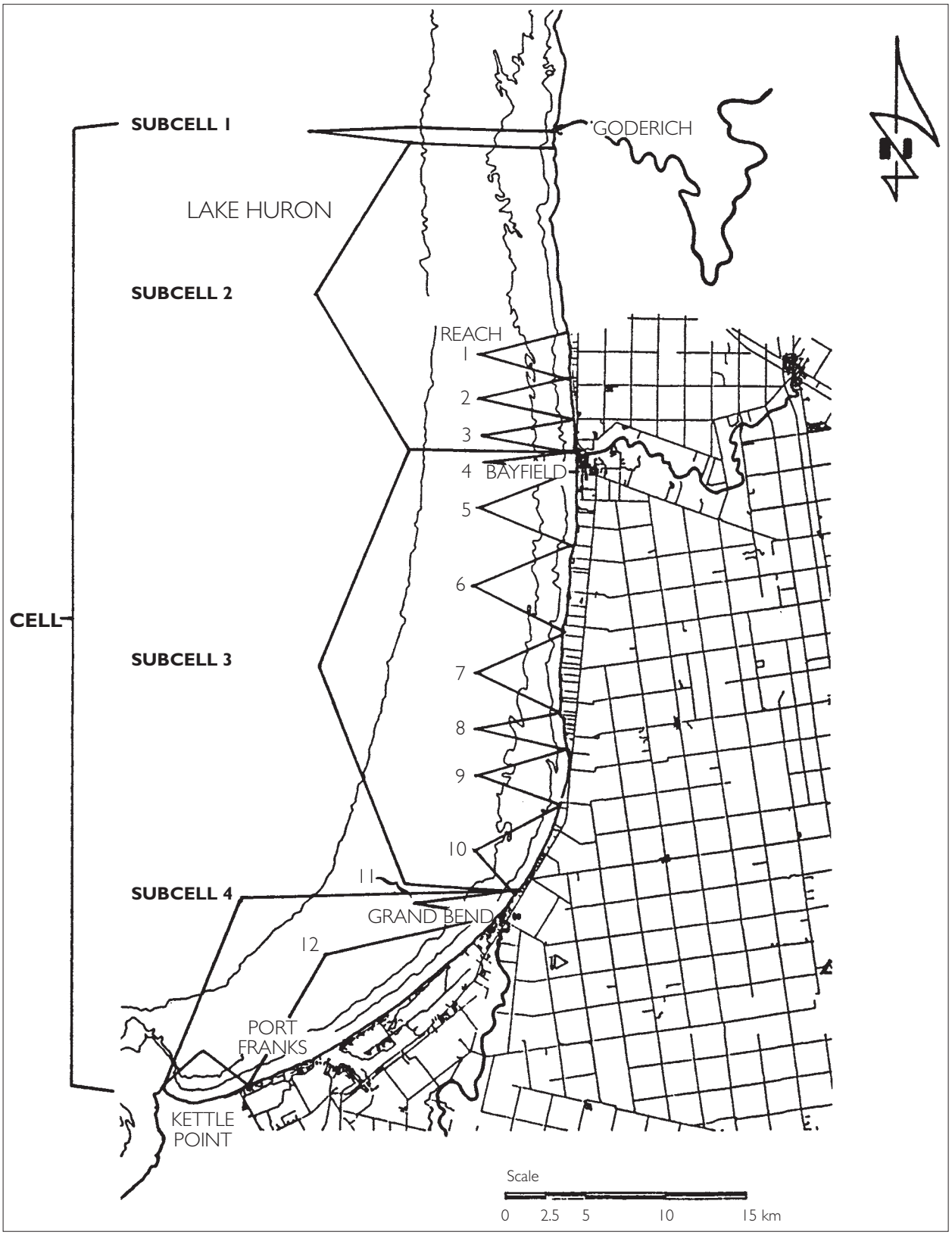


Figure 14 - Shoreline Littoral Cell, Subcells & Reaches

ABCA SHORELINE DESCRIPTION, CONTINUED

Subcell 4:
Maple Grove subdivision to Kettle Point
(Reach J in Reinders, 1989)

Between Maple Grove subdivision and Kettle Point, the shoreline consists of relatively wide beaches fronting sand dunes. This reach of shoreline represents the deposition zone for material eroded from bluffs, gullies and lake bed along the "updrift" shoreline to the north. Reinders *(1989)* initially defined the transition between Subcells 3 and 4 *(Reinders' Reaches I and J)* at the westerly extension of the Highway #83 road allowance. However, based on a review of shoreline characteristics in this area, it appears that the transition from a cohesive bluff shoreline to a sand dune shoreline lacking cohesion actually occurs in the vicinity of Maple Grove subdivision, approximately 1.2 kilometres south of Highway #83. This location has thus been adopted as the boundary between Subcells 3 and 4.

Over thousands of years, sand deposition between Grand Bend and Kettle Point has created today's fully-developed, beach-dune system. However, a comparison of shoreline conditions in 1935 and 1988 indicates that although the dune face has been relatively stable, the beach width has decreased substantially over this 53-year period. In part, the change may be due to reversible (temporary) beach profile adjustment in response to different water level and wave conditions during the periods preceding the two surveys: the 1935 survey was completed following several years of very low lake levels, while the 1988 survey was completed shortly after the record high lake levels of 1985-86. In addition, the 1935 survey was completed in August, after a relatively calm summer, while the 1988 survey was completed in April, after a stormy fall/winter season. Both factors would lead to a narrower beach (above the waterline) in 1988, as indicated by the survey results.

It is likely, however, that a net loss of sand from the Pinery/Ipperwash beach system has occurred since 1935 (irreversible — permanent — beach erosion due to a negative sediment budget, with sand losses exceeding sand supply). This loss may be due in part to a reduced supply of sand to the area caused by construction of Goderich harbour in 1916, as well as possible losses to deep water caused by harbour structures at Bayfield and Grand Bend. Beach losses also occur as a result of aeolian (wind) transport to the dunes and offshore transport to deep water during storms. Due to limitations in available data — specifically absence of detailed beach and near-shore profiles at the time of the two surveys — it is not possible to estimate volumetric change in the beach system over the period of available data. Thus, it is also not possible to quantify the roles of temporary beach profile adjustment and permanent beach erosion on the observed recession of the waterline.

Similar to Bayfield, a filet beach has developed to the north of the Grand Bend harbour structures (built in 1904). This beach extends to the Maple Grove area, and appears to have reached equilibrium, so that sand is now bypassing the harbour structures to be deposited further downdrift. Limited shoreline protection has been constructed to the north of the harbour, while extensive protection has been constructed to the south of the harbour, particularly within village limits. This protection consists of groynes, seawalls and revetments intended to limit erosion of the dune during periods of high water.

SECTION 3.2.5 GODERICH HARBOUR ANALYSIS

Potential impact of the Goderich harbour structures on sediment transport along the ABCA shoreline was analyzed as part of this study *(Baird, 1992)*. The findings of this analysis suggest:

1) The full impact of sand bypassing at Goderich on the downdrift shoreline would take decades to be realized, while the full impact of construction of the harbour at Goderich (completed in 1916) was probably not realized until about 1970.

2) Sand bypassing at Goderich would result in a significant increase in beach width between Grand Bend and Goderich, with positive impact on shoreline and bluff erosion in this area.

3) A comparison of shoreline features between Grand Bend and Kettle Point in 1935 and 1988 indicates that while the dunes have been relatively stable, the waterline has moved landward and the beach has become considerably narrower; this waterline recession may be the result of reversible (temporary) beach profile adjustment and/or irreversible (permanent) beach erosion. Given limitations of the available data, it has not been possible to quantify the roles of these two processes on the observed waterline recession.

ABCA SHORELINE DESCRIPTION, CONTINUED

4) It is likely that a net loss of sand from the Pinery/Ipperwash beach system has occurred since 1935 (due to a negative sediment budget, with sand losses exceeding sand supply). This loss may be due in part to the reduction in sand supply caused by the construction of Goderich harbour, as well as possible offshore losses caused by harbour structures at Bayfield and Grand Bend. Losses from the beach also occur as a result of wind-blown transport to the dunes and offshore transport to deep water during storms. Due to limited data, it is not possible to quantify the roles of these factors on the observed waterline recession.

5) The benefit of bypassing sand at Goderich would be an eventual increase in sand supply to the beach of 27,000 m3/yr; this is equivalent to reduced erosional stress of about 0.05 to 0.1 m/yr (horizontal distance) over the 27-km length of shoreline between Grand Bend and Kettle Point. It would take many years for this benefit to reach the Pinery/Ipperwash area after beginning the process of bypassing at Goderich.

In summary, bypassing of sand at Goderich would benefit the shoreline to the south. Wider beaches between Goderich and Grand Bend would provide increased protection to the shoreline, as well as increased recreational benefits. A qualitative assessment of potential benefits to the Pinery/Ipperwash beach system is limited by available data. Future investigations are recommended to develop a detailed sediment budget for this reach of shoreline (especially the magnitude of onshore and offshore losses), and to assess long-term stability of the beach system, recognizing the dynamic nature of beach profiles under varying conditions.

At the request of this project's Steering Committee, the Canadian Coast Guard (having jurisdiction over Goderich harbour) was contacted and these results of the preliminary analyses were presented. Future options are being investigated with this agency.

SECTION 3.2.6 DETAILED DISCUSSION OF THE SHORELINE

This section, presents a detailed discussion of the shoreline between Lot 30, Concession 1 in Goderich Township and Port Franks. Since Subcell 1 and most of Subcell 2 are outside ABCA jurisdiction, the descriptions begin in that portion of Subcell 2 which is within the ABCA boundaries. This discussion is based on details of shoreline characteristics and erosion control structures *(ABCA, 1990)*, hydrographic survey data, aerial photographs, technical reports, site visits and shoreline erosion analyses *(see Section 3.1.2)* undertaken by Baird and Associates and Geomatics International Ltd.

The reaches are identified by numbers 1 to 12 and subcells are identified as numbers 1 to 4 on the bathymetric map *(see Figure 14)*. For ease of reference, structures which have been erected along the shoreline are described as shore protection structures, although no comment is made on their effectiveness.

Subcell 2:

St. Christopher's Beach to Bayfield Harbour

This subcell of the shoreline is approximately 20 kilometres long and is primarily outside of the area under ABCA jurisdiction, being contained within the Maitland Valley Conservation Authority jurisdiction *(see Section 2.1.1. Littoral Cell Management)*. The most northerly 14 kilometres within the Maitland shoreline consists of high steep till bluffs containing seasonal residential development similar to the area south within ABCA jurisdiction. The remaining length of shoreline within this subcell is 6 kilometres long and consists of bluffs 16 to 20 metres high, with an average slope of 28° from the horizontal. The top of the bluff over most of the shoreline has a two- to three-metre vertical scarp face, bare of vegetation. The toe of the bluff is oversteepened, with poor vegetative cover, to an elevation of two to three metres above beach level. The middle section of the bluff usually has a more gentle slope and is well covered with vegetation, including mature cedars, poplars, white birch and grasses.

Thirty percent of this shoreline contains shore protection structures in one form or another (i.e. groynes, seawalls or revetments). Twelve cottage subdivisions exist in this subcell with approximately 138 cottages located at the top of the bluffs. The subcell is further divided into three reaches labelled as Reaches 1, 2, and 3.

ABCA SHORELINE DESCRIPTION, CONTINUED

REACH 1:

SIDEROAD 30 TO SUNSET LANE, GODERICH TWP.
Shoreline Map Numbers: 44 & 43

General — This reach includes the cottage areas of LaVrangue Beach, Pope's Beach, Elliott's Grove, Fox Hill, Coventry Heights and Sunset Lane, and is a typical till shoreline representative of this region. The bluffs are 20 metres high and erosion rates are less than 0.3 m/yr. North of the Gully Creek outlet, the shoreline has no shore protection structures — likely a consequence of limited erosion in this area, possibly due to stabilization of the nearshore (and therefore the shoreline) by gravel lag deposits from the Rannoch till south of Gully Creek. Much of the shoreline (60 per cent) of both Coventry Heights and Sunset Lane is altered by structures.

Erosion — Rates of erosion are less than 0.3 m/yr for this reach. In April 1991, Pope's Beach experienced bank movement which extended across three cottage lots along the top of the bank (about one metre wide and dropped one metre).

Access — Public access to the beach is limited to Sideroad 30 which crosses the northern border of this reach; it is not improved, however, for actual access.

Environment — The Gully Creek area is designated as a Class A ESA by the ABCA due to the cold water stream (a significant trout stream) and surrounding woodlot along the gully banks.

Development has occurred on the north side and is planned for the south gully side.

Drainage — Many of the northern cottage areas have wooded areas inland which can be used as storage areas for surface drainage. As is commonly the case, no drainage plans exist for most of the cottage areas; gully lots are being developed for cottage use.

Planning Issues — Development plans for the vacant property south of Gully Creek have incorporated the lakebank to remain as a separate parcel of land rather than creating lots which extend down the lakebank — an approach which is preferred by this SMP.

REACH 2:

LANE O'PINES TO CAMP CANBAY, GODERICH TWP.
Shoreline Map Numbers: 43, 42 & 41

General — This reach includes the cottage areas of Lane O'Pines, Lighthouse Cove Trailer Park, Salvation Army Camp, Birchcliff, Melena Heights and Part Lot 40. The shoreline has many shore protection structures (34, of which 17 are groynes). An increase in the erosion rate here (0.3 to 0.9 m/yr) separates this reach from adjacent shorelines.

Erosion — In the vicinity of Melena Heights cottage area, the nearshore lake bottom is eroding and the water depths close to the shoreline are deeper than in adjacent areas. This is evident from a hydrographic survey completed by the Canadian Hydrographic Service (CHS) in 1981 *(see Figure 15)* and from a diving inspection of the nearshore lake bottom *(by W.F. Baird, September 10, 1991)*. As a result, this area experiences the second highest bluff erosion rates in all of the ABCA jurisdiction (long-term erosion rates of up to 0.9 m/yr).

Protection — It is considered that many of the existing shore protection structures built in this area (groynes and sea walls) will not provide protection for many more years, and if no action is taken, severe erosion of the bluffs will take place in the next few years. If improved shore protection is constructed, it is recommended that a revetment structure (as opposed to groynes or seawalls) be built and that its design allow for continuing erosion of the nearshore lake bottom. This type of structure would be considerably more costly than the existing structures; however, it would be capable of stabilizing the shoreline.

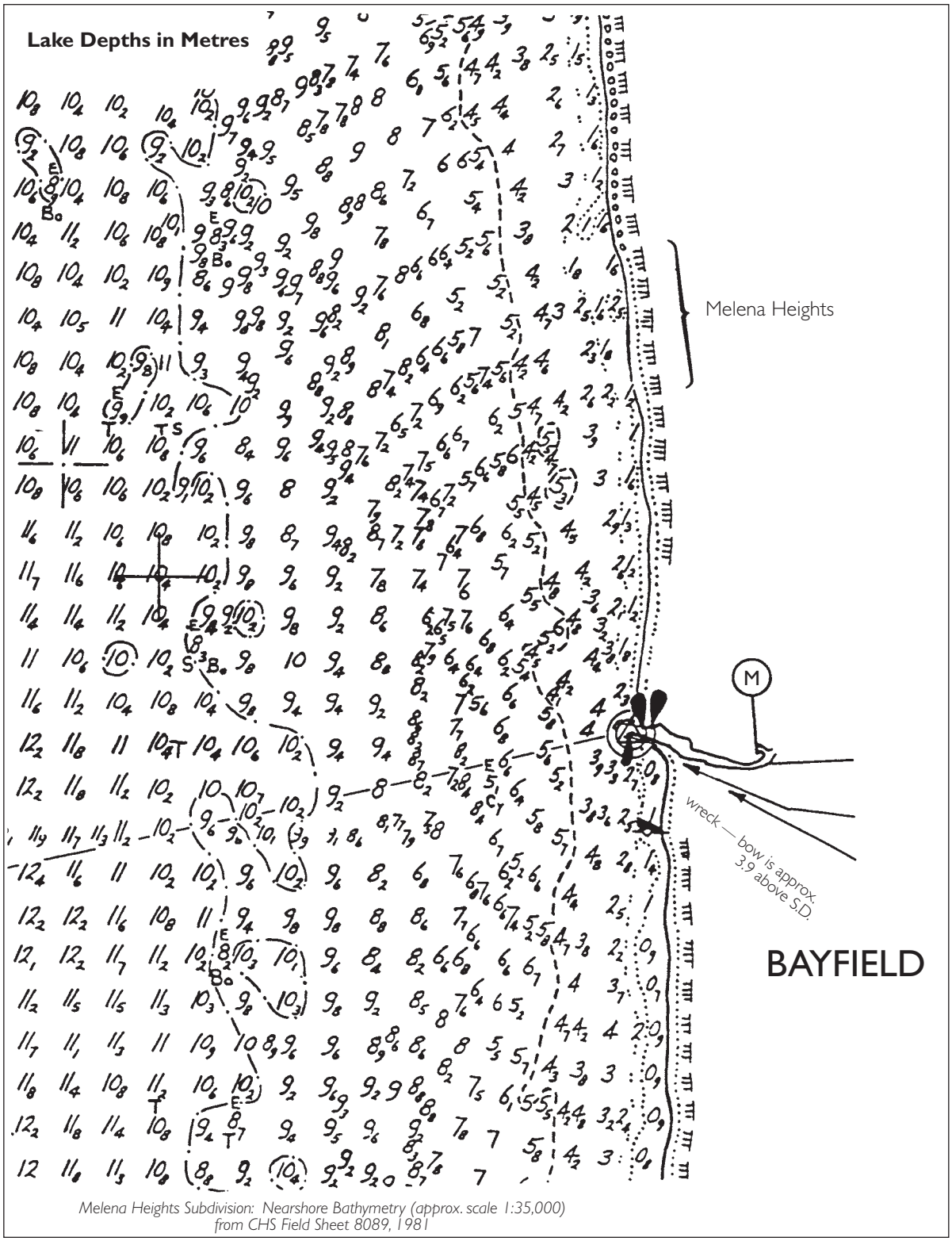
Access — Public access is limited to the Sideroad 35 road allowance which follows the gully at the north end of Lane O'Pines; however, access is not improved through the gully.

Drainage — As part of a development proposal, the Oteva Municipal Drain empties into the gully which borders Lighthouse Cove Trailer Park. This drain is designed to handle surface water from the north.

Planning Issues — Lighthouse Cove Trailer Park has expanded to double its original size and rebuilt the main office which is within 10 metres of the top of an eroding bank.

Other — Other noteworthy features are a nearly vertical scarp along the lakebank at Birchcliff (can be seen from Bayfield Harbour two kilometres south), and a five-metre high waterfall located within a rapidly eroding gully flowing through Lot 40, Concession 1.

ABCA SHORELINE DESCRIPTION, CONTINUED



Melena Heights Subdivision: Nearshore Bathymetry (approx. scale 1:35,000) from CHS Field Sheet 8089, 1981

Figure 15 - Melena Heights / Bathymetric Chart

ABCA SHORELINE DESCRIPTION, CONTINUED

REACH 3:

CAMP CANBAY, GODERICH TWP., TO BAYFIELD HARBOUR, VILLAGE OF BAYFIELD

Shoreline Map Numbers: 41 & 40

General — This reach includes Camp Canbay, Bayfield Highlands, Jowett's Grove and Ronethroy Cottages. The till bluff is protected by the extensive sand beach (referred to as a filet beach) held in place by the harbour structure. It is important to note that the harbour structures must continue to be maintained in order for this beach to remain in place. The transition region from the north end of the filet beach will need to be carefully monitored and assessed to fully understand the role that Lake Huron water levels have on bluff erosion of this sensitive area.

Erosion — Due to the sand beach at the toe of the bank, erosion rates in this reach are less than 0.1 m/yr.

Access — Private beach access exists as part of the marina/condominium complex north of the harbour. No improved, public access locations exist.

Planning Issues — A large-scale development (40 residential lots) which includes regrading the bluff is planned for the area located on the north side of the harbour along the lakebank.

Subcell 3:

Bayfield Harbour to Maple Grove, Stephen Twp.

This subcell forms most of the ABCA bluff shoreline and accounts for the majority of residences located in the risk zone, either related to erosion or flooding. Within this subcell are found the headland features known as Dewey and Rocky Points which, locally, provide more stable bluff conditions and permit cottage development at beach level. This subcell is further divided into seven reaches, labelled Reaches 4 to 10.

REACH 4:
BAYFIELD HARBOUR TO PAUL BUNYAN CAMP, VILLAGE OF BAYFIELD

Shoreline Map Numbers: 40 & 39

General — The 1.8-km length of shoreline between the harbour and Bayfield's southern limit experiences unique problems because of the harbour structures. It appears that north-to-south movement of sand along the northern shoreline is forced offshore by the harbour structures and returns only slowly to the southern shoreline; consequently, the harbour's southern shoreline is partly "starved" of beach sand and may have experienced increased bluff erosion as a result. The beach in this area, including the Village Public Beach, is relatively narrow, and many erosion control structures have been built in an attempt to protect the 19-metre high, unstable bluffs from eroding further. Groyne protection constructed here may not be effective due to lack of longshore sand movement.

In general, these bluffs have a slope of 32°, with 70 per cent vegetative cover (grasses, wild flowers, shrubs, cedars and poplars). However, six sections of the bluff (each between 30 and 80 metres long) are completely bare of vegetative cover. Bluff erosion is evident along much of the shoreline and, in one location, a scarp face is located at the top of the bluff.

Shore protection structures exist along 53 per cent of this shoreline, between the harbour and the south end of Tuyll Street, corresponding to the section of bluff which is eroding and has dwellings situated along the bluff's top. It might be in the public interest for the Village to acquire riparian rights to the base of the bluff and beach and construct community shore protection — for example, a series of offshore breakwaters containing beach fill would protect the shoreline and provide a continuous public beach. This approach, while costly, could provide significant recreational benefits to the community.

Erosion — The owner of a large estate near Pioneer Park has regraded the lakebank and constructed a rock revetment at the toe to improve stability. A second site, at the south end of Tuyll Street, has a residence partway down the lakebank; further review of the site is warranted to assess risk. An erosion monitoring station *(#H-90-30)* exists along the south border of Pioneer Park and records an average erosion rate of .3 m/yr.

Access — Pioneer Park and Bayfield Public Beach provide improved access directly to the beach; Longhill Road enables access to the south harbour structure and adjacent beach. Huron Terrace road allowance formerly paralleled the lakebank along the top of the bluff before erosion of the bluff reduced or eliminated this road. The section between Dow and Christy Streets was the focus of concern in August, 1989, when adjacent landowners took steps to close the public road and purchase the remaining property.

Drainage — Due to a high water table, the Village has installed three large storm sewer outlets (two at the west end of Develan and Cameron Streets, and one near the south end of Tuyll Street) which flow year-round. Evidence of bank seepage has been found at the south end of the Village adjacent to the vacant field.

ABCA SHORELINE DESCRIPTION, CONTINUED

Planning Issues — An amendment to the Village zoning bylaw in 1992 established a top-of-bank building setback for the lakebank equal to 30 metres; this is consistent with the rest of Huron County.

Other — A shipwreck, partly visible at average lake levels, exists approximately 110 metres offshore, north of the Public Beach.

REACH 5:
PAUL BUNYAN CAMP TO HOUSTON HEIGHTS, STANLEY TWP.

Shoreline Map Numbers: 38, 37 & 36

General — Reach 5 includes the cottage areas of Crystal Springs, Wildwood, Glitter Bay, Lakewood Beach and Elmslie Drive, plus the Huron Church Camp and Baron de Tuyll property. In addition, two undeveloped parcels of lakefront cover 450 metres of the shoreline. The reach has 15-metre high bluffs with slopes of 30° and beaches less than 12 metres wide. There are more scarp faces at the top of the bluff and evidence of ground water seepage on the bluff face in this area than exist in the rest of the township. Erosion rate varies from minimal (Houston Heights) to about 0.6 m/yr (Glitter Bay Subdivision).

Erosion — Although the erosion rate is generally less than 0.3 m/yr, there are isolated areas of 0.6 m/yr. In April 1991, the Elmslie Drive area of the shoreline experienced considerable bank movement caused in part by high runoff and saturated soil. At a second site, the ABCA was involved in a project to assist in stabilizing an eroding gully that threatened two cottages. At a third location in this reach, a cottage lot owner in Wildwood subdivision has regraded the lakebank and installed bank toe protection.

Access — There is a well-maintained, private access in the Paul Bunyan Camp for use by camp patrons. Public access to the beach is limited to Sideroads 1 and 5; however, only #5 is actually developed to provide access. Sideroad 5 borders the Baron de Tuyll Crown land parcel with its public beach and limited parking.

Environment — One of the last remaining, large expanses of wooded lakeshore exists within this reach, covering 102 ha of land and including Wildwood, Glitter Bay, Baron de Tuyll, Lakewood Beach and Elmslie Drive. This wooded parcel is identified as a Class A, ESA by the ABCA due to its large size and tree species (described as a mature, beech/maple upland forest).

Drainage — Genoch Municipal Drain was installed to drain a portion of Lot 5, LRW Concession and provide outlet directly south of Lakewood Beach. This drain is noteworthy in that it has provided for erosion control within the outletting lakeshore gully and has involved participation by the cottage residents. At a second site, road drainage is contained and outletted down the lakebank to a protected outlet at the beach adjacent to Sideroad 5.

Planning Issues — Within the ESA, two large residential subdivisions are proposed; these would substantially reduce the forest cover area. Both proposals have undergone review of the woodlot condition and options to reduce impact to the forest were considered as part of the proposals for development.

Other — Related to access, one cottage lot owner has constructed a suspended walkway, 60 metres long, over a gully to allow access to the beach.

REACH 6:
HOUSTON HEIGHTS TO ROCKY POINT, STANLEY TWP.

Shoreline Map Numbers: 36, 35, 34 & 33

General — This reach includes the cottage areas of Houston Heights (North and South), Egerton Beach, Westdell Beach, Snowden Acres, Homestead Heights, Bluehaven Beach and Vodden Beach and ends at Rocky Point. In addition, this reach boasts the only functional township lakeshore park. This shoreline is unique, both for the township and the ABCA, due to the high concentration of steel sheet pile groynes and seawalls. Beach widths are generally wider (about 20 metres wide), although there are some subdivisions (Westdell and Snowden Acres) with beaches less than 10 metres wide. Houston Heights (both North and South), Egerton Beach and Snowden Acres South all have beaches 20 to 25 metres wide, and contain 24 steel sheet groynes in four series. This section of shoreline has little or no bluff erosion. The only location experiencing erosion of greater than 0.3 m/yr is at Snowden Acres. Extensive steel sheet pile groynes along this section of shoreline appear to have been built to hold the sand beach in place for recreational activities and to protect the toe of the bluff during periods of high water.

Erosion — Although erosion is not severe, localized events (such as the bank movement in Westdell Beach in April, 1991) do occur. This slump was 1.5 metres wide and crossed five of the lots at the south end of the subdivision. Material from the slump flowed onto the beach and caused damage to existing seawalls.

Access — Stanley Township Park, located at the west end of Sideroad 10, provides improved access to the beach, picnic shelter and limited parking.

ABCA SHORELINE DESCRIPTION, CONTINUED

Environment — A large woodlot and abandoned fieldstone farmhouse is located inland from Egerton Beach.

Drainage — Snowden Acres has a pipe outletting road drainage water at the top of the lakebank which has contributed to the creation of a gully. Corrective measures need to be taken and were considered in a failed bid for a municipal drain applied for in 1980.

Planning Issues — One of the older cottage areas (pre-1935) along the ABCA shoreline, Egerton Beach has preserved two parcels of land for communal use (playground/tennis courts; septic tank installations).

Other — An interesting feature along this shoreline is a beach terrace partway down the lakebank at Egerton and Westdell Beaches, formed by another stage or level of Lake Huron (the post-glacial Lake Algonquin). This stranded beach feature has been enhanced by Egerton Beach cottage owners and incorporated into the survey plan as a walkway along part of the lakefront. Vodden Beach is located at Rocky Point — a relatively stable area of the shoreline due to the more resistant Rannoch Till in the lakebank. Absence of cracking on cement structures (such as boathouses) near this location provides evidence of stability.

REACH 7:
ROCKY POINT, STANLEY TWP., TO DEWEY POINT, HAY TWP.
Shoreline Map Numbers: 33, 32, 31, 30 & 29

General — This reach stretches from lakeshore 'point-to-point', or between headland features including the cottage areas of Durand Rocky Point, Durand Huronview, Crest Beach, Dennome and Drysdale Beach in Stanley Township. South into Hay Township it includes Sunset Cove, Harvey Dennome, Greystone Beach, Northridge and Ducharme Beach. One undeveloped parcel also exists at the most northerly end of Hay Township, covering 360 m of lakefront. Fifteen dwellings are located on the beach in the southern part of Stanley Township. Durand-Huronview and Dennome subdivisions each have one cottage on the beach, while Drysdale subdivision has 13 cottages on the beach. All the houses on the beach have shoreline protection (usually a steel sheet or concrete seawall).

Erosion — Bluff erosion is generally less than 0.3 m/yr. From the Township boundary (Drysdale) to Dewey Point (including Sunset Cove, Harvey Dennome, and Greystone Heights), the bluffs are completely covered by cedars, birch, maples and grasses. Thirty-nine per cent of this shoreline contains 25 different seawalls, installed to protect the toe of the bluff from wave action during periods of high water. The nearshore lakebottom receives natural protection from the 'points', as a result of gravel lag deposits associated with the Rannoch till; this protection is likely the reason why the shoreline between the two is relatively stable.

Access — There are no improved, public access locations along the shoreline, despite the existence of three township road allowances (Stanley Sideroad 20, Stanley Sideroad 30 — the township border — and Hay Sideroad 5). The access road for the cottages on the beach at Drysdale also acts as a seawall to reduce storm damage during high lake levels.

Drainage — Cottage owners in the vicinity of the gully in Sunset Cove have difficulty getting access during high runoff periods because the access road crosses the gully twice on reaching beach level. One cottage at the south end of this area is constructed straddling the gully outlet.

Planning Issues — A multi-lot severance, which would form second-tier development at Vodden Beach, has raised the question of adequate storm drainage through an existing gully outlet. Adjacent property to the south is also being investigated for a 25-lot residential subdivision.

REACH 8:
DEWEY POINT TO ST. JOSEPH SHORES, HAY TWP.
Shoreline Map Numbers: 29 & 28

General — This reach includes the cottage areas of Vista Beach and Antoinette's Lane, as well as Driftwood Beach Trailer Park and the permanent residential areas of St. Joseph and St. Joseph Shores. The shoreline orientation south of Dewey Point changes slightly to extend further east until a point along the shoreline approximated by Hay Sideroad 15 (Bayview area). The reach extending to St. Joseph consists of 13-metre high bluffs with a vegetative cover of grasses. Shore protection structures, mainly groynes and seawalls, exist along 18 per cent of the shoreline.

Erosion — Immediately south of Dewey Point, increased bluff erosion (greater than 0.3 m/yr) is seen at Vista Beach and Driftwood Trailer Park; it then reduces and the shoreline is relatively stable until St. Joseph. In St. Joseph Shores, the lakebank of three lots has been regraded to a more stable slope (3:1 slope) and bank toe protection has been installed. A second site, north of Antoinette's Lane, was altered by regrading the bluff, installing drainage improvements, and placing rock at the bluff toe. A large estate home was constructed at the top of the bluff on a parcel of land previously divided into 5 subdivision lots.

ABCA SHORELINE DESCRIPTION, CONTINUED

Environment — The gully which flows through St. Joseph Shores subdivision was originally promoted as a 'wildlife sanctuary and ravine'. Restrictions on individual titles have ensured that the gully environment is preserved — evidenced by thick forest cover and walkways which cross the ravine area for local use.

Access — Private beach access is provided to park patrons at Driftwood Beach Trailer Park. This reach also provides the only public vehicular access to the lake between Bayfield and Grand Bend, with a boat launch facility at St. Joseph.

Drainage — Driftwood Trailer Park is the site of Jeffrey Municipal Drain (a closed drain) which was constructed by installing drainage improvements through a gully, then infilling the gully. At a second site, in Vista Beach, surface water drainage problems exist; however, outlet into the municipal drain was not possible. The last vacant lakeshore cottage lot within this cottage area, which contains a small gully, is planned for development.

Planning Issues — South of Driftwood Trailer Park is a vacant parcel of lakefront land. The trailer park has received permission to expand operations eastward, to allow more trailers and a campground.

Other — A landowner placed material on the beach to form a boat ramp without permission from MNR under the Public Lands Act. MNR action was postponed, however, as a result of the Interim Policy on the Management of Canada Company Beaches *(see Section 4.2.5 "Policy and Implementation")*. The material on the beach will need to be removed if this policy changes as a result of other court decisions.

REACH 9:
ST. JOSEPH SHORES TO POPLAR BEACH, HAY TWP.
Shoreline Map Numbers: 28, 27, 26 & 25

General — This reach includes the cottage areas of Bayview Estates, Lakewood Gardens, Sunnyridge and Poplar Beach. The change in shoreline orientation reaches furthest east near Bayview Estates where the shore comes within 100 metres of Highway #21.

Erosion — South of St. Joseph Shores, bluff erosion increases progressively and exceeds 0.6 m/yr throughout the Lakewood Gardens/Sunnyridge/Poplar Beach area, reaching a maximum of about 1.3 m/yr between Sunnyridge and Poplar Beach. Clearly, this high-bluff erosion rate — the largest in the ABCA area — occurs as a result of erosion of the nearshore lakebottom and is a sediment source area for the shoreline to the south. Deeper water adjacent to this area's shoreline is evident in the hydrographic survey *(CHS, 1981)* shown in Figure 16. Protecting this shoreline from continuing erosion (if necessary) would require a very extensive and costly armour stone revetment to allow for the extensive downcutting of the nearshore lake bottom that will occur in future.

Access — Hay Sideroad 15 provides improved pedestrian access to the beach (limited parking); the adjacent site formerly contained a public picnic shelter. In contrast, Hay Sideroad 20 ends at the top of a steep, eroding bank.

Environment — Bayview Subdivision was the site of a sample survey conducted by the ABCA, concerning use and maintenance of septic systems *(referenced under Section 3.5, Environmental Overview)*.

Drainage — Lakewood Gardens has a substantial erosion control structure located in the gully under the Highway #21 crossing. Concern for erosion and proximity of the shoreline to the highway is reflected in the scale of this protection, installed by the Ministry of Transportation. A municipal drain is proposed for the southern half of this subdivision area, with the water to outlet into this existing erosion control structure.

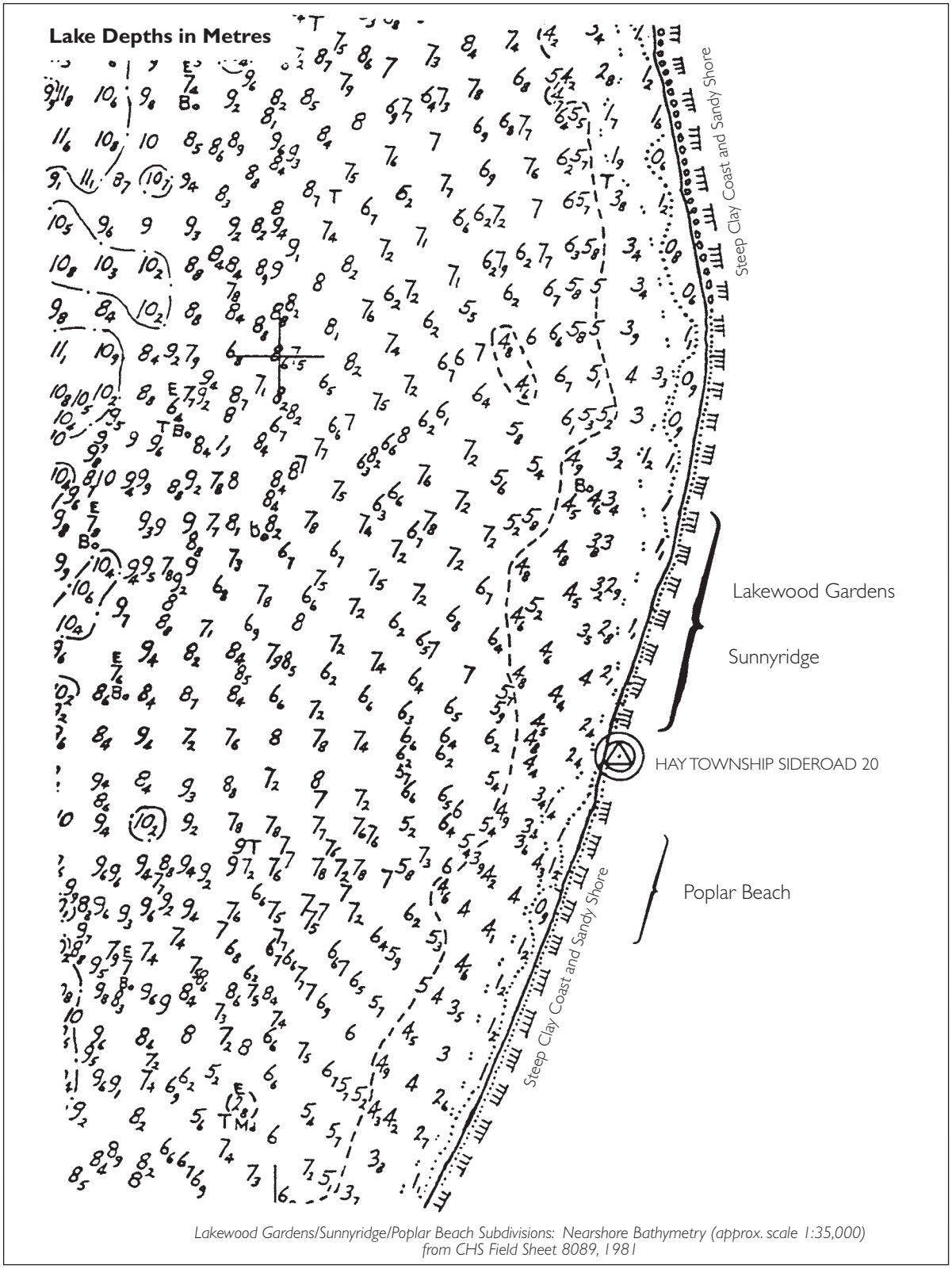
Planning Issues — Several planning-related issues exist in this reach, all related to severity of erosion. Sunnyridge is a cottage area with minimal development, likely related to severe erosion of the lakebank: each of the three existing cottages have had to be moved back at least once from the lakeshore. To ensure future safety of development, lot layout here needs to be redesigned or land use restrictions need to be applied to lands susceptible to long-term erosion.

Poplar Beach, adjacent to the south, has an approved 26-lot subdivision immediately inland from the existing cottage strip along the lakeshore. Long-term erosion (the 100-year erosion line) was accommodated here by the developer, designating that area lakeward of the setback line as open space or park.

Lakewood Gardens is an existing developed subdivision with few vacant lots remaining. Long-term erosion rates here range from 0.6 to 1.2 m/yr; management options will need to consider these rates. Lakeshore Area 1 (slope stability risk) includes three cottages and the caution zone (long-term erosion area) incorporates 28 cottages *(see Section 3.3 for zone definitions)*. Vacant lakeshore property makes up almost 1.5 kilometres along this reach, vacant primarily due to high erosion rates. New development will need to regard the long-term erosion rates in their plans.

Other — Poplar Beach is the site of an erosion monitoring station *(#H-90-40)*.

ABCA SHORELINE DESCRIPTION, CONTINUED



Lakewood Gardens/Sunnyridge/Poplar Beach Subdivisions: Nearshore Bathymetry (approx. scale 1:35,000) from CHS Field Sheet 8089, 1981

Figure 16 - Poplar Beach / Bathymetric Chart

ABCA SHORELINE DESCRIPTION, CONTINUED

REACH 10:
POPLAR BEACH, HAY TWP.,
TO MAPLE GROVE, STEPHEN TWP.
Shoreline Map Numbers: 25, 24, 23, 22, 21 & 20

General — This reach includes the Hay Township cottage areas of Cedarbanks, Schadeview, Ridgeway, Norman Heights, Windy Hill, Turnbull's Grove, Elmwood and Highlands I, II, and III. In Stephen Township, the reach includes Kingsmere and Maple Grove cottage areas and the Port Blake Conservation Area and Lake Huron Water Supply facility. Reach 10 is the most southerly location where till bluffs are found and contains the transition region from the bluffs to a shoreline dominated by sand dunes. Although partly due to shoreline orientation, the availability of sand supply by littoral drift will also affect the stability of this transition region. Lake Huron water levels will also affect the extent of this transition zone, varying north and south with higher and lower lake levels.

South of Poplar Beach, the 6- to 10-metre high bluffs reduce in height until they disappear into the sand at Maple Grove. The bluffs are relatively stable and contain good vegetative cover; the historical ero-sion rate is less than 0.3 m/yr, and areas such as Ridge-way, Norman Heights and Turnbull's Grove have experienced no significant erosion. Protective structures have been built along about 44 per cent of this reach.

Erosion — Localized erosion occurred at the base of the bluffs during the 1986 high lake levels. The Ridgeway/Schadeview/Cedarbank areas have been the focus of additional investigation on the localized erosive effects of groynes on the shoreline as a result of a legal case initiated in 1986, and yet unresolved.

Access — Beach access is provided at Port Blake Conservation Area and the adjacent township road allowance along the north side of the Lake Huron Water Supply facility. Neither Hay Sideroad 25 nor 30 have improved access to the beach.

Environment — The Highlands II cottage area has a history of poor surface drainage; this has resulted in problems with the operation of individual septic systems, most recently during the summer of 1991.

Drainage — The Luther-Miller Municipal Drain forms the boundary between Highlands II and III and was the subject of a drain improvement in 1987. When a drain deepening was proposed to improve agricultural outlet for rural lands to the east, however, it was found that the cottage development had encroached too close to the drain to allow the widening that would be required. As a result, a pump was incorporated into the maintenance at Highway 21 to raise the water from the deepened drain east of the highway up into the existing channel. Surface drainage remains a problem in most of the subdivisions within this reach. A municipal drain is proposed for Highlands II to improve drainage.

Planning Issues — Norman Heights and Windy Hill are the locations of two large residential subdivision proposals (29 lots and 25 lots, respectively). Schadeview is the site of a 3-lot development along the gully.

Subcell 4:
Maple Grove, Stephen Twp., to
Kettle Point Indian Reserve

This subcell forms the deposition area (or littoral 'sink') for the sediment transported along the shoreline from the north. This area is a vast dune/beach complex which has important environmental qualities as well as an important role in protecting the extensive residential development that has occurred along the shore. The term 'dynamic beach' is the regulatory term which defines the inland extent of this shoreline zone and provides direction on how best to manage the dune environment *(see Section 3.3, Lakeshore Development Policy)*. This subcell is further divided into two reaches: Reach 11 and Reach 12.

REACH 11:
MAPLE GROVE, STEPHEN TWP. TO
GRAND BEND HARBOUR
Shoreline Map Numbers: 20 & 19

General — This reach includes the cottage area of Oakwood Subdivision, Stephen Township, with the remainder within the Village of Grand Bend. The reach within Stephen Township is homogeneous, with a wide sand beach (30 to 50 metres), often including a 1.5-metre high terrace fronting a 3- to 5-metre high sand dune. The face of this dune has a 70 per cent cover of beach grass, and shows some evidence of having been disturbed in the past — likely by pedestrian traffic or storm wave runup. Most of the houses are located on top of the ridge dune.

North of the harbour, the 0.7-kilometre length of shoreline within Grand Bend consists of a 70- to 100-metre wide stable beach. The residences are all located close to beach level, but well back from water's edge.

Erosion — This section of shoreline has been stabilized by the extensive sand beach that has developed after construction of the Grand Bend harbour structures; its stability partly depends on continuing maintenance of these structures.

ABCA SHORELINE DESCRIPTION, CONTINUED

One residential site in Oakwood Park has a 'break' in the foredune, lakeward of the house, to permit easy access to and sight of the water. This break may need to be managed to ensure wind scour does not enlarge the hole and affect dune stability.

Access — The public beach at Grand Bend provides beach access both on the north and south side of the harbour. A recent court case has cast some doubt on the ownership of a portion of the beach north of the harbour *(see Section 4.2.5)*.

Environment — This reach is the northern limit of an area with an abundance of sand-forming dunes when supply and conditions are satisfactory. As the dunes provide protection from lakeshore processes, they need to be carefully maintained *(see Section 3.5, Environmental Overview)*. A beach management plan *(ABCA, 1993)* has been given to Grand Bend offering options on how best to keep sand where it is most needed.

Planning Issues — Beach Place Condominiums is a seven-storey structure on the beach, directly north of the site of the former casino building which burned down in the 1970s. The condo structure has an armourstone revetment and concrete retaining wall about 60 metres from the shoreline, and the condominium structure is set back an additional five metres.

The Main Beach, between Main Street of Grand Bend and the Ausable River, was the subject of a court case over ownership between Archie Gibbs and the Village and Province. In a landmark decision, the appeal court overturned an earlier decision by Mr. Justice Chilcott that the reservation of beds and banks of Lake Huron for public (or Crown) use was "void for uncertainty". Successful appeal of this decision maintains that the property remains in public ownership.

REACH 12:
GRAND BEND HARBOUR TO STONY POINT, TOWN OF BOSANQUET (IPPERWASH MILITARY RESERVE)

Shoreline Map Numbers: 19, 18, 17, 15, 14, 13 & 12
(Sheet #16 is not shoreline)

General — This 19.2-kilometre length of shoreline includes 0.5 kilometres of shoreline within the Village of Grand Bend, 6 kilometres of shoreline within Bosanquet Township, and a total of 12.7 kilometres of shoreline within Pinery Provincial Park and Ipperwash Military Reserve. Although the Pinery and Ipperwash shorelines are not under ABCA jurisdiction, the management of these areas should reflect the overall concepts presented in this Plan.

The shoreline in this area consists of a sand beach backed by 4.5-metre high sand dunes with a poor-to-fair cover of grasses. Comparisons of shoreline features in 1935 and 1988 indicate that the dune face has been relatively stable over this 53-year period, but that the beach width has decreased substantially. As noted earlier, this recession of the waterline is likely the result of different beach profiles at the time of the two surveys (in response to different water level and wave conditions in the periods preceding the two surveys), as well as a net loss of material from the beach (due to a negative sediment budget). This loss may be due in part to reduced supply of sand to the area following harbour construction at Goderich, Bayfield and Grand Bend. Losses from the beach also occur as a result of wind-blown transport to the dunes and offshore transport to deep water during storms. Because of limitations in the available data, it is not possible to quantify the role of these different processes in the observed recession of the waterline between 1935 and 1988. Further investigations are recommended in to accurately establish the sediment budget for this reach and assess long-term stablility of the beach.

Extensive shore protection structures have been built along some of the shoreline, for example, immediately south of Grand Bend harbour, 98 per cent of the shoreline is protected by various structures, including groynes, seawalls and the armourstone revetment in front of Southcott Pines. Further southwest, in Bosanquet Township and northeast of Pinery Park, 60 per cent of the shoreline is altered by armourstone revetments, gabion walls and groynes.

Erosion — The north section of this reach (near Southcott Pines) is subjected to increased erosional stress compared to the adjacent shoreline to the southwest, due to the presence of Grand Bend harbour structures which divert sand offshore; this material bypasses the Southcott Pines area as it slowly returns to the shoreline.

Access — South Beach provides public access to the beach in Grand Bend, and the Mud Creek area provides private beach access in Port Franks. In addition, Pinery Provincial Park provides about 10 km of public beach in the dune area of the shoreline.

Environment — Refer to Section 3.5, *Environmental Overview*, for a detailed account of the Grand Bend to Kettle Point dune area.

Planning Issues — Both the cottage areas of Armstrong East and Peninsula #2 (or 'Chicken Island') are remote locations relying on water access for transportation to the sites. This can prove difficult in severe weather; the limited access will need to be considered in any plans to develop or redevelop the areas.

ABCA SHORELINE DESCRIPTION, CONTINUED

The shoreline between Stony Point and Kettle Point completes the littoral cell which has its northern limit at Goderich Harbour. This 6-km reach of shoreline is considered a stable beach zone due to the natural headland boundaries — or 'points' — which contain it. Kettle Point forms a complete barrier to littoral transport, whereas Stony Point is only a partial barrier. Alongshore movement of sand is minimal and cross-shore movement predominates.

Ipperwash Provincial Park provides public access to almost 1 km of the shoreline; the remaining length is divided between cottage development and Kettle Point Indian Reserve. Stony Point and Kettle Point Tribal Councils recently laid claim to portions of this cottage area. Considerable shoreline damage occurred during storms in the 1973 high lake level period; ice piling caused damage to property and structures.

Environmentally, the backshore region of the beach is designated as an ESA by Lambton County and as a provincially significant wetland, named the Ipperwash Inner-Dunal Wetland, by MNR, due to the significant dune swale and wetland features found within the successive dune ridges. These ridges extend inland from the shoreline, showing evidence of past shoreline locations and dune migration.

LAKESHORE DEVELOPMENT GUIDELINES

SECTION 3.3.1 INTRODUCTION

In February 1988, the ABCA was designated as lead commenting government agency with regard to plan input and review matters as they relate to flooding and erosion hazards along the Lake Huron shoreline.

In 1997, the Provincial Policy Statement was adopted by the Province of Ontario under Section 3 of the Planning Act that includes specific shoreline hazard polices. In order to meet standards in the Provincial Policy Statement and to provide effective direction on land use and land development to the lakeshore municipalities which comprise the ABCA shoreline, the *ABCA Lakeshore Development Guidelines* are proposed. The following guidelines are intended to meet this local requirement while implementing Provincial Policy regarding shoreline hazards.

SECTION 3.3.2 LAKESHORE GOALS AND OBJECTIVES

These ABCA Lakeshore Development Guidelines implement Provincial Policy Statement regarding shoreline hazards. This policy statement outlines the three hazards of flooding, erosion and dynamic beaches found along the Great Lakes/St. Lawrence River System of which Lake Huron is one component. It also presents the definition of these hazards which are:

- "Flooding hazard means the inundation, under the conditions of specified below, of areas adjacent to a shoreline or a river or stream system not ordinarily covered by water: Along the shoreline of the Great Lakes/St. Lawrence River System and large inland lakes, the flooding limit has been 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 (average annual rate of recession extended over a 100-year time span), an allowance for slope stability, and an erosion allowance."
- "Dynamic Beaches means areas of inherently unstable accumulations of shoreline sediments along the Great Lakes/St. Lawrence River System and large inland lakes. The dynamic beach hazard limit includes the flooding hazard limit plus a dynamic beach allowance."

The Provincial Policy Statement is the foundation of the Lakeshore Development Guidelines used to effectively direct land use and development in order to prevent or minimize lakeshore flood and erosion damages. It is believed that the pro-active approach to the lakeshore hazard situation outlined in these guidelines will enable the ABCA and lakeshore municipalities to focus on prevention of the hazard as opposed to relying on the reactive approach of protection and emergency response.

It is also recognized that the lakeshore is a valuable resource and part of a complex natural system which requires consideration. By prohibiting and/or restricting development in certain areas of the lakeshore, degradation of this important resource is prevented and the natural processes associated with the shoreline (sediment transportation along the shoreline: littoral drift) are preserved.

The Fill, Construction and Alteration to Waterways Regulation administered by Conservation Authorities under Section 28 of the Conservation Authorities Act will have regard for this policy in relation to areas currently under regulation, as will all other programs of the Conservation Authority. This includes the implementation of the Federal Fisheries Act in which the ABCA assists, under agreement with the Department of Fisheries and Oceans, Environment Canada. These Lakeshore Development Guidelines shall recognize other lakeshore jurisdictions (Public Lands Act, Aggregate Resources Act) if conflicts in policy are encountered.

LAKESHORE DEVELOPMENT GUIDELINES, CONTINUED

SECTION 3.3.3 LAKESHORE HAZARDS

When combined, the three hazards of flooding, erosion, and the dynamic nature of the dune/beach system describe the Lakeshore Hazard Area. These three hazards are described in detail in this section and are based on the standards identified by provincial policy for each hazard listed in Appendix B.

The Lakeshore Hazard Area has been divided into two — Lakeshore Area #1 and #2 — in order to recognize the application of these standards to existing residential development *(see Section 3.3.5)*. The most landward, or inland, location of any of the three hazard criteria is referred to as the **landward extent** of the Lakeshore Hazard Area. The lakeward, or offshore, boundary is generally regarded as the 6-metre lake depth contour although, administratively, it matches the municipal border which is the international boundary. Mapping shows the landward extent of this Lakeshore Hazard Area *(see Appendix D)*.

1) Flood Hazard

Flood hazard is defined as the area of shoreline closest to the water's edge which is affected by a flood having a probability of occurring once every 100 years — or one per cent each year. This flood level has been calculated for Lake Huron by MNR based on historical records. This level — plus a horizontal allowance for wave uprush and other related hazards — defines the flooding hazard *(see Appendix B)*. **Wave uprush** refers to wave action during storm activity; **other related hazards** includes wind set-up and winter ice action.

Due to changes in offshore slope and shore orientation of the ABCA shoreline from Bayfield to Grand Bend, a change in the flood level and wind set-up occurs from Bayfield to Grand Bend. The township line between Stanley and Hay Townships is the location used to indicate where this change occurs. Shorelines north and south of this line have a 100-year flood level equal to 177.8 metres G.S.C and 177.9 metres G.S.C., respectively.

Minimum allowance for wave uprush and other water-related hazards is considered to be 15 metres, measured horizontally from the 100-year flood level where no specific studies have determined otherwise *(see Figure 17)*. Studies should be undertaken to determine wave uprush extent where lake banks or protective works may be overtopped and ponding occurs.

Flood levels for river mouth areas of Bayfield, Grand Bend and Port Franks are determined by considering the Lake Huron 100-year flood level plus wave uprush and other water-related hazards or the specific riverine flood level criteria, whichever is **greater**. For further information, refer to *Riverine Areas Affected by Flood Levels on Lake Huron*, contained in Appendix D of the *Policy and Procedures Manual* for Administration of Ontario Regulation 46/95, ABCA.

2) Erosion Hazard

Erosion hazard describes the process of bluff erosion and instability by using the calculated annual rate, determined and described in Section 3.1.2. The erosion hazard is difficult to apply to the dune region south of Maple Grove subdivision, as care is needed to ensure that the normal annual changes to the beach location are considered (e.g. a beach can recede or accrete over time). For this reason, dynamic beach hazard criteria are used on the predominantly sandy shoreline south of Maple Grove, Stephen Township. Shoreline comparison methodology is best for calculating long-term erosion of the bluff shoreline north of Maple Grove (e.g. bluffs will erode over time, not accrete).

The erosion hazard used by this SMP and in the Provincial Policy *(see Appendix B)* is a combination of three factors: stable slope, long-term erosion rate, and an erosion allowance. This erosion allowance is also referred to as a **structural allowance** or **setback** in other planning documents *(ABCA, 1999)*. Combined, the three criteria describe an area of the shoreline where new development is restricted and existing development is controlled *(see Figure 18)*.

Slope stability is related to:

- inherent strength of the till materials which comprise the lakebank, and
- the lakebank's composition, the presence of groundwater, and management of the slope. Geotechnical studies conducted on undisturbed, Ontario glacial tills have documented their threshold slope inclination, which includes an appropriate factor of safety for residential development, to be **2.75 horizontal to 1 vertical** or abbreviated to be **2.75 to 1**, or 20 degrees *(Tanos, 1994)*. For ease of reference and analysis, these criteria have been approximated to a **3-to-1** slope and are used by this Plan and in the *Natural Hazards Training Manual* (MNR, 1997) related to the Provincial Policy Statement. Site-specific geotechnical analysis can be completed for more detailed information on a parcel of land. It should be noted that this analysis may be limited in areas where erosion rates are high.

LAKESHORE DEVELOPMENT GUIDELINES, CONTINUED

The use of geotechnical information for siting of new residences on vacant lakeshore lots will be carefully reviewed. In areas subject to high erosion rates, the long-term erosion rate has a greater impact on siting requirements than slope stability considerations.

Erosion has been calculated using the method described in Section 3.1.2. Note that the erosion rate is a long-term average which will not necessarily reflect what occurs on a yearly basis. Rather, erosion most commonly occurs sporadically in large sections, depending on specific site conditions such as drainage, offshore lake depths and vegetative cover. The calculated average annual erosion rate is multiplied by 100 and added to the stable slope allowance and an erosion allowance to provide a site-specific setback from top of bluff. Development guidelines within these areas are summarized in Section 3.3.7. Further information on erosion can be found in the general description of the cohesive bluff shoreline *(Section 2.1.3)*.

Due to many forces which act upon lakebanks and cause erosion, a minimum distance of 30 metres from top of bank is proposed to indicate this potentially hazardous area and to safeguard lakebanks from unsafe practises (e.g. related to drainage, vegetative cover and bank overloading — *see Figure 18)*. This setback is consistent with existing setbacks as established in individual municipal zoning bylaws and provincial hazard land criteria. In any case, where slopes are not eroding and have reached a long-term angle of stability, a 6-metre structural setback from top of bank is recommended to ensure that bank overloading, drainage, maintenance access, and public access to the lakebank (if applicable) are taken into account. This structural setback is consistent with Policy E.6 of the *Plan Input and Review Manual (ABCA, 1999)*.

The following section provides criteria to be used to identify both the forces of flooding and erosion acting on a sandy shoreline.

3) Dynamic Beach Hazard

Shoreline beach profiles composed of sand, gravels and other small cobbles are physical features experiencing constant change. In this highly dynamic area, the combined forces of flooding, erosion by water and erosion by wind need to be considered. The *Natural Hazards Training Manual (MNR, 1997)* related to Policy 3.1 of the Provincial Policy Statement states that in order to be described as a dynamic beach hazard, the beach must match three criteria:

- have beach or dune deposits landward of the waterline (e.g. land/water interface); **and**
- have beach or dune deposits overlying bedrock or cohesive materials equal to or greater than 0.3 metres in thickness, 10 metres in width, and 100 metres in length along the shoreline; **and**
- where the maximum fetch distance measured over an arc extending 60 degrees on either side of a line perpendicular to the shoreline is greater than 5 km. This normally does not occur where beaches or dune deposits are located in embayments, along connecting channels and in other areas of restricted wave action where wave-related processes are too slight to alter the beach profile landward of the waterline.

These three factors exist consistently along the Lake Huron shoreline between the Grand Bend area and Kettle Point.

Where a dynamic beach site has been identified using the above criteria, it is defined in cross-section to identify development guidelines as the 100-year flood level plus a flooding allowance (also called **flood standard**) plus a horizontal setback to account for potential movement (both recession and accumulation) of sand within the beach zone. This horizontal setback inland from the flood standard includes embryo dunes, foredunes, and the dune ridge as seen in profile *(see Figure 19)*. The landward extent was determined by analysis of dune topography and characteristics to identify these key dune features, referred to as the **dune model approach**. From this identification and analysis of historical shoreline records, the landward extent of the dynamic beach was determined. This identification was complicated by the effect of residential and roadway construction into this dune environment. The landward boundary is therefore often coincidental with the shoreline parallel access road common to many of the shoreline subdivisions.

Provincial Policy has further refined the description of the dynamic beach hazard to identify the "Defined portion of a dynamic beach", which:

"…means those portions of the dynamic beach 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." *(Provincial Policy Definitions, p.13)*.

It is understood that disturbance of the defined portion of the dynamic beach will irreversibly alter the balance of the dynamic beach and potentially destroy this important shoreline feature.

LAKESHORE DEVELOPMENT GUIDELINES, CONTINUED

4) Hazard Locations and Multiple Hazards

Areas susceptible to all three hazard criteria can be found along the shoreline under ABCA jurisdiction.

- **The erosion hazard** applies to all bluffs north of Grand Bend, albeit with varying bluff erosion rates.
- **The flooding hazard** applies to the beach areas, including Port Franks and Grand Bend, and development below top of bank at the beach level such as those areas near Dewey and Rocky Points and Bayfield.
- **The dynamic beach** hazard applies to the dune areas and low-lying bluffs where sand accumulation predominates over lakeshore bluff erosion. Such areas include the Grand Bend, Port Franks and Ipperwash beach areas of Bosanquet Township and the Kingsmere, Oakwood, Maple Grove subdivision areas of Stephen Township. Filet beaches located north of the harbour structures in the Villages of Bayfield and Grand Bend are also considered dynamic beach zones. Further investigation is needed to refine the precise location of the northern boundary of the dynamic beach standard at these two harbour locations, due to unnatural circumstances of beach formation caused by the harbour structures.
- Flooding hazards may apply to those areas where beach level development has historically occurred near the bottom of lakeshore bluffs, while erosion hazards may apply to those adjacent lands on top of the bluff.
- A dynamic beach hazard and an erosion hazard may apply adjacent to one another in some areas where sand accumulation has occurred near the base of low bluffs (e.g. Norman Heights, Kingsmere). In these areas, the two distinct features (bluff versus beach) will be distinguished by soil sampling to determine quantity of sand versus till in the subsoil.

Note: The flooding hazard is part of the dynamic beach hazard definition. Therefore the dynamic beach hazard criteria will apply in those dune and beach areas where sand has accumulated in the fashion meeting the criteria described under 3) above, as the three factors for dynamic beach hazard delineation.

SECTION 3.3.4 LAKESHORE AREA DESIGNATIONS FOR NEW DEVELOPMENT

The Lakeshore Hazard Area defines that area consisting of the furthest landward limit of the three lakeshore hazards: flooding, erosion or dynamic beach. This definition applies to the siting of new development proposed along the lakeshore and recommends they be located landward of this area. This complies with the Public Health and Safety Section of the Provincial Policy Statement:

Section 3.1 Natural Hazards

Section 3.1.1. Development will generally be directed to areas outside of:

a) hazardous lands adjacent to the shorelines of the Great Lakes/St. Lawrence River System and large inland lakes which are impacted [sic] by flooding, erosion, and/or dynamic beach hazards;

b) hazardous lands adjacent to river and stream systems which are impacted [sic] by flooding and/or erosion hazards.

Section 3.1.2 Development and site alteration will not be permitted within defined portions of the dynamic beach.

Section 3.1.3 Except as provided in policy 3.1.2, development and site alteration may be permitted in hazardous lands and hazardous sites, provided that all of the following can be achieved:

a) the hazards can be safely addressed, and the development and site alteration are 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.

Changes proposed to existing development will follow the criteria described below.

LAKESHORE DEVELOPMENT GUIDELINES, CONTINUED

SECTION 3.3.5 LAKESHORE AREA DESIGNATIONS FOR EXISTING DEVELOPMENT

It is recognized that prohibiting or restricting development within the Lakeshore Hazard Area will protect new and existing development from shoreline hazards while also protecting the shoreline resource from inappropriately located and/or expanded development. Implementation of this goal is straightforward when dealing with new development. However, incorporating guidelines which reflect the lakeshore's hazardous nature is more complex when applied to existing developments or existing undeveloped lots (i.e. areas of redevelopment, or infilling proposals on existing lots). For this reason, the shoreline is further classified into Lakeshore Area 1 and Lakeshore Area 2, to assist in implementation of guidelines as related to existing development. Generally, Lakeshore Area 1 and Lakeshore Area 2 reflect shorter- and longer-term lakeshore concerns, respectively. They are defined with reference to the ABCA shoreline as follows.

1) Lakeshore Area 1

Flood Hazard — That area of the shoreline landward (or inland) from the water's edge, including the 100-year flood level plus wave uprush setback, which is also known as the Regulatory Flood Standard *(see Figure 17)*.

Erosion Hazard — That area of the shoreline lakeward (or offshore) of the stable slope line, including the slope and toe of the lakebank *(see Figure 18)*.

Dynamic Beach Hazard — That area measured landward (or inland) from the water's edge including the flood hazard plus a distance of 15 metres measured horizontally. This 15 metres is the defined portion of the dynamic beach; the active beach zone and portion of the dune complex which would be affected by wave action during the 100-year flood plus wave uprush event (or historical storm event causing dune cliffing or erosion). *(See Figure 19)*

2) Lakeshore Area 2

Flood Hazard (not applicable).

Erosion Hazard — That area of the shoreline located landward (or inland) from Lakeshore Area 1 (being the stable slope line) and extending to the 100-year erosion setback line, **or** extending landward from the top of the unaltered lake bluff measured a distance of 30 metres, **whichever is greater** *(see Figure 18)*.

Dynamic Beach Hazard — That area landward (or inland) from Lakeshore Area 1 (the flooding hazard plus the defined portion of the dynamic beach) to where water erosion ceases to influence dune morphology and wind erosion creates embryo and foredunes with sparse vegetative cover established. This distance is a minimum of 15 metres landward from Lakeshore Area 1, however generally extends over the entire dune area stretching to the shore parallel road. *(See Figure 19.)*

3) Lakeshore Region

This general description, termed the 'Lakeshore Region', lies outside the Lakeshore Hazard Area and the shoreline hazard policies of the Provincial Policy Statement. It is defined as the area landward from Lakeshore Area 2 which may still have peripheral influences on the shoreline environment (i.e. drainage, lakebank seepage, overall lakebank weight and loading). The 'Lakeshore Region' designation allows for both new development and redevelopment of existing houses. It is defined by a physical feature along the shoreline rather than a setback distance.

- North of Grand Bend, the lakeshore region is defined as west of Highway #21. North of Grand Bend, the most important factor influencing the Lakeshore Hazard Area is the issue of drainage. Municipal drains are common; their location emptying into ravines near the shoreline can create erosion and slope instability if not properly constructed and maintained.
- South of Grand Bend, the region varies depending on topography but is generally bordered by the lakeshore parallel road system (Huron Place/Beach O'Pines and Lakeshore Drive/Southcott Pines). These roadways limit the landward extent of dynamic beach profile adjustment. Where it is easily identified, the dune ridge is used. South of Grand Bend, the most important factor influencing the Lakeshore Hazard Area is vegetation over relic dune deposits. Dunes inland from the dynamic beach hazard are the product of a historic lake climate and conditions that no longer exist; they are therefore relic features that will not be easily repaired if damage occurs. Proper management of vegetation is therefore essential.

This region does not extend into the Villages of Bayfield or Grand Bend because of existing urban development controls. Boundaries here require further research *(Section 5.3, item f)*; consideration should be given to the use of Wyoming Moraine as the boundary instead of Highway #21.

LAKESHORE DEVELOPMENT GUIDELINES, CONTINUED

SECTION 3.3.6 LAKESHORE DEVELOPMENT GUIDELINES

In an attempt to provide clear direction to lakeshore municipalities and lakeshore landowners, guidelines are proposed to assist in the wise management of existing residential development. These guidelines consist of criteria for such structures as additions, accessory buildings, infilling of residences on existing lots, decks, pools and septic systems. They provide direction on such activities as relocating buildings landward, rebuilding residences, severing new lots, rezoning and changes in land use designations. The information is summarized in table form in the following section *(see Section 3.3.7)*.

All of these guidelines relate to potential impact from flooding, erosion, or the dynamic nature of sand dunes along the shoreline. They are provided within the context of the Provincial Policy Statement and from existing requirements which have not been specifically articulated for the lakeshore region.

For example, much of the existing development within the bluff portion of the lakeshore is contained within a 30-metre construction setback requirement from top of bank as described within municipal comprehensive zoning by-laws. This leads to legally existing, non-complying residential structures along much of the lake bluff; approval by minor variance from the local municipal committee of adjustment is required for any substantial change to these buildings. These guidelines provide criteria to assist in reviewing such applications for minor variance in a consistent manner.

As a second example, individual sewage disposal systems, or septic systems, have been installed along the lakeshore based on a minimum top of bank setback which varied depending on the condition of the lakebank at the time of inspection. However, where possible, it was suggested that the system be located landward of the house for slope stability reasons. This statement is also supported by Recommendation #37 in the *Rural Servicing Study (Huron County, 1993)* which gave specific consideration to lakeshore development. This SMP provides lakebank descriptions more detailed than previously available, thereby improving the lifespan and reducing adverse effects of new systems in the lakeshore area by suggesting siting criteria to reflect the lakebank's stability. Where lot size is inadequate and restricts proper system siting, such alternative options as using adjacent vacant property or communal systems should be investigated. In both cases, registration on title of the septic system is required to ensure clear ownership and future maintenance.

As a third and last example, the issues of relocating residences landward and rebuilding residences which were demolished are included in this policy. In both cases, these actions can be beneficial to the safety and lifespan of the buildings when the maximum lot depth landward is used to avoid a potentially hazardous building site nearer to the lakeshore.

The word 'movable' is used to describe buildings that can be transported landward to a new site on the existing lot or to a new lot, thereby increasing long-term safety and building lifespan. Such factors as size and type of foundation, clearance along roadways, and location of a suitable site nearby need consideration.

Major limitations to relocating or rebuilding structures are the size and construction style of the building (and therefore, feasibility of moving), as well as availability of a site for relocation. The cost of moving typical single-family dwellings can be relatively small compared to providing protection works; limiting factors are usually the width and height of the house. Width must be less than the clearance along roadways (between trees, hydro poles) and the height lower than overhead clearance (under overhead wires, bridges). Houses with slab foundations, concrete block walls, extensive brick or stone work, or large unusual shapes are often impracticable to move. The greatest cost associated with relocation may be in acquiring an additional parcel of land if setbacks do not permit relocating on the same property. Even when moving a structure is impossible, complete rebuilding may be less expensive than long-term coastal protection *(Griggs, 1986)*.

As a form of prevention, relocation is effective for mitigating flood, erosion and dynamic beach hazards for existing buildings. Prevention often proves to be less costly than protection, especially in areas of high to severe erosion. Many owners invest so much in protection (including materials, construction and future maintenance) that they essentially 're-buy' their house and land every 20 years, and in most cases their land continues to erode *(Robbins et al, 1981)*. In many instances a benefit-cost analysis may suggest that acquisition and/or removal/relocation of buildings from flood and/or erosion-susceptible shorelines is more appropriate than implementation of protective works. Any such acquisition should be undertaken on a willing buyer/willing seller arrangement.

When development or rebuilding is contemplated, the hazards must be considered — including, but not limited to, the following considerations:

LAKESHORE DEVELOPMENT GUIDELINES, CONTINUED

Bluffs

- a site-specific geotechnical investigation to determine the stable slope plus a setback for 100 years of erosion in areas subject to low erosion. Conversely, those areas experiencing long-term calculated erosion rates greater than 0.3 m/yr should use 3:1 stable slope criteria plus the 100-year erosion rate to safely consider any development changes.
- assessment of the effectiveness of structural protection which exists at the site, including monitoring results, where available;
- assessment of mobility of the residential or accessory building (size of building and type of foundation, available room on existing lot landward of the hazard, and consideration for road layout of the subdivision allowing relocation of the building);
- assessment of drainage (existing improvements and their effectiveness) and include assessment of existing or proposed siting of sewage treatment facilities.

Beach Level

- assessment of lot area above and below the bluff (e.g. alternate siting);
- site-specific geotechnical investigation for slopes adjacent to the site;
- assessment of potential for flood hazard and ice damage;
- assessment of existing or proposed siting of sewage treatment facility.

Sand Dunes

- assessment of impact on dunes (degree of alteration);
- restoration and re-vegetation of disturbed sand dune area;
- assessment of dune slope stability;
- feasibility of nourishment of the beach region;
- location and sensitivity of affected dune feature;
- assessment of existing or proposed siting of sewage treatment facility.

LAKESHORE DEVELOPMENT GUIDELINES, CONTINUED

SECTION 3.3.7 - **Lakeshore Development Guidelines Summary**

Development Activity	**Lakeshore Area 1 ◆**			**Lakeshore Area 2 ◆**	
Existing Developed Lots	Dune	Flood	Bluff	Dune	Bluff
Repairs/maintenance	✔	✔	✔	✔	✔
Interior alterations	✔	✔	✔	✔	✔
Minor additions *	×	×	Conditional[1]	✔ provided no encroachment into Lakeshore Area 1	✔
Major additions *	×	×	×	landward of foredune	design is movable
Unattached garages	×	×	×	landward of foredune	design is movable
Rebuilding of dwelling destroyed by forces other than flooding & erosion	✔ if same size and utilizes maximum lot depth (most landward location)			✔ dune - if design minimizes dune impact	✔ bluff - if structure is movable *
Rebuilding of dwelling destroyed by flooding and/or erosion	×	×	×	×	×
Relocation of dwelling away from shoreline	Optional, on the part of the owner; however: recommended			Owner should consider this as a future option, depending on severity of the hazard	
Minor Structures *	×	×	Conditional[2]	Conditional[3]	Conditional[2]
Swimming pools	×	×	×	Conditional[3]	✔ Provided drainage is addressed
New septic systems	×	×	×	Conditional[4]	Conditional[4]
Decks (existing)					
Repair and maintenance	✔	✔	✔	✔	✔
Decks (new)	×	×	No closer than 3m to top of bank and not connected to dwelling	If landward of the foredune (see Figure 17)	✔
Existing Vacant Lots (infilling)					
New dwellings	×	×	×	Conditional[5]	Conditional[5]
Septic systems	×	×	×	Conditional[4]	Conditional[4]
New Development					
Creation of New Lot(s) (i.e. severances, subdivisions)	×	×	×	×	×
Technical Severance	✔	✔	✔	✔	✔
Lot Consolidation	✔	✔	✔	✔	✔
Land use designation/zone changes	Support changes to planning documents to Hazard, Natural Environment or Open Space designations			Support changes to planning documents to a lakeshore overlay (subscript "L") designation	
	Do not support proposed zoning, land use designation or official plan changes which further intensify land use, i.e. seasonal residential to multi-unit dwelling.				

LEGEND

✔ allowed
× not allowed
◆ on a site-specific basis/study, where calculated erosion rates are low (less than 0.3 m/yr); these boundaries may be adjusted
* refer to Glossary (Appendix A) for full definition
- a minor addition is equal to less than 30% of total existing foundation area
- a major addition is equal to or greater than 30% of total existing foundation area
- a minor structure is a portable building (storage shed, gazebo) with no utilities and maximum size 14 sq. m. DOES NOT INCLUDE SHORE PROTECTION DEVICES.
- a technical severance is a boundary adjustment where no new lot is created

* movable design considerations are only necessary where long-term erosion rate calculations apply

Conditional[1] - yes, provided calculated erosion rate is less than 0.3 m/yr, slope stability is addressed
Conditional[2] - yes, provided structure is inland from primary dwelling if calculated erosion rates are greater than 0.3 m/yr
Conditional[3] - yes, provided dune restoration is implemented and/or provided no encroachment into Lakeshore Area 1
Conditional[4] - yes, and it is recommended to be landward of primary dwelling & conforms to setbacks as required under Building Code
Conditional[5] - yes, provided that building is movable by design, impact to dunes is minimized, and provided that more than 50% of existing lots/parcels in the residential/cottage area are developed

NOTE: Please refer to text in the previous section (3.3.6) for a complete description. All of the above is subject to appropriate setbacks and maximum lot coverage requirements as listed in municipal zoning by-laws.

LAKESHORE DEVELOPMENT GUIDELINES, CONTINUED

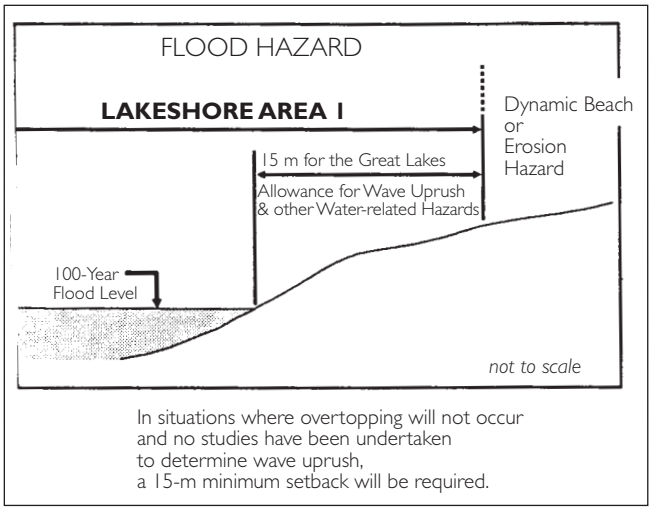


Figure 17 - Flood Hazard

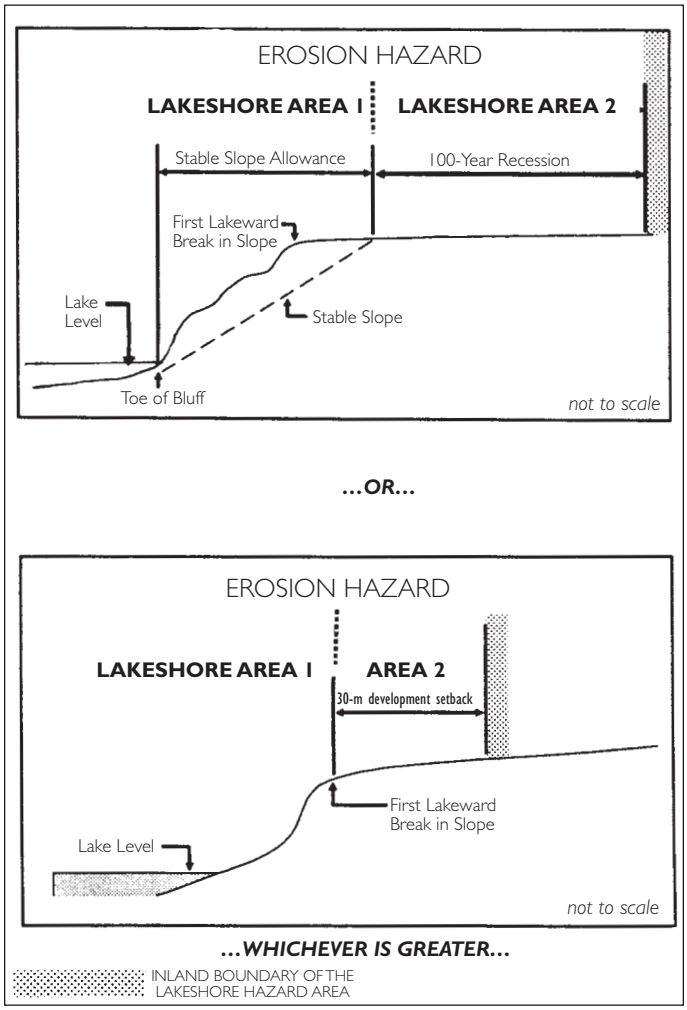


Figure 18 - Erosion Hazard

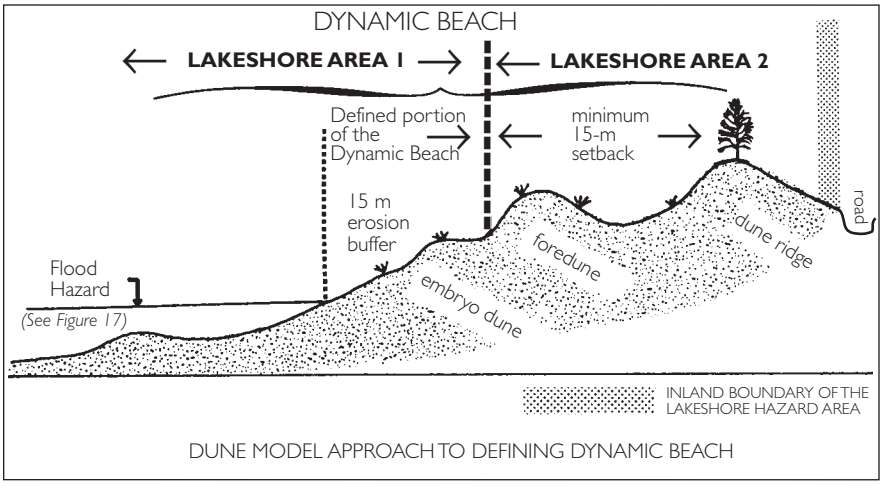


Figure 19 - Dynamic Beach Hazard

SHORE PROTECTION

SECTION 3.4.1 INTRODUCTION

Recommendations have been developed addressing shore protection along the shoreline over which the ABCA has jurisdiction. One objective of these recommendations is to balance the desire to maintain (and enhance, if possible) existing sand beaches along the shoreline with increasing pressure for shoreline protection. Maintaining beaches requires continuation of the natural shoreline processes, including erosion of the bluffs which supply sand to the shoreline, the longshore transport of sand to the south, and the deposition of sand in the Grand Bend/Pinery/Ipperwash beach system. A second objective is to develop specific recommendations with respect to the selection, design and implementation of shore protection methods and structures along the ABCA shoreline.

Summarized below, these recommendations include both structural and non-structural approaches. The recommendations address structures that are intended to stabilize the shoreline in eroding areas (i.e. erosion protection), as opposed to structures built along a relatively stable shoreline that are intended to protect a building or the bluff from wave runup during periods of high water levels (i.e. wave damage protection). The following discussion is summarized from *Considerations for Shore Protection Structures, (Baird, 1994)*.

SECTION 3.4.2 STRUCTURAL VS. NON-STRUCTURAL PROTECTION

There are methods designed for protection of existing development along the shoreline. These methods are grouped into those requiring the construction of structural devices to limit shore flooding and erosion (e.g. groynes, revetments, seawalls), and those which improve the inherent characteristics of the shore without structural measures (e.g. drainage, regrading, beach nourishment and vegetation).

Prior to any work being initiated for structural protection, it should be clearly demonstrated that the following additional options cannot be feasibly undertaken or obtained:

1) relocation of existing building,

2) consolidation of adjacent properties to provide additional area, and

3) use of appropriate setbacks for existing vacant lots.

SECTION 3.4.2.1 STRUCTURAL PROTECTION

There are various forms of structural protection which have been used along this shoreline. An inventory, completed in 1990, documents the methods. Briefly, structural works can be described as one of three types: revetment/seawalls, groynes and offshore breakwaters.

These types of protection vary as to applicability to a specific shoreline reach, however, considerations specific to this SMP are listed by reach, where appropriate, in Section 3.2.6. Six recommendations from the protection background report are presented here:

a) In areas subject to moderate to severe long-term erosion (average calculated erosion rate greater than 0.3 m/yr.), an engineered rubblemound revetment is the recommended erosion protection structure. Any revetment design should consider long-term erosion (or downcutting) of the nearshore lake bottom.

b) In areas subject to less severe long-term erosion (average calculated erosion rate less than 0.3 m/yr.), a rubblemound revetment is the preferred approach, but groynes may be another option. However, groynes remain a topic of much debate with regard to downdrift impact on adjacent shorelines. Ministry of Natural Resources policy on the approval of groynes states that the Ministry will *"refrain from granting authority to place groynes on Crown lakebed.*

"Until this science becomes more precise, it is considered that the more prudent course for the Ministry to follow is to generally say 'No' to applicants," (MNR, Nov. 17, 1986). There has been no revision to this approach. If a future policy change by MNR were to occur, this SMP would suggest that proponents of groyne construction must prefill the groynes with suitable material (clean sand and gravel, D50 > 0.3 mm) to minimize impacts downdrift. However, according to available information, it should be noted that groynes may not provide full protection to the shoreline during extreme conditions such as severe storms at higher water levels.

c) Offshore breakwater design containing imported beach fill should be considered by the Village of Bayfield for the area south of the harbour. While relatively expensive, this approach can provide significant recreational benefits as well as effective erosion protection. This approach is not recommended elsewhere along the ABCA shoreline due to potentially adverse impact on the longshore transport of sand.

SHORE PROTECTION, CONTINUED

Potential impact of such a project located immediately south of Bayfield harbour would be limited due to the presence of the harbour structures.

d) Solid vertical seawalls parallel to the shoreline (commonly constructed using steel sheet pile) are not recommended for erosion protection anywhere along the ABCA shoreline — they would reflect most of the wave energy hitting them, thus magnifying the effect of the waves on the lakebed and causing severe scouring of the toe of the structure.

e) Any number of structures may be considered for wave damage protection. These include revetments and groynes, as discussed above, and retaining walls of various construction (gabion baskets, steel sheet piling, concrete). Retaining walls should be constructed behind the active beach zone (i.e. not exposed to direct wave action, and only exposed to wave runup during extreme conditions such as storms at high water levels) in order to minimize impact on the beach and shoreline processes. Information on the many different types of structures designed to resist wave runup are available in other reports and are not discussed in this document. *(Refer to MNR, 1986; USACOE, 1977, 1981.)*

f) With respect to improving the performance of existing shore protection structures, beach nourishment should be considered in areas where there are groynes in good repair but not full of sand. Consideration should also be given to replacing reflective seawalls with rubblemound revetments or, at least, providing toe protection when maintenance operations are being considered by the landowner.

SECTION 3.4.2.2 NON-STRUCTURAL PROTECTION

a) From a theoretical perspective, regional beach nourishment would be a desirable protection alternative in terms of maintaining/enhancing coastal processes — but from a practical perspective, it is unlikely that a regional beach nourishment scheme could be implemented. A nourishment scheme would involve placing approximately 30,000 to 60,000 cubic metres of sand on the shoreline each year; this would require establishing a guaranteed supply of an adequate grade of sand and transporting it to the desired location — and therefore may not be a viable alternative.

b) Regrading of the lakebank to a more gradual slope has been done at some locations within the study area with variable success (e.g. St. Joseph Shores, Wildwood, Bayfield). Although limited research has been conducted along the Great Lakes on effective means of slope stabilization, it is generally accepted that bank regrading requires site-specific investigation and should attempt to achieve a 3-horizontal to 1-vertical slope, use a shore parallel structure outside of the active beach zone for bluff toe protection, and improve drainage to contain surface water and outlet it at the bluff toe. Care is needed to ensure that the sides of the regraded area are gradually shaped to provide a transition zone from the new to old lakebank slopes.

Due to the scale of work required, the property needs a substantial frontage (e.g. minimum 200 m) with a low erosion rate (less than 0.3 m/yr.) to be considered feasible. Special attention to subsurface drainage is critical as groundwater seepage zones may be interrupted by the work. Also critical to the project's success is the timing of establishing vegetative cover.

c) Drainage improvements — both for surface and subsurface — will enhance bank stability, especially where groundwater seepage is a concern (e.g. Bayfield area, Snowden Acres). When water is artificially collected, the outlet needs to be taken to an appropriate location where erosion protection is provided (e.g. toe of lakebank, bottom of gully).

Subsurface drainage improvements should dewater the bluff area and help to reduce bank movement during extreme precipitation and excessive soil moisture. **French drains** (also called **blind drains**) or perforated subsurface drains covered by pea-sized stone have been used extensively along the top of bluffs as a technique to improve drainage.

Improvements to road ditching on the east side of roads parallel to the shore and to the most westerly edge of agricultural fields (to prevent surface water flow over the lots and roadway to the lakebank) will provide additional benefit for existing development. It is suggested that subdivision-scale drainage improvements be undertaken and a suitable protected outlet provided for the entire area. A variety of approaches (informal agreement, or mutual agreement drains or petition drains under the Drainage Act) could be used. The ABCA has been active in recent discussions on two such proposed municipal drains at Lakewood Gardens South and Highlands II subdivisions.

Existing gullies are the logical location for water outlet, however, a site-by-site analysis will be necessary. *(Refer to Conclusion #12 and #13 in Section 5.2.)* All subsurface drainage improvements will need to carefully consider the existence of individual septic fields and not interfere with their operation.

SHORE PROTECTION, CONTINUED

New developments will need to complete storm water management investigations which consider both surface and subsurface water quantity and quality. This is especially important where existing groundwater seepage occurs along the lakebank, threatening existing development.

d) Vegetative growth on both dune areas and lakebanks is encouraged to promote stabilization and reduce the impact of rain and surface water erosion. In dune locations, beachgrass will reduce the impact of wind erosion and promote dune evolution. Grasses and shrubs are best suited to lakebank slopes where bank movement is likely to continue due to lake effects (e.g. offshore wave climate, beach width) and runoff. Seepage zones along bluff slopes can be planted using more moisture-tolerant species. The publication, *The Role of Vegetation in Shoreline Management (Environment Canada and U.S. Corps of Army Engineers)*, is a good reference for more information.

SECTION 3.4.3 IMPLEMENTATION

a) A co-ordinated approach for shore protection (by community or subdivision) is recommended. Protection recommendations are included in Section 3.2.6 and described on a reach-by-reach basis.

b) Shoreline protection structures are only to be considered for development which currently exists along the shoreline (i.e. not for new development such as subdivisions, multi-lot severances, multi-unit/condominium developments).

c) The objective of the proposed works (i.e. to prevent storm wave damage uprush, overtopping, or other water-related hazards or to stabilize the shore over the long term) must be clearly outlined.

d) Prior to design, ownership of the land on which the structure is to be built should be clearly established by the proponent. Costs associated with design, installation and future maintenance of shore protection are the responsibility of the proponent and/or landowner.

e) The design of structures located above the 100-year flood level that are intended to provide protection from wave runup and storm damage should follow guidance presented in MNR *(1986)* and/or USACOE *(1978, 1981)*.

f) The design of structures which extend below the 100-year flood level and wave uprush, and/or that are intended to stabilize the shoreline against continuing erosion, should be prepared using accepted engineering and geotechnical principles.

g) Any application to construct shore protection must be accompanied by a detailed description of the site and proposed work, and an impact assessment based on current engineering and scientific principles which demonstrates the following points:

- The proposed works will not increase the long-term shoreline erosion rate at adjacent properties,
- The proposed works will not adversely affect longshore sand transport rates,
- The proposed works will not adversely affect adjacent structures, and
- The proposed works will not adversely affect the terrestrial and aquatic shoreline ecosystem.
- The proposed works will maintain pedestrian access along the beach.

h) Any application for shore protection, including the impact assessment, should be circulated by the applicant to all property owners within an appropriate distance (i.e. 300 m) of the property boundaries in question and to any applicable cottage association to solicit their written comments and/or participation in the project prior to the approving authority responding to the applicant.

i) Quality control during construction is an essential component of a successful project, and construction monitoring services should be provided by the designer.

j) Monitoring of completed projects should be undertaken annually, and following severe storms, by the proponent of the project so that potential problems can be identified and required maintenance can be completed before excessive and irreparable damage occurs. It is the proponent's responsibility to ensure long-term maintenance of the structures and could be stipulated by a registered agreement binding on the landowner.

k) Currently, subdivision scale projects to protect existing developments from ongoing erosion may be eligible for a 50 per cent grant through the ABCA Capital Projects program. Such projects can be initiated by landowners, with the formal request for a project being made through the local municipality. Once a project is initiated, it would proceed in two phases:

Phase One would involve a preliminary engineering study and review to comply with requirements of the Class Environmental Assessment for Remedial Flood and Erosion Control Projects *(1993)*.

SHORE PROTECTION, CONTINUED

Based on technical information and public review of alternative solutions to resolve the flooding or erosion problem, a preferred solution would be selected giving consideration to costs, anticipated benefits and environmental concerns.

Phase Two would involve construction or implementation of the preferred solution.

It should be noted that the availability of grant funding to initiate such projects is contingent upon funding from the Ministry of Natural Resources and the anticipated benefits of undertaking a project.

ENVIRONMENTAL OVERVIEW

SECTION 3.5.1 INTRODUCTION

As discussed in Section 2.1.1, the Goderich to Kettle Point shoreline is a closed littoral cell with respect to sand transport *(Reinders, 1989)*. Kettle Point and the breakwaters at Goderich Harbour each extend far enough into Lake Huron to trap any sand from the shoreline to the north. The bluff region of the shoreline, from Goderich to just north of Grand Bend, provides sediment to the shoreline sediment budget. Conversely, the dune/beach area from Grand Bend to Kettle Point acts as a sediment **sink** where sand is deposited. These two shoreline characteristics (bluff versus dune), separate the shoreline into two distinct regions.

The closed cell concept defines the shore zone in a north/south direction. Reviewing the terrestrial data, it soon became apparent that the inland boundary of the shore zone was not as easy to define. The shoreline and water quality of the shore waters are affected not only by lake and shoreline processes but also by other processes and activities throughout the watersheds of all the streams and rivers that flow into the shore zone. To effectively manage the shoreline environment, this entire ecosystem — of which the shoreline is a part — must be considered.

The shore zone can be defined on the basis of its features and the processes affecting it. The immediate shore zone is strongly affected by lake processes. However, it may also be influenced, especially for water quality issues, by land use practises in headwater areas of the inland watersheds. Thus, optimal management of the shore zone has implications on management throughout the watershed.

The Provincial Policy Statement *(Section 2.3)* refers to natural heritage policies that complement this discussion on inland watersheds and the connections to various natural heritage features. Shorelines of both rivers and lakes tend to be the location where exist such important features as wetlands, wildlife habitat, woodlands and fish habitat. These features are therefore commonly located at or connected to the Lake Huron shoreline.

The environmental discussion that follows is divided into the land-based (terrestrial) and water-based (aquatic) environments. Significant features in each region are described *(see Figure 6)*, and management criteria are proposed in relation to their sensitivity to the overall system. The terrestrial component is based on an overview report by Snell and Cecile *(1991)* prepared for the SMP and on the Watershed Management Strategy *(ABCA, 1995)*. The aquatic component is based on input by MNR Fisheries specialists and conservation authority staff.

SECTION 3.5.2 ENVIRONMENTAL ECOSYSTEMS

SECTION 3.5.2.1 TERRESTRIAL FEATURES

Most of the environmentally significant features along the shoreline are remnants of past native woodlands that once covered this region. The only exception is the Pinery to Kettle Point area which possesses significant environmental qualities more related to physical land form, flora and fauna attributes.

1) Pinery to Kettle Point Dunes

By far the most significant area along the shoreline or within the entire ABCA watershed is the Pinery to Kettle Point sand plain and dunes. The area's unique, extensive, relatively undisturbed and diverse wet and dry sand habitat, numerous rare species and rich diversity of species, dune successional sequence, marsh and shale at Kettle Point are all cited as reasons for a very high rating *(Lindsay, 1984 and Lambton County Preliminary ESA Survey)*. The area is also cited as being near the northern limit of the Carolinian zone which is itself a provincially and nationally significant region. This site is one of 38 designated under the Carolinian Canada Program which works to protect a variety of habitat types through stewardship and acquisition. The area also has a low agricultural capability and has remained extensively wooded. In addition, this area is identified by the Federation of Ontario Naturalists as one of 32 'Ecological Hot Spots' where unique and rare habitats and wildlife can be experienced *(Seasons magazine, Special Great Lakes Issue, Vol. 27, No. 3, 1987)*.

The foredune area supports such flora as sprout sand cherry, little bluestem grass, puccoon, ground juniper and balsam poplar. Dune forests further inland support seven species of oak, and the wet meadows shelter their own distinctive flora, including Bluehearts, grass pink and ladies' tresses, and wild lupine. Significant fauna species include prairie warbler, Karner blue butterfly, fox snakes and hog-nosed snakes. Within the Huron fringe physiographic region, this area is described as 'one of southern Ontario's ecological jewels' *(Seasons, 1987)*. Endangered species include the Karner blue butterfly and the Heart-leafed plantain.

ENVIRONMENTAL OVERVIEW, CONTINUED

Significant natural areas have been recognized by ANSI designations in this area. The Port Franks Wetlands and Forested Dunes Complex is a Class I wetland located in Port Franks adjacent to the Mud Creek channel and the small lakes near Richmond Park and Outer Drive. The second site is the Ipperwash Inner-Dunal Wetland Complex inland from Ipperwash Beach. Both sites possess significant natural attributes derived from their formation and evoluation of successional dune ridges. In contrast, Kettle Point and Stoney Point are recognized as provincially significant Earth Science ANSI due to their geologic and cultural history *(see Figure 6)*.

2) Bayfield Region

Two significant natural areas occur near the shoreline in the Bayfield area (both designated by MNR as Areas of Natural and Scientific Interest - ANSI). The first is the Bayfield River Valley (for 10 km upstream of Bayfield) which has a diversity of habitat and vegetative communities, as well as being relatively undisturbed.

Second, the nearby Bayfield North woodlots are representative of upland woodlot types of this area of the province, as well as being relatively large and undisturbed *(Hanna, 1984)*. Both sites include cold water streams.

3) Gully and Lakeshore Corridors

North of Grand Bend, very prominent features of the shoreline landscape are the many gullies leading to the lake; they represent the most obvious land form (besides the shore bluffs), valuable aesthetic potential, the location of all the stream habitat, much of the remaining natural vegetation remnants and poten-tial corridors for wildlife.

The gully of greatest significance is Gully Creek in Goderich Township which is a cold water stream (one of only two such streams along the shoreline, both in Goderich Township) and is designated an Environmentally Significant Area by the ABCA due to its length, natural vegetation and fisheries potential. Other gully systems have the potential of being environmental linkages to interior woodlots commonly located within the first and second concessions inland. The woodlots are most extensive in Goderich and Hay Townships.

The linear shape of the lakeshore provides the potential for a wooded corridor joining some of the more significant vegetated areas. The Pinery in the south and the Bayfield ANSI and Baron de Tuyll ESA in the north provide the large wooded areas to attempt to join using linages. This could be accomplished by promoting vegetative planting along the lakebank and encouraging building setbacks from the lakeshore. Mention of this existing, interrupted wooded corridor is made in Snell and Cecile *(1991)* and is referenced regarding the waterfowl flyway which may be enhanced by promoting re-establishment of the corridor. This corridor is further identified and explained in the Watershed Management Strategy *(ABCA, 1995)* which offers a rehabilitation network to enable restoration activity to concentrate. This network provides the best opportunity to connect existing forest patches given the least geographic distances and the most environmental benefit.

The Watershed Management Strategy provides information regarding environmental stresses and goals to achieve based on the subwatersheds of the Ausable and Bayfield Rivers. Along the shoreline of Lake Huron, the relevant subwatersheds are divided into three primary areas: Lakeshore Gullies north of Bayfield (G1), Lakeshore Gullies south of Bayfield (G2), and the Dune region south of Grand Bend (D1). Other subwatersheds extending to the shoreline are, however, smaller and generally relate to the outlets of Parkhill Creek at Grand Bend and the Bayfield River at Bayfield. All three primary shoreline subwatersheds are listed in the Strategy as being High-Priority with action plans focusing on protection and preservation. Much of the priority ranking relates to potential impact of faulty septic systems associated with shoreline residential development on water quality.

ENVIRONMENTAL OVERVIEW, CONTINUED

SECTION 3.5.2.2 AQUATIC FEATURES

These features relate to the various aspects of Lake Huron, the gullies, the former channel of the Ausable River where it parallels the shoreline through Pinery Provincial Park and where it forms relic lakes in the Port Franks area, and the Klondyke Marsh area.

1) Lake Huron

The lake shoreline is characterized by long narrow sand beaches at the base of the shore bluffs over much of the shoreline length. Offshore features can be grouped into erosion-resistant stratigraphy forming headlands, and shoals. They are (from south to north):

1) Kettle Point — a major bedrock outcrop which forms a shallow offshore shelf and is the southerly boundary of this shoreline littoral cell.

2) Stony Point — an offshore shelf located north of the headland feature also known as Stony Point, located adjacent to the Ipperwash Military Camp. This feature may be associated with a former outlet of the Ausable River.

3) Cantin Shoal — a shallow submerged 'island' 1 km offshore in the vicinity of Norman Heights Cottage area, Hay Township (approximately 3.4 m higher relative to surrounding lake depths).

4) Unnamed shoal — a shallow submerged 'island' 1 km offshore in the vicinity of Hay Township Sideroad 15 (Bayview subdivision, approximately 1.7 m higher relative to surrounding lake depths).

5) Shallows offshore of Dewey Point, Hay Township and Rocky Point, Stanley Township — shallow water depths extend out into the lake in these areas due to the presence of erosion-resistant material.

Fish spawning locations match those offshore features previously discussed (i.e. shallow water areas). In addition, areas offshore from Pinery Provincial Park and Port Franks within the sand beach deposition zone are recognized for fish spawning. Fish species in the offshore waters include rainbow, brown and lake trout, coho, chinook and pink salmon, freshwater cod, lake whitefish, chub, smelt and alewife. Near-shore waters contain yellow perch, walleye, small mouth bass, northern pike and various pan fish.

Commercial fisheries depend primarily on lake whitefish and yellow perch (with less emphasis on walleye, lake trout and chub) and operate based on the issuance of 10 commercial fishing licences for Huron County and 11 for Lambton County. The number of licences will remain unchanged since no new licences are permitted. These licensed fishermen harbour at Grand Bend and Bayfield, as well as one at St. Joseph. Whitefish is the commercial fishermen's staple catch. Recently, yields have been higher than the theoretical MNR estimates due to the decline of predator species such as trout following the invasion of the sea lamprey into the lakes system in the 1930s.

Sport fisheries focus on yellow perch, rainbow trout, brown trout and chinook salmon in Lake Huron waters. The three harbours of Bayfield, Grand Bend and Port Franks are used by the fisherman for docking and launching facilities. Some of the larger gully systems (i.e. Gully Creek, Stanley Township) also provide opportunities for sport fishing.

The introduction of zebra mussels to the lower Great Lakes through improper discharge of ship ballast water could affect facilities along Lake Huron. Although they are not anticipated to become a major problem due to the colder temperature of Lake Huron water, the Water Supply Plant at Port Blake did complete the installation of a chlorine feed system in 1992 to control zebra mussel development. The mussels are a threat to some aquatic life because they are prolific and compete with fish for plankton; they can also encrust and eventually affect water intake and outlet pipes. One of the main methods of inhibiting mussel development is the application of chlorine. Other exotic species are also suspected of being brought to the Great Lakes Basin through ship ballast water; their effects on the ecosystem are still being investigated.

2) Gully Systems

As previously discussed, the gully corridors add significant environmental value to the shoreline ecosystem. From a hydrologic viewpoint, they represent a separate group of subwatersheds within ABCA watershed jurisdiction. The Lake Huron Shore Processes Study *(Reinders, 1989)* also recognized the importance of gullies in the estimate that sediment eroded from gullies represents 12% of the total supply of sand which maintains the southern dune/beach area.

3) Relic River Channels and Lakebeds

The former channel of the Ausable River south of Port Franks is evidenced by a series of small lakes (Richmond Park, 'L', Moon, Bio, Perch and Hidden lakes). The combination of these lakes forms most of the area described as the Port Franks Wetland Complex, which is listed as a provincially significant, Class 1 wetland complex *(Crabe, 1983)*. The rest of the complex extends into the current channel of the river. North of Port Franks, the Old Channel (of the Ausable River) parallels the shoreline and extends through Pinery Provincial Park and north, through the Huron Woods and Southcott Pines residential areas.

ENVIRONMENTAL OVERVIEW, CONTINUED

The sensitivity of this channel is significant as there is limited flow of water through the channel due to its small drainage area.

The region directly inland from Pinery Provincial Park is a former lakebed of Lakes Smith, George and Burwell which, in the past 100 years, have been drained for agriculture. This area, now known as the Klondyke Marsh, is a stopover for migratory birds, the most notable being Tundra Swans. Although records are sparse, it is reasonable to assume that the former wetland area was used by many other bird species for habitat.

SECTION 3.5.3 ECOSYSTEM MANAGEMENT

SECTION 3.5.3.1 DUNE/BEACH REGION

This region, including the Kettle Point to Pinery sand plain and dune area, is maintained by sand contributed from the north and transported along the shore. The current beach sand budget includes a portion that is blown inland *(Reinders, 1989*). To maintain the beach and the associated successional vegetative sequence, a continuous supply of sand is required. This supply should not be threatened by adverse impacts of development such as a longer breakwater or offshore marinas at existing harbours, nor by extensive erosion control efforts along the bluffs. An overall strategy of preserving this area and managing the northern bluff shoreline, as well as the watersheds flowing into this area, is needed to preserve the dune environment.

It is recognized that the dune region falls under the jurisdiction of many groups: Pinery and Ipperwash Provincial Parks, Ipperwash Military Camp, Kettle and Stoney Point Indian Bands, Lambton County, Stephen and Bosanquet Townships, and the Village of Grand Bend. The formation of a stakeholder committee with representation from all bodies would allow a consistent approach to protecting and managing the dune region. Suggestions should be made to the Military Camp on dune management (specifically for that area lakeward of Moon Lake, where a blow-out in the dunes has occurred) and contact maintained as to future management plans for the camp. Mention is also made of the ridge and trough landscape inland from Ipperwash Beach which is the only non-government or non-reserve portion of this sand plain unit. As it too is rated a significant site *(Lindsay, 1984),* options for long-term management should be considered by the stakeholder committee.

Proper dune management should include limiting development on the beach area. An ecosystem approach to defining 'dynamic beach' *(see Policy and Implementation, Section 4)* would best identify the dune features which need to be considered due to their sensitivity to the whole dune evolution process. It is possible that increased beach development may reduce beach area for public use (e.g. Grand Bend), and subsequently may increase pressure to use more sensitive dune areas. Pinery Park staff should be invited to contribute to dune management decisions in the surrounding region.

Development pressure within this region is primarily focused along the Highway #21 corridor between Grand Bend and Port Franks, which is inland from the present shoreline. However, developments and proposals have occurred within the backdune areas, close to the Port Franks Dune ANSI and the Class I wetland areas of Port Franks (i.e. Florida North Estates and Seven Winds proposal for high-density developments). Due to the sensitivity of these areas, consideration regarding the need for buffer areas around these significant sites and the cumulative impact of such proposals is necessary to ensure adverse impacts do not occur.

ENVIRONMENTAL OVERVIEW, CONTINUED

SECTION 3.5.3.2 BLUFF/GULLY REGION

Sediment generated from the erosion of bluffs and gullies north of Grand Bend contributes to the maintenance of the Pinery to Kettle Point dune complex and the narrow strip of sand beach found at the bluff toe north of Grand Bend. It is recognized that this process directly conflicts with the welfare of existing cottage areas near these eroding bluffs. However, in an ecosystem context, the maintenance of the dune environment is of high environmental value. New development should be restricted to landward of the 100-year erosion setback and limitations on scale of erosion protection of the bluffs should be considered to ensure a continued supply of littoral sediment.

Other problems within this region include:

- erosion accelerated over natural rates by increased development or more intensive agricultural use directing water to unstable areas of bluffs and gullies;
- possible inadequate septic fields contributing to water quality problems;
- agricultural contaminants contributing to water quality problems;
- agriculture and development removing most of the natural bluff top vegetation and wildlife habitat;
- increased land development pressure due to increased servicing of cottage areas (i.e. water pipeline) and increased land values;
- lack of environmental features within this region (i.e. many woodlots have been cleared and vegetation along gullies has been denuded related to agricultural practices);
- lack of environmental protection which currently exists within many designated significant areas (i.e. areas designated ESA by the ABCA).

General gully management should include protection of existing limited vegetation and replanting or regeneration of native vegetation as a condition of any development proposals. This will maintain or improve the capability of the gully to perform as a corridor and act as an environmental link to wooded areas inland. Goderich Township has the best examples, where wooded gully corridors extend inland to large woodlots. Through two of these gully corridors exist the only cold water streams in the ABCA shoreline watershed. Gully corridors should only be used for pedestrian access to the beach if the trail minimizes impact to the vegetation and does not increase the natural erosion of the watercourse.

Where the opportunity exists to re-organize the layout of existing cottage areas threatened by bluff recession, a design should be used which avoids the linear arrangement parallel to the lakeshore composed of multiple tiers, or rows of lots. This arrangement could focus on a stable gully rather than the eroding lakebank, similar to the concept illustrated in the St. Joseph Shores development, Hay Twp. Any redevelopment plans for existing older cottage areas should include a comprehensive surface drainage plan and stormwater management plan prepared on a subdivision scale, to provide an overall approach to the problem of inadequate drainage. Stability of the existing lakebank and adverse impacts to adjacent cottage areas should be considerations of all proposed residential developments.

SECTION 3.5.3.3 OVERALL WATER QUALITY

Due to the overriding and recurring concern raised by almost all cottage representatives, a separate discussion on the topic of water quality is presented. This discussion is linked to many past and present lakeshore issues.

Development concerns — both in the dune/beach region and the bluff region — have been discussed but not in the context of impact on water quality. This issue has been studied locally by Huron County and provincially by the Ontario Commission on Planning and Development Reform. The previous practise of relying on private septic systems for disposal of residential sewage in new developments is now under study. The cumulative impact of these systems in a relatively impervious clay soil (commonly found along the lakeshore) is the primary concern. The MOEE has been focusing on this issue along the shoreline as a result of 'beach closings' and 'warnings to bathers' which periodically are issued for public beach areas. A recent funding program by MOEE, to assist landowners in the repair of faulty sewage handling systems, is currently being administered by the ABCA. This program targets the farming community and their septic and manure handling practices, as well as the cottage communities and inadequacy of their septic systems *(CURB program, 1991)*.

The Rural Servicing Study *(Huron County, 1993)* provided recommendations for proper sewage treatment along the shoreline in the characteristically heavy clay soils; include are such guidelines as individual septic systems to be located landward of the residence and communal treatment facilities, where feasible.

ENVIRONMENTAL OVERVIEW, CONTINUED

The SMP supports the recommendations of the Rural Servicing Study.

Best Management Practises should be encouraged for the agricultural region within the coastal watershed. This watershed has its inland boundary coincident with the Wyoming Moraine, a linear ridge that parallels the lakeshore and is located as far inland as Zurich and Dashwood *(see Figure 6)*. Such management practises as proper manure handling, soil conservation and pesticide management are examples of areas where improved water quality can result. Such programs as Environmental Farm Plans should be encouraged in this region.

Groundwater quality remains an environmental concern despite increased use of a piped water supply along Highway #21. The pipeline extends from the water supply facility at Port Blake north to Bayfield and south to the Pinery, and is proposed to continue south to Port Franks and other areas of Town of Bosanquet. The sandy soils within the dune/beach region possess a high percolation rate, resulting in greater concern for groundwater contamination than the northern bluff region. Conversely, the bluff region may experience surface water contamination related to shallow water table problems that allow seepage laterally through the soil, emerging at gully or lakebank slopes. Both situations warrant careful consideration for existing and future land uses.

SECTION 3.5.4 SUMMARY

The shoreline environment possesses a complex and unique ecosystem which must be recognized, understood and preserved. Due to the nature of this recreational region, development pressures will continue to be exerted along this ecosystem which may adversely affect the system. Only if development can preserve — or, preferably, enhance — the existing ecosystem (for example, through revegetation of the shoreline or preservation of existing gully corridors), should additional development be considered. Since the Pinery to Kettle Point dune/beach region is so significant on a provincial and national scale, an intensive review of the development policies within this region should be completed. This review needs to consider the Provincial Policy Statement that restricts site alteration in these areas.

When combined, the two regions discussed in the previous section form a closed cell with respect to sediment transport along the shoreline. For this reason, the entire shoreline ecosystem must be considered when management decisions are being made. In this way, the few remaining areas of environmental significance which exist along the shoreline will be preserved and possibly enhanced.

EMERGENCY RESPONSE

SECTION 3.6.1 INTRODUCTION

The ABCA has the mandate to take measures to prevent loss of life and property damage from the hazards of flooding and erosion. This is accomplished through a variety of programs and regulations undertaken by the Authority, including implementation of an Emergency Flood Contingency Plan. The current emergency plan focuses on existing riverine development which was built without the benefit of present-day standards for flood hazard mitigation.

The nature of the shoreline and the desire to inhabit the lakefront with houses as close as possible to the shoreline have created hazardous situations due to the effects of bluff instability and possible flooding. High, steep bluffs and extensive development nearby create the most common hazard, although a few flood-prone sites also exist. Section 3.3.3 describes the criteria used to identify these hazards specifically for the lakeshore region.

This chapter describes the existing emergency response mechanism based mainly on the riverine environment. Lakeshore hazards are described from results shown on the shoreline mapping *(see Section 3.1)*, and recommendations are made with respect to the most efficient deployment of resources. This report also discusses the necessary data needed for municipalities to update or create their own Emergency Contingency Plans.

SECTION 3.6.2 ABCA EMERGENCY (FLOOD) CONTINGENCY PLAN

This plan is maintained by the ABCA and is used primarily in situations of riverine flooding. It combines local watershed information with general data obtained from the MNR Stream Forecast Centre. Copies of the plan are kept in every municipal office and an up-to-date list of municipal contacts is maintained.

In summary, the ABCA monitors local watershed conditions and provides advisories and warnings of potential flooding, when appropriate, to municipalities. It is then the responsibility of the municipality to advise local residents who may be at risk. During the record high lake levels of 1986, Environment Canada provided 'Lake Level Advisories' to the Conservation Authorities by way of the existing relay system through the Stream Forecast Centre. The ABCA then passed the information on to the affected municipalities for use in implementing their own emergency plans.

SECTION 3.6.3 HAZARD DELINEATION RESULTS

Lake-related flooding is most predominant during periods of above-normal lake levels on Lake Huron. This condition — plus the occurrence of strong west, southwest or northwesterly winds — will cause flooding in low-lying areas. The existing ABCA Contingency Plan identifies the harbour and river mouth areas of Port Franks (Mud Creek and Ausable River Cut), Grand Bend and Bayfield as being the most susceptible to flooding.

Slope instability and bluff failure are considered to be site-specific problems without the need for an overall emergency plan. However, broad-scale slope failures have occurred along the ABCA shoreline and should be given consideration in any municipal lakeshore emergency response plan. Areas of known high erosion or those with development within the stable slope allowance should be monitored during periods of high lake levels or high rainfall. It should be noted that severe storms and excessive rainfall are common after the cottage season has ended, when monitoring by individual owners may be difficult.

Results of the shoreline mapping and hazard identification *(see Section 3.3.3)* have provided the following criteria for sites considered to be in a hazardous situation:

1) Erosion Risk

Developments which may be at risk due to the location of the building (residence) with respect to the bluff slope are included here. This risk is based on the premise that erosion will cause the slope to become unstable and assumes that a typical bluff undergoing erosion will eventually reach a stable slope of 3-horizontal to 1-vertical or 18° slope *(see Section 3.3.3)*. A list documenting the number and location of buildings located within both the stable slope allowance and an area of high erosion has been prepared from the mapping analysis *(see Table 3)*. This list should be carefully reviewed by all affected municipalities.

EMERGENCY RESPONSE, CONTINUED

2) Flooding Risk

Properties that could be susceptible to flooding risk can be classified into three site descriptions:

a) development at the toe of the bluff on a beach terrace;

b) development near the river mouths of the Bayfield, Ausable, Ausable Cut and Mud Creek watercourses;

c) development on a mature beach which could be undermined by wind action and subsequently affected by flood waters.

The listing of properties included in the three site descriptions will be provided to the municipalities for reference and inclusion into their Emergency Contingency Plans *(see Table 3)*.

3) Dynamic Beach Risk

Related to discussion above *(2c)*, the Regulatory Dynamic Beach criteria *(see Section 3.3.3)* will affect a number of properties within the Village of Grand Bend, Bosanquet Twp. and Stephen Twp. Criteria currently proposed within the Lakeshore Development Section *(see Section 3.3)* would not identify any of the sites within the risk zone. By the nature of the dynamic beaches hazard, the risk involved is generally not an emergency occurrence. However, such isolated storms as the March 17, 1973 storm — which caused much destruction along Ipperwash Beach — may be cited as exceptions to this statement.

SECTION 3.6.4 SUMMARY

ABCA Flood Contingency Plan

It is recommended that the ABCA Emergency Contingency Plan be amended to include the erosion hazards component for the lakeshore. This amendment will identify potential problem areas and recommend to the municipalities tasks needed to adequately address the hazard; these may include provisions to facilitate relocation of structures that must be moved on existing roadways, as well as an inventory of local companies who can undertake such operations. Special consideration will be given to Lakewood Gardens subdivision (Hay Twp.) and Melena Heights area (Goderich Twp.) which exhibit the greatest potential for existing cottage development to be affected by large-scale slope instability problems.

Procedures for forecasting lake effect flooding and disseminating information to the ABCA will need to be formalized by discussions with MNR and Environment Canada. The lakeshore flooding component of the ABCA plan should be expanded to include identification of problem areas.

Municipal Emergency Plan

Municipalities will be encouraged to investigate evacuation routes in the event of flooding and slope instability. In addition, options need to be examined regarding limited access to the area immediately south of Pinery Provincial Park referred to as Armstrong East and 'Chicken Island'. Marine emergency support such as Coast Guard and Ontario Provincial Police (OPP) will be investigated. Where there is development in gully channels (Cedarbanks, Schadeview, Sunset Cove - Hay Twp.), recommendations should be made on possible methods of reducing the hazard (i.e. upgrading culvert size in access road, structure relocation on- or off-site). Sites at beach level which could be affected by ice damage related to flooding and storm effects should also be identified for municipal consideration.

The responsibilities of the ABCA, as explained within the existing Emergency Contingency Plan, are to notify the municipality of pending hazardous conditions. Municipal, cottage association, county and individual landowner responsibilities need to be determined and clearly outlined by the municipalities. However, the Emergency Contingency Plan may provide advice on such matters. Potential damage centres or 'hot spots' will be identified by the ABCA for the municipalities to include in their emergency contingency plans.

In recent years, the advent of low water levels poses another set of hazards related to limited water for water supply and boating. Municipal infrastructure may also be affected by lower water levels where water intake pipes and sewage treatment plant outflows exist.

Other Initiatives

The ABCA may also be able to inform municipalities and cottage associations of programs and funding sources for upgrading emergency measure planning for the areas. Use of such programs through the Emergency Measures Organization (EMO) and local OPP stations to improve house-numbering systems for emergency use should be encouraged. As part of the 911 program, better definition of residential addresses and street identification is proposed for most areas in both Huron and Lambton Counties. Cottage associations should also be encouraged to identify and maintain lake viewing sites for emergency use during marine emergencies (i.e. boating accidents) and maintain a listing of these sites in a central registry for the appropriate authorities.

EMERGENCY RESPONSE, CONTINUED

Table 3 - Regulatory Lakeshore Residences

Municipality	LAKESHORE AREA 1		LAKESHORE AREA 2		Total
	flooding & wave-related concerns	slope stability concern	long-term erosion concern	30 m or dynamic beach	
Goderich Township	0	79	46	21	146
Village of Bayfield	0	15	13	17	45
Stanley Township	0	72	84	98	254
Hay Township	20	24	192	146	382
Stephen Township	0	1	1	52	54
Village of Grand Bend	0	0	10	37	47
Bosanquet Township	3	0	57	113	173
TOTAL	**23**	**191**	**403**	**484**	**1,101**
	214		**887**		

Note: This information is based on 1988 shoreline mapping and does not preclude the use of additional site-specific data which may alter the zone locations.

The Shoreline Management Plan provides detailed information about possible hazards along the shoreline. This information, when incorporated into an Emergency Contingency Plan which includes the lakeshore, should provide a detailed supplement to the existing Plan already in place at the ABCA. In this way, the Authority can expand its warning and advisory service to municipalities to effectively include the shoreline and its inherent hazards.

The hazards of erosion, flooding and the dynamic nature of beaches and dunes must first be explained to and fully understood by lakeshore residents in order to provide the necessary warning during emergencies.

FUTURE MONITORING

SECTION 3.7.1 EROSION

In the past, monitoring of erosion along the ABCA shoreline has consisted of repeat profile surveys at approximately 35 locations. These surveys have clearly identified recession of the top of the bluff and provided limited information on the profile change. Interpretation of these profiles in terms of average long-term bluff recession is limited because of the relatively short period over which the profiles were taken (with respect to the erratic rate at which some bluffs recede). The bluff may be relatively stable for a number of years and then experience sudden and dramatic recession during a period of high water levels as a result of major movement of the bank.

It appears that some of the locations for the profile stations were established based on ease of access, and consequently are located at road ends. Unfortunately, at some of these locations, shoreline erosion and bluff recession are not representative of the adjacent reach of shoreline because of the existence of shore protection structures, unique shoreline features or gullies.

The development of some details of this shoreline management plan has depended on a comparison of a detailed shoreline survey undertaken in 1935 with 1:2000 scale photogrammetric mapping undertaken in 1988. The 1988 photogrammetric mapping provides an excellent database, defining the shoreline and topography above the water line (including the toe and top of bluff) in detail. The 1935 survey provided extremely useful information, documenting the shoreline, toe of bluff and top of bluff locations. However, the data do not provide complete information on the topography above the water line, and interpretation of available data was difficult in several areas. In addition, it was apparent that these data included at least one error between St. Joseph and Bayfield; this error could not be identified, and limits the accuracy of the 1935-1988 comparison in this area.

Accurate and reliable bathymetric surveys of the nearshore lake bottom generally do not exist, although limited profiles are available at some locations. The best available information for the area offshore of the ABCA shoreline is a 1981 bathymetric survey of Lake Huron at a scale of 1:50,000. Information on the composition of the nearshore lake bottom is also limited. Rukavina *(1988)* has compiled some information (including cores, jet probes and samples) on the lake bottom composition between Sarnia and McRae Point. However, the data coverage is relatively sparse, and is located in depths of two to 20 metres, with the majority in depths greater than 10 metres. Thus, these data are of limited use in defining the composition of the very nearshore lake bottom (depths less than two metres), which is the section of the profile that controls shoreline and bluff erosion. An estimate of the shoreline stratigraphy has been developed from available onshore well records and borehole logs, but this data will not accurately reflect the stratigraphy in the nearshore area, and cannot be used with complete confidence to define the composition of the nearshore lake bottom.

It has been established that the bluff recession — and therefore development setbacks — are controlled by the erosion of the nearshore lake bottom. Further, the design of structures to stabilize the shoreline and eliminate bluff recession depends on the rate of downcutting of the nearshore lake bottom and/or on the elevation of a wave-resistant material. Consequently, it is recommended that future monitoring of the ABCA shoreline should emphasize monitoring of the nearshore lake bottom.

Ideally, this monitoring would have two phases:

First, a regional bathymetric survey of the shoreline would be undertaken, covering the nearshore area from the shoreline to a depth of about five metres. Associated with this survey, sampling of this area would be undertaken with the objective of mapping the lake bottom material characteristics.

Second, the monitoring station profiles would be expanded in coverage along the shoreline to include more representative locations, and the surveying procedures would be modified as follows:

- Profiles to extend to -5 m depth or greater;
- Vertical accuracy of the profile measurements to ±1 cm;
- Horizontal accuracy of the profile measurements to ±10 cm;
- Identification of lake bottom characteristics;
- Samples of sand to be taken to establish gradation;
- At selected locations, iron bars would be driven into the exposed till on the lake bottom; this would allow direct measurement of lake bottom erosion over time.

It is recommended that monitoring at the existing profile stations continue in order to provide long-term data on bluff recession. Consideration should be given to vertical and horizontal accuracy and control of these surveys. In some areas, new stations should be established to represent reaches of shoreline having similar characteristics.

FUTURE MONITORING, CONTINUED

Areas that should be given priority in any monitoring program — particularly of the nearshore lake bottom — include the Melena Heights area, the Bayfield Village shoreline south of the harbour, the Lakewood Gardens/Sunny Ridge/Poplar Beach area, the shoreline to the south of Grand Bend, and the shoreline between Pinery Provincial Park and Ipperwash Military Reserve. In 1995, new sites were established in Melena Heights (Goderich Twp.), Crystal Springs, (Stanley Twp.), Bayview (Hay Twp.), and Beach O'Pines (Town of Bosanquet). New aerial photography was flown in 1999 which can also be used to update erosion monitoring and mapping materials.

SECTION 3.7.2 SETBACKS

Recession rates and setbacks should be revised at intervals in the order of 10 years. Ideally, this would be undertaken by completing 1:2,000 scale photogrammetric mapping of the shoreline every 10 years and comparing the results to the base case established by the 1988 FDRP shoreline mapping. Recognizing the cost associated with this work and the difficulty in obtaining the necessary funding, the alternative is to revise the recession rates and setbacks based on ground measurements taken at the erosion monitoring stations.

These site-specific (localized) results, in conjunction with observations along the shoreline and a review of the detailed information available from the 1935-1988 shoreline comparison, would likely provide sufficient information to define areas where the originally established setbacks should be revised. However, this approach would not be as accurate as detailed photogrammetric mapping of the shoreline and comparison to the 1988 shoreline mapping. Possible applications of the Global Positioning System should be investigated as to their applicability in this task.

SECTION 3.7.3 EROSION CONTROL STRUCTURES

It is further recommended that selected shoreline structures which represent particular designs and are located along shorelines experiencing different rates of erosion should be carefully monitored. The monitoring would consist of limited surveying and developing a photographic record of the structure. This could be undertaken as a joint venture between the landowner and the Conservation Authority.

SECTION 3.7.4 LAND USE

The Steering Committees recognized that increased development pressure and land use change (primarily from agriculture to recreational use) have occurred along the shoreline. Direction given through the Lambton and Huron County Official Plans and the Municipal Secondary Plans are guiding documents for land use change decisions; however, it can also be economically and politically driven. This change can be monitored by an analysis of zoning and official plan amendments for a particular township.

The number of minor variances approved by local councils enabling lakeshore owners to build closer to the top of lakebank is an indication of the confidence or short-term consideration for long-term hazards of bluff erosion. This criterion must be carefully reviewed to ensure that necessary setbacks are being utilized for appropriate shoreline locations *(see Figure 8, 1988 Shoreline Mapping)* and amendments made, if appropriate, to rectify improper setback criteria. These exercises can be incorporated into the regular five-year review required for municipal official plan documents.

Some type of procedure is needed to survey the number of residents who use their lakeshore residence on a full-time (versus seasonal) basis. Much of the issue regarding this question of residency is the need for a consistent definition of the term 'seasonal residence'. Some may argue that the definition is not used for describing the nature of the occupancy of the building, but is more related to the degree of servicing which the township has agreed to provide the area. This issue will need to be further investigated.

Both Huron County and Lambton County have passed new Official Plans (1998 and 1999, respectively) to direct land use planning decisions consistent with the Provincial Policy Statement. Both documents include mention of shoreline hazards and indicate the need to respect the defined portion of the dynamic beach. These documents will provide direction to future updates and redrafting of local secondary plans or new amalgamated municipal Official Plans.

FUTURE MONITORING, CONTINUED

SECTION 3.7.5 WATER QUALITY

An increased awareness of water quality issues along the shoreline will likely promote a lower tolerance level of lakeshore residents to poor water quality. The MOEE and ABCA should promote community participation in sampling programs to monitor water quality along the shoreline, possibly as part of the CURB Program initiated for the shoreline in 1991 *(ABCA, 1991)*. This will be contingent upon the necessary funding being made available and is commonly a reflection of the degree of public concern voiced to local politicians. Water quality issues remain topics of much discussion and research in 1999 and 2000. The use of 'Nutrient Management Plans' has been on the increase to direct agricultural management practises through local zoning by-laws.

SECTION 3.7.6 WATER QUANTITY

Where new municipal drains are being planned along the shoreline region, their outlets need to extend to an outlet at the base of the bluff or slope which is properly designed to prevent erosion problems. This is in contrast to the past occurrence of ending the drain at Highway #21, using the highway culvert as sufficient outlet, or ending at the head of a lakeshore gully. A co-ordinated approach to surface drainage within residential areas will also assist in wise stormwater management. Currently, overall drainage schemes are not usually present in typical lakeshore residential areas.

COMMUNICATION STRATEGY

During the development of the SMP, the public was involved in many ways *(see Section 2.5)*. However, as this plan is not static and will require future review and analyses to respond to changing demands on the shoreline resource, a continued strategy for communication with lakeshore residents is necessary. This section outlines the communication strategy to be used upon the finalization and adoption of the SMP.

1) Input and direction will be needed to provide for continued application of the SMP and management of the shoreline. A committee composed of representatives from the lakeshore community (possibly a subgroup of the Steering Committee for the SMP) should continue to provide direction and advice on shoreline management topics.

2) The SMP should encourage the cottage/ratepayer associations to strengthen their organizations. Better communication between lakeshore residents and the ABCA (being the agency mandated to implement shoreline management) can occur with the assistance of such lakeshore resident associations. The ability to efficiently and effectively transfer information between association contacts and the lakeshore management agency (e.g. ABCA) will assist in the delivery of various programs. This could be as simple as maintaining up-to-date membership and mailing lists. Such groups may benefit from being able to request services (e.g. tree planting program - ABCA; municipal drainage applications - municipality; or lakeshore hazard assessment - ABCA) on a group basis that may not be available or as effective to the individual.

3) There is a need to produce and distribute an annual lakeshore bulletin to provide relevant information to the lakeshore community on relevant topics. These may include lake level forecasts, land use issues, new technologies for septic systems and/or shore protection. It could also be a vehicle for informing residents of new programs for assistance or new regulations which may affect aspects of the lakeshore environment (e.g. river mouth dredging and open lake dumping practises, zebra mussel abatement programs, etc.).

4) Communication among lakeshore personnel of conservation authorities, government agencies and academic researchers involved in coastal issues should be maintained (e.g. with the Canada Centre for Inland Waters and the International Joint Commission) to enable the most current information and recent findings to be applied to the study area of this SMP. Management decisions can be more soundly made if they evolve with a better understanding and knowledge of coastal processes, issues and relationships.

5) Ongoing communication among other interest groups and municipal councils will continue to promote a better understanding of the shoreline resource at the local level.

Grand Bend Beach (Lakeview Casino), 1964

CHAPTER FOUR / POLICY AND IMPLEMENTATION

PHOTO: COURTESY OF THE GREAT LAKES WATER LEVEL COMMUNICATIONS CENTRE, BURLINGTON, ONTARIO N7R 4A6

POLICY AND IMPLEMENTATION

SECTION 4.1 INTRODUCTION

The Shoreline Management Plan in isolation has no status. The strength of a Plan is contingent upon the consensus of the various interest groups which form the Steering Committee, the approval of the seven municipalities, agreement of the various provincial and federal government agencies and acceptance by those it affects and the general public.

The Plan is intended to be referenced as background information for changes to the planning documents of the lakeshore municipalities (comprehensive zoning bylaws, Official Plans and Secondary Plans). It is also written to be of assistance to other government agencies who, by nature of their work, focus on the lakeshore and the inherent physical limitations and hazards which it possesses.

The Plan is intended to comply with and assist in implementation of Provincial Policy regarding hazards for Lake Huron. It will assist in land use decisions made by local municipalities regarding the shoreline.

SECTION 4.2 LEGISLATION

This section outlines the various interest groups and the methods available for these groups to utilize the results of the Plan. At the time of writing this Plan, the lakeshore issues of proper land use management are being debated by all levels of government, be it municipal, county, provincial or federal. For this reason, some of the methods and policies discussed in the following discussion are in draft or preliminary form.

SECTION 4.2.1 PROVINCIAL POLICY STATEMENT

This Policy Statement contains specific reference to natural hazards associated with the Great Lakes/St. Lawrence River System. Lake Huron forms part of that system and the shoreline contains all three defined hazards listed in the Policy Statement: flooding, erosion, and dynamic beach hazards. Together, these three hazards form the Lakeshore Hazard Area of the shoreline, identified on the maps contained in Appendix D. This Plan sets out criteria for determining the hazard to which development restrictions will apply *(for details, see Section 3.3, Lakeshore Development Guidelines)*.

The Provincial Policy Statement provides direction as to what topics need to be addressed by municipalities in their planning documents to address new development which may be affected by lakeshore hazards. These policies include ensuring that:

1) development is generally directed to areas outside of the lakeshore hazards;

2) no new development or site alteration is permitted within the defined portion of the dynamic beach;

3) development and site alteration may be permitted in hazardous lands provided that all of the following can be achieved:

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

The policy statement is applicable to all provincial ministries which must have regard for the policy statement, including such boards and agencies as the Ontario Municipal Board and Ontario Hydro.

POLICY AND IMPLEMENTATION, CONTINUED

SECTION 4.2.2 PLANNING ACT

Relevant information from the SMP needs to be incorporated into municipal official plans or zoning by-laws, where appropriate. Many municipalities are undergoing mandatory review of their secondary plans. The county Official Plan and associated municipal Secondary Plans identify existing land use, guides and directs potential land uses and establishes implementation policies within municipal boundaries. Both the Lambton county and Huron County Official Plans have been updated (1998 and 1999, respectively) and have sections regarding shoreline hazards.

The Comprehensive Zoning By-laws, by comparison, establish detailed boundaries of land uses, specific site requirements of land uses, and policies under which land uses will be permitted. General planning statements, recognizing the lakeshore as a unique area which warrants special consideration regarding inherent hazards, are needed as the basis of further discussion. These basic statements, in addition to stating the need for such policies as outlined in the previous section, are the minimum requirements for inclusion in the secondary plans. This provides the foundation and justification for more details being included within the zoning by-law at the appropriate time (possibly upon completion and adoption of this Plan).

Mapping changes to planning documents may be necessary to reflect data showing the erosion hazard along the shoreline. This will especially apply to Huron County municipalities which currently have a 1,000-foot wide 'Recreational' designation paralleling the shoreline top of bank. This designation appears in both the secondary plans and zoning by-laws for all four rural municipalities within the ABCA's jurisdiction (Goderich, Stanley, Hay and Stephen Townships). Erosion mapping information (discussed in Section 3.1) indicates areas where new development will need to be set back from the top of bank. Using the most extreme erosion rates, an appropriate setback may very well include one-third of this 1,000-foot zone, and therefore the location of this line may need review.

Regarding setbacks, zoning by-laws have commonly made use of a term, **top of bank** in describing a feature from which a certain building setback applied. This feature is relatively easy to identify where gully and lakeshore slopes or 'banks' are predominant. However, the definition is inadequate in describing the type of environment found in a beach/dune system. Confusion of the use of this term is most applicable to the dune areas of Bosanquet and Stephen Townships and the Village of Grand Bend. The term **dynamic beach** and the description used to define it *(see Section 3.3)* may prove useful as a substitute.

SECTION 4.2.3 CONSERVATION AUTHORITIES ACT

Under Section 28 of this Act, an Authority may make regulations applicable to the area under its jurisdiction restricting, prohibiting or requiring the permission of the Authority for development activities such as building construction and filling. As the legislation was originally intended for riverine situations, some clarification may be required to incorporate the lakeshore. Terminology such as 'regional storm' will need to be reviewed to ensure its application to Lake Huron. In addition, the use of the existing term, 'conservation of land' will need to be clarified as to its application to erosional concerns *(McKeen and Law, 1991)*. At present, the existing regulation enforced by the Conservation Authority *(Ontario Regulation 46/95)* pertains to the lakeshore region only where watercourses such as gullies outlet into Lake Huron.

Also within the mandate of the Conservation Authority is the function of lead commenting agency on planning matters involving lakeshore flooding and erosion. To provide direction to staff when reviewing planning matters and to maintain consistency, it is proposed that the ABCA and lakeshore municipalities approve a lakeshore development policy as part of this SMP. This policy *(see Section 3.3)* provides implementation criteria for the Provincial Policy Statement.

SECTION 4.2.4 LAKES & RIVERS IMPROVEMENT ACT

Administered by the Ministry of Natural Resources (MNR), this Act provides the powers "to provide for the use of waters of the lakes and rivers of Ontario and to regulate improvements in them" *(sec.2)*. As discussed in McKeen and Law *(1991)*, the legislation was intended to reflect the interests of the government in the 1920s related to dam construction, timber driving, protection of public interest (riparian rights) and water power privileges, to name a few. The Act applies to any shoreline work extending into the water and requires the issuance of a Work Permit.

POLICY AND IMPLEMENTATION, CONTINUED

Table 4 - MNR Guidelines for Reviewing Shoreline Projects

Project	Hard Shoreline [1]	Soft Shoreline [2]	Sensitive or Critical Areas [3]
FILL a) Conversion to dry land			
- minor (generally < 3 ft.)	may be acceptable with conditions		not allowed
- major (generally > 3 ft.)	not allowed		
b) Reclaim land previously lost to erosion	allowed with conditions		
RETAINING WALL	allowed with conditions		
BEACH NOURISHMENT	allowed with conditions		generally not allowed
DREDGING a) To allow water access to property	may be allowed with conditions		not allowed
b) navigational for Great Lakes shipping	allowed with conditions		
DOCKS & BOAT HOUSES	allowed with conditions		generally not allowed
GROYNES	generally not allowed		not allowed
BREAKWALLS	allowed with conditions		not allowed
BOAT LAUNCHES	allowed with conditions		not allowed
MARINAS	allowed with conditions		not allowed
OPEN LAKE DUMPING [4]	generally not allowed		
LITTORAL ZONE DUMPING [4]	generally not allowed		

NOTE: These guidelines are presented for information purposes only and are based on compliance with the Public Lands Act, Lakes and Rivers Improvement Act and Section 35 of the Fisheries Act. The guidelines do not account for project review based on potential adverse impact on littoral drift and other environmental factors.

[1] **Hard shoreline** is defined as — *shoreline or substrate composed of rock, boulder, rubble or gravel and includes shorelines artificially hardened with protection*

[2] **Soft shoreline** is defined as — *shoreline or substrate composed of sand, silt, clay, muck or detritus*

[3] **Sensitive or critical areas** includes — *documented site-specific spawning or nursery habitat. This may include wetlands and marshes hydrologically linked to the Great Lakes.*

[4] **Dumping** — *will need to comply with the MOEE guidelines for such work*

POLICY AND IMPLEMENTATION, CONTINUED

SECTION 4.2.5 PUBLIC LANDS ACT

Also administered by MNR, this legislation directs the Ministry to "have charge of the management, sale and disposition of the public lands and forests" *(sec.2)*. Crown land and resources are therefore regulated with regard to development on, management and use of, and rehabilitation to said lands. Although the Act authorizes MNR to define 'shore lands' for the purpose of the legislation, the terminology needs to be carefully considered. Inaccuracies in use of such terms as beds and banks were recently debated in a trial over ownership of the beach in the Village of Grand Bend. This celebrated case provided insight into the limitations of surveying terminology and revealed the difficulty of accurately defining property boundaries based on historical data in a dynamic beach environment *(Chilcott decision, 1990)*.

Specific to shoreline environments, two sections of the Act do provide direction for activities involving the sale of public lands covered by water *(sec.39)* and beach management agreements *(sec.42)*. As suggested by McKeen and Law *(1991)*, however, legislation and regulatory controls need to be strengthened to provide assistance to provincial shoreline management interests. Some limited applications may apply to the study area where undisputed Crown ownership exists. Work proposed for areas under Crown ownership or 'shore lands' will need to be supported by the issuance of a Work Permit, possibly with additional requirements of tenure document and indemnity agreement. Section 14 of the Act applies to lands under Crown ownership and 'shore lands'.

Canada Company beaches have been specifically dealt with in an MNR interim beach management policy *(#LM 7.09.02, dated June 29, 1990)* created as a result of the uncertainty which resulted regarding beach ownership after the Grand Bend beach ownership trial. This policy encourages the status quo until a final decision has been reached regarding the court decision and subsequent appeal made by the Province.

SECTION 4.2.6 FISHERIES ACT

Although this Act is federal legislation, its powers have been delegated to local Conservation Authorities. The wording of the Act is sufficiently broad to control almost any activity which is planned in the water or in areas covered by waters of Lake Huron. Unfortunately, the legislation is reactive rather than pro-active and there is a limited pre-approval process. However, since the punitive fines are in the range of $50,000 to $100,000 and an offender may also be charged to rehabilitate the site at his/her cost, discussion of a proposed project prior to initiation should not be too difficult to obtain once repercussions are widely known. In an effort to improve understanding of the various factors which are considered when approached with a project within shorelands, the two local MNR District Offices within the study area have drafted guidelines for reviewing various shoreline projects *(see Table 4)*. Fisheries concerns are also being included through the current review process established under the Public Lands Act. The Ausable-Bayfield Conservation Authority currently (2000) has a new Level II Agreement with the Department of Fisheries and Oceans (DFO) to refer proposal to DFO if fish habitat will be harmfully altered, disrupted or destroyed.

SECTION 4.2.7 ENVIRONMENTAL PROTECTION ACT

Under Section 7 of this Act, requirements are stipulated for the proper and controlled emission of any contaminant into the environment. This includes the disposal of sewage using sewage disposal systems, including the most common method used along the Lake Huron shoreline: septic tank systems. Exceptions to this method of sewage disposal in the study area are within the Village of Grand Bend, which has sanitary service, and Bayfield, which has a proposal for service in 2001.

The review and approval of septic systems now comes under the Building Code Act and is administered by the local municipalities. New alternative systems have become available as options for difficult sites. These systems include sand and wood chip filters, effluent filters, aerobic treatment units, and artificial media filters, to name only a few.

In 1991, Huron County was affected by a development moratorium, or 'slow-down' issued by the MOEE in response to long-term concerns about using individual septic systems to service new residential development (including the lakeshore). This concern is based on several factors, including the following:

POLICY AND IMPLEMENTATION, CONTINUED

1) The soil of the lakeshore region of Huron County is typically composed of a heavy clay soil which requires special considerations for septic system installations (i.e. raised tile beds using imported fill due to slow percolation rates in the native soil which may create surface drainage problems).

2) The lakeshore between Grand Bend and Bayfield has recently been provided with a reliable source of potable water. The extension of Lake Huron Water Supply by means of a water pipeline along Hwy #21 has initiated a concern that existing residential septic systems, which may be under-maintained or faulty, will be overworked by this uninterrupted water supply.

3) Residential development along the lakeshore was originally built as 'cottage style' development and justified the zoning designation 'seasonal residential'. Current trends in development and re-development (i.e. expansions, rebuilding) of these areas have changed to construction of, or conversion to, more permanent residences for year-round use. Part of this upgrading and conversion trend to residences may be due to limitations in the Building Code not allowing a 'simple cottage' to be constructed (i.e. stipulations on foundations, minimum standards of insulation).

SECTION 4.2.8 DRAINAGE ACT

This Act has commonly been used to fairly and equitably apportion costs related to the creation and maintenance of drainage systems in agricultural areas. These systems ensure that drained agricultural land has sufficient outlet to ensure adequate drainage for agricultural purposes. However, this Act has increasingly been used to provide the mechanism for surface drainage systems in residential areas where no overall drainage scheme exists. Examples can be found in Section 3.2.6.

Lakeshore examples are described under the heading of drainage in Section 3.2.6. As discussed under non-structural protection *(see Section 3.4.2.2)*, a variety of approaches are available. The key issue is to establish a communal arrangement which is legally binding and provides a protected outlet to the lakeshore. Unfortunately, many existing municipal drains ended at Highway #21 where 'safe and sufficient outlet' *(Section 15, Drainage Act 1989)* was deemed to be. This sometimes led to erosion problems related to outletting channeled water into a natural ravine, compounded by the elevation difference the water needed to transcend from tableland to lakeshore. The sensitivity of these lakeshore watercourses and their environmental importance is described under the title, 'Environmental Ecosystems' *(Section 3.5.2.1)*.

SECTION 4.3 CONCLUSIONS

In some Great Lakes shoreline jurisdictions there is an over-riding legislative document which provides clear and concise direction regarding shoreline management and the necessary powers to enforce them. An example is the State of Michigan which has a Dune Protection and Management Act. The Province of Ontario has only shoreline hazard policies. It is therefore only through the co-operation and consensus of a variety of government legislation, user groups and an understanding by the public that the principles of shoreline management can succeed.

Implementation of this SMP can be achieved mainly by use of the Planning Act and/or Conservation Authorities Act. Based on public and municipal response to this issue of implementation, we recommend that the Planning Act be used as the sole implementing mechanism unless regulations under the Conservation Authorities Act are requested by the municipality. A new generic regulation may be applicable to the shoreline if incorporated by local Conservation Authorities.

In the short term, implementation of the SMP will be completed by the ABCA through comments submitted to municipalities regarding land use matters (e.g. Huron and Lambton County Official Plans, zoning amendments, minor variances). Implementation in the long term will occur through incorporation of this document into municipal planning documents (e.g. zoning by-law, secondary plans).

It should be stressed that much of the SMP is considered the best and most detailed information currently available regarding the shoreline and related hazards. Use of the data will therefore be encouraged. As research and monitoring results reveal new data, they will be incorporated into the SMP.

Dewey Point, Hay Township, 1986

CHAPTER FIVE / CONCLUSIONS & RECOMMENDATIONS

PHOTO: AUSABLE-BAYFIELD CONSERVATION AUTHORITY

CONCLUSIONS AND RECOMMENDATIONS

SECTION 5.1 INTRODUCTION

The ABCA Shoreline Management Plan (SMP) is a long-range planning reference document intended to direct land use planning along the shoreline. It is designed to support new regulations or policy regarding development restrictions within areas where lakeshore hazards create avoidable risks. It is also intended to suggest and recommend approaches and means to achieve the common goal of wise shoreline management through existing legislation and policies. The following conclusions were developed through consensus of the committees.

SECTION 5.2 CONCLUSIONS

DAMAGE MITIGATION

Conclusion #1 — **The most effective response to mitigating shoreline damages is prevention through land use management (new development) *OR* relocation of threatened structures (existing development) away from the shoreline hazard.**

Wise land use management that results in locating development outside of lands susceptible to flooding and erosion is the preferred response to proposals for new development. In areas of existing development, this option is not available and measures are required to minimize potential of structural damage and injury. In areas where flooding and erosion are considered to be risks, the only viable alternative may be relocating the building away from affected lands. Feasibility of this approach is evident from a cost/benefit approach when the total costs of protection (including materials, installation and future maintenance) are considered.

An additional consideration is the impact that increased protection may have on the reduction of sand supply to the sediment budget. It is generally accepted that downdrift impact should not be allowed to occur, therefore the interruption of littoral drift should also not be allowed. This supply and continuance of the sediment budget is important for maintaining shoreline beaches. Preferred strategies are proper setbacks, relocating buildings and redesignating lots for open space instead of residential use if they become non-buildable sites due to erosion.

NEW LAKESHORE DEVELOPMENT

Conclusion #2 — **New development proposed along the shoreline will be permitted outside of the regulatory lakeshore.**

As stated in the Lakeshore Development Guidelines *(see Section 3.3)*, new development is defined as plans of subdivision, multi-lot severances, multi-unit/ condominium developments and existing subdivisions which are primarily vacant of development (fewer than 50 per cent of lots are developed).

Surface water drainage plans will be reviewed with respect to the lakeshore impact through stormwater drainage and hydrogeologic reports. It is recognized that improvements to water quality need to focus on septic systems along the lakeshore and agricultural practises inland. The cumulative impact to the quality of groundwater must be examined when considering the impact of each new development (both in dune environment and in bluff regions).

Specifically related to the potential for development within the areas of Sunnyridge and north of Poplar Beach, Hay Township, this region experiences the greatest rates of bluff erosion compared to the remainder of the shoreline under consideration within this study. For this reason, shoreline stabilization methods would not be feasible as discussed in Conclusion #7.

CONCLUSIONS AND RECOMMENDATIONS, CONTINUED

EXISTING LAKESHORE DEVELOPMENT

Conclusion #3 — When contemplating changes to existing development along the shoreline, the Lakeshore Development Guidelines (Section 3.3) will need to be considered.

When contemplating changes (i.e. additions, new accessory buildings) to existing development along the shoreline, the degree of hazard at the site will need to be considered. Potential hazards have been defined in Section 3.3, *Lakeshore Development Guideline*s, and are described as being within the '**Lakeshore Area 1**' or '**Lakeshore Area 2**' designations.

Where shoreline erosion threatens existing development, residence relocation is still considered the most effective protection in many cases. Owners need to be made aware of opportunities to acquire adjacent inland properties to provide 'run-away lots' for threatened sites. This situation can best be seen in the Poplar Beach area where the most northerly existing cottages are threatened by bluff erosion; here, a new plan of subdivision has been approved inland, supplying 26 vacant lots for purchase. A mechanism to give these lakefront cottage owners 'first right of refusal' for these new lots would allow for the establishment of 'run-away lots' nearby.

Wherever long-term erosion rates are high and cottage development has not yet occurred, lot layout should be redesigned to avoid the linear arrangement of lots parallel to the lakeshore.

SHORELINE PROTECTION

Conclusion #4 — Shoreline protection (both structural and non-structural) may be permitted for development which currently exists along the shoreline.

This will involve the use of minimum engineering criteria *(see Section 3.4.3)* and an assessment of the proposed structural protection and its potential impact on adjacent sites *(see Section 3.4.2 and Conclusion #6)*. Existing protection will be reviewed and managed using existing legislation. All efforts will be made to avoid vertical structures.

New development planned for the shoreline region should not require shoreline protection, since all necessary precautions will be taken at the planning stage — using appropriate setbacks to ensure that it is not proposed in an area susceptible to flooding or erosion.

Conclusion #5 — Shoreline protection structures have two objectives: storm damage protection (designed to protect property from storm waves) and shore stabilization (designed to stabilize the shoreline for a long time).

Clarification of these two objectives is important to clearly outline the intent of various structures so proper design can be achieved and structure limitations understood. Both types of protection need to be considered. On a regional scale, however, shore stabilization is a much larger and more costly project.

Conclusion #6 — Shoreline protection structures are an acceptable response to storm damage protection when properly designed and engineered so that they do not adversely affect adjacent areas and the overall sediment budget.

Areas with average erosion rates of less than 0.3 m/yr should use a rubblemound revetment as the preferred regional protection approach (where deemed necessary by the landowner). Other protection methods are also recognized as viable alternatives, depending on specific reach characteristics; these include:

1) seawalls (commonly built using steel sheet pile walls) are not recommended erosion protection structures anywhere along the shoreline, due to resulting wave action that tends to deflect wave energy downward toward the structure toe, either undermining the structure and causing failure of the protection, or overtopping and suffering wave erosion by splash effects.

2) retaining walls — by definition, these structures need to be behind (landward of) the active beach zone. Designed to avoid water acting at the structure's base, these walls provide bank stability by securing the bank toe from movement. Due to the nature of the bluff shoreline between Grand Bend and Goderich, these structures will have limited usefulness — based on the fact that high lake levels in 1986 did reach the toe of the bluffs in most areas.

CONCLUSIONS AND RECOMMENDATIONS, CONTINUED

3) groynes — improved design data for groynes should be developed prior to their use as an alternative for shoreline erosion control. Because it is not possible to predict the effects of their use, the MNR has effectively put a moratorium on new structures proposed within the beach zone where the Public Lands Act has jurisdiction (effectively all beach area covered by water). If a design process is used permitting effective assessment review, then their use should also be considered on a subdivision scale approach.

Conclusion #7 — Shoreline protection structures may be built in an attempt to stabilize the shoreline. However, depending on structural design, they may be ineffective over the long term in areas where significant erosion occurs.

Protection is only recommended for areas which are eroding at rates less than 0.3 m/yr. Again, to be effective, this approach should be considered on a regional scale, both environmentally and economically.

An example is the Village of Bayfield, south of the harbour, where shoreline stabilization may be considered using offshore breakwaters. They are not likely suited, however, for any other location along this shoreline — partly due to unique local conditions of a bluff environment immediately downdrift of a littoral drift partial barrier (harbour protection). The protection structure would need to include complete design and coastal engineering considerations; however, this is likely a feasible site due to minimal impact to the littoral drift pattern already disrupted by harbour protection.

Conclusion #8 — New shoreline protection structures must satisfy several conditions.

The report titled, *Considerations for Shore Protection Structures - ABCA SMP* by Baird *(1994)*, describes in more detail the primary conditions. They are summarized as follows:

a) They are to be part of a co-ordinated approach (multi-lot or subdivision scale) for an existing development.

b) Land ownership should be clearly established.

c) The design of structures above the 100-year flood level to prevent storm damage should follow recommendations of existing guidelines and reports prepared by the various implementing agencies (MNR, U.S. Corps of Army Engineers).

d) Structures proposed below the 100-year flood to stabilize the shoreline should be designed by a coastal engineer.

e) An impact assessment needs to accompany any application for protection approval to demonstrate that: adjacent erosion will not increase, alongshore sand transport rates will not be reduced, adjacent structures have been considered, and the structure will not adversely affect the shoreline ecosystem or associated cultural heritage resources.

f) Adjacent property owners are to be given the opportunity to comment on application.

g) There is to be quality control during construction.

h) Monitoring of structures and regular maintenance are to be undertaken as part of an agreement with the proponent.

i) Consideration must be given for maintaining pedestrian access along the beach.

Regional-scale beach nourishment is not practical as an effective alternative for new protection structures. It does, however, have some applications to improving the effectiveness of existing structures. Other applicable Acts and legislations referred to in Baird *(1994)* may also apply.

Conclusion #9 — Improvements or maintenance to existing protection structures must consider ways to reduce shoreline impact.

Beach nourishment should be considered for groynes which are being upgraded and are in good condition. Reflective seawalls should be replaced with rubblemound revetments or, at minimum, toe protection should be provided.

CONCLUSIONS AND RECOMMENDATIONS, CONTINUED

INCORPORATION INTO PLANNING DOCUMENTS

Conclusion #10 — The Lakeshore Development Guidelines (*Section 3.3*) need to be recognized in municipal planning documents to provide consistency among lakeshore municipalities.

As part of the continuing update of municipal planning documents, the lakeshore should be specifically referred to and general statements need to be incorporated into the Huron County Secondary Plans, Lambton County Municipal Official Plans and zoning by-laws to recognize inherent hazards along the shoreline. Mapping changes to the planning documents that reflect the lakeshore areas should also be undertaken; these may include investigating the suitability of the existing location of the recreational zone in the Huron County Secondary Plans along the shoreline.

Specific to the zoning by-laws for Stephen, Bosanquet and Grand Bend, replacement of the term **top of bank** with a more suitable description (i.e. dynamic beach) is required where it refers to beach areas. Dune protection and restoration policies have been added to Bosanquet, Grand Bend and Lambton County planning documents to reflect the necessary attention to these fragile areas. Other municipal zoning by-laws need to be reviewed with the shoreline mapping *(see Section 3.1)* to investigate whether site-specific setbacks are necessary in extreme erosion areas (Sunnyridge to Poplar Beach areas, Hay Twp.).

Related to general planning issues, the ABCA will assist municipalities and County Planning Offices with the definition of the term **seasonal use** and how it applies along the shoreline. Further investigation is also needed regarding the land ownership situation. Using available deeds, it should be undertaken to determine where lakeward lot lines are and where problems in interpretation will likely occur.

Advice will be sought from the MNR on such issues as definition of toe of slope and on specific requirements of a geotechnical report to satisfy slope stability concerns.

WATER QUALITY

Conclusion #11 — The ABCA should assist in and support efforts to improve surface water and groundwater (potable) quality along the lakeshore, specifically in the subwatershed bordered by the Wyoming Moraine.

Wyoming Moraine, a linear geographic feature parallel to the shoreline as an elevated ridge or watershed, forms the inland drainage boundary for most of the lakeshore. All efforts to improve agricultural land management practises in this subwatershed through existing or new programs will be supported.

Wherever possible, the ABCA will assist the MOEE in their efforts to provide the lakeshore community (cottagers and municipalities) with options for rural sewage disposal to maintain or improve lakeshore environmental quality. This will pertain to both new and existing development and may include both individual sewage treatment and communal facilities. Recent (2000) concerns have caused the formation of such groups as the Huron County Water Quality Coalition and the St. Joseph / Zurich Subwatershed Pilot Project for the purpose of addressing some of these water quality issues.

DRAINAGE

Conclusion #12 — Master drainage plans need to be implemented for existing development along the shoreline to improve surface water drainage.

Due to the large number of existing cottage areas which do not benefit from an overall surface drainage plan, cottage area plans need to be prepared. This fact is most apparent in cottage communities where surface water ponding has impaired effective operation of septic fields. The problem, however, is widespread, covering almost all areas adjacent to bluffs (north of Grand Bend). To achieve this goal, co-operation will be required between townships and residential owners, and will likely require the services of a drainage engineer. Conservation Authority staff will be able to assist through background information and recommendations for each site. As co-operation among residents will likely be the key to success of this initiative, unified cottage associations, or ratepayers' associations will be beneficial. Eventually, all municipal drains should be taken to properly designed and protected outlet structures, not at the gully head or at Highway #21 as is currently the case. In the sand dune environment, consideration should be given to the problem of inadequate outlet due to blockage by sand.

CONCLUSIONS AND RECOMMENDATIONS, CONTINUED

GULLIES

Conclusion #13 — Gullies bisecting the shoreline require preservation and aesthetic improvement to ensure that further degradation does not occur.

The gully channels which typically provide boundaries of the cottage areas are often the only natural regions remaining for aesthetic values to lakeshore residents. For this reason, care is needed to protect and enhance these areas from inappropriate use. Uses such as surface water outlets and pedestrian access to the beach should be carefully evaluated to ensure that gully regions are not adversely affected. They do, however, provide the most logical location for improved access to beach areas and a natural location for the outlet of drainage water, if properly undertaken. A review of existing gully features and the ownership of them may be required in order to achieve Conclusion #12.

SAND DUNES

Conclusion #14 — Sand dunes should be considered as a natural resource, crucial for continued protection of existing development within the dune region.

Development projects proposed on beach areas will be assessed with regard to dynamic beach criteria described in Section 3.3. In addition, consideration for the cumulative impact of such developments on beach use changes toward the more sensitive beach areas, that is, where dune formation actively occurs. An Ontario Municipal Board hearing in 1989 *(OMB Decision by G.A. Harron regarding an appeal made by Sterling Kenny — Lots 9, 10, 11, 35, 36 & 37, Plan 125, Twp. of Stephen — June, 1992)* further confirmed this requirement when it was decided to overturn a local decision allowing a new residence to be built in the dunes. Grand Bend, in particular, will need to assess this impact since the beach within the village is not considered to be environmentally sensi-tive, primarily due to the historic practise of grading the beach when dunes begin to form. This practise should be evaluated in the context of any change in use of the beach from recreational — for example, sun bathers to commercial/residential (i.e. condominiums and tourist commercial use). Beach management prac-tises need to be reviewed.

Discussions should be conducted with the First Nations regarding the former Ipperwash Military Camp, with suggestions for dune preservation and management (possibly as part of an overall strategy for the dune area). Some consideration for long-term plans for the dune area inland from Ipperwash Beach, in the Town of Bosanquet, should also be given.

As outlined in the Environmental Overview *(Section 3.5)*, the dune environment requires an overall strategy in order to ensure that sand supply is not interrupted as part of the littoral drift concept. As outlined in Section 3.2.4, evidence suggests that a narrowing in the width of the beach south of Grand Bend has occurred since 1935; this could indicate a redution in sand supply which, if it continues, may eventually affect residential areas along the shoreline. For this reason, a stakeholder committee should be formed (composed of representatives from Ipperwash Military Camp, Kettle and Stony Point Indian Bands, Bosanquet Twp., Pinery Provincial Park, Port Franks and Grand Bend) to provide a joint management approach to the dune region.

Existing shore protection along the bluff shoreline is largely limited to small-scale protection works with limited life span. As such, the threat to effectively reducing sediment sand supply from the northern shoreline area to the southern dune complex is considered to be minimal. However, continued upgrading of existing protection in combination with new small-scale protection schemes may result in a reduction of sand supply and in increased erosion of beach areas. An assessment will need to be carried out, however, when considering large-scale projects for erosion protection or harbour expansions. Potential effects of sand mining should also be assessed in the context of overall dune management and sediment budgets.

CONCLUSIONS AND RECOMMENDATIONS, CONTINUED

GREEN SPACE

Conclusion #15 — Green space (a valuable asset to the shoreline) has been reduced in extent. All opportunities should be taken to protect and promote expansion of existing wooded areas.

Gully corridors connecting inland woodlots to the shoreline should be protected and enhanced, where possible, through inclusion of open space areas in planning documents, new plans of subdivisions, multi-lot severances, and any changes to existing drainage courses, possibly through the Drainage Act.

Existing ESAs should be recognized in municipal planning documents to provide some level of protection for this area of (native) tree cover. Available means should be investigated by municipalities and counties to provide more lakefront park space/green space for public use and enjoyment. Where lots become 'unbuildable' and funds are available, land purchase should be investigated on a willing buyer/willing seller basis by the cottage associations, townships, counties or Conservation Authority to create new opportunities for green space. A Natural Area Network outlined in the *Watershed Management Study (ABCA, 1995)* provides a framework to initiate discussions on this topic. Portions of this framework were incorporated into the Lambton County Official Plan *(1998)*.

GODERICH HARBOUR

Conclusion #16 — The ABCA and other lakeshore interest groups should continue efforts to seek appropriate management options regarding the operation of Goderich Harbour area.

Despite continued efforts of the Steering Committee, this project has not received a response from the Coast Guard to the report prepared by W.F. Baird and Associates *(Baird, 1992)* pertaining to the impact of Goderich Harbour on the shoreline's sediment budget. The Committee diligently approached the Coast Guard with options which may be incorporated into normal operating procedures of the harbour but received no official response. The Baird report referred to findings of *Lake Huron Shore Processes Study (1989)* which provided detailed analysis of the shoreline using state-of-the-art technology and a variety of coastal engineering experts as advisors. The harbour has now been sold to the Town of Goderich and attempts should be made to discuss these options with them.

REVIEW OF DEVELOPMENT GUIDELINES

Conclusion #17 — The SMP and the Lakeshore Development Guidelines should be reviewed (1) as new data and research become available, and (2) at least every 10 years to ensure applicability.

Long-term erosion rates are largely based on comparison of the 1935 historic survey with recent 1988 shoreline mapping. However, these data are now dated; changes to the shoreline have likely occurred and will undoubtedly continue to occur. As discussed in Section 3.7, 'Future Monitoring', erosion rates and setbacks should be reviewed every 10 years to ensure their appropriateness. This should be undertaken using erosion monitoring data and site-specific data as major erosion events occur; Lakeshore Area boundaries should be revised accordingly. New aerial photography from 1999 will assist in this review in 2004.

Future monitoring of the shoreline to assess erosion should also emphasize the nearshore lake bottom and provide more detailed and accurate data with regard to bathymetric surveys and offshore/onshore soils. Monitoring should focus on the areas of Melena Heights, Bayfield (south of harbour), Lakewood Gardens to Poplar Beach, shoreline south of Grand Bend, and the shoreline between the Pinery and Kettle Point First Nations.

As an additional opportunity to improve accuracy of the 1935 survey data, consideration should be given to re-establishing ground control points and separating the survey into smaller segments. This would enable a more accurate rate of shoreline change to be determined within the general area of Stanley Township between Crystal Springs and Rocky Point. Specific case studies should be reviewed as they become available.

After completing the mandatory review, a supplementary document may be required to replace the original SMP. This will be assessed on an as-required basis, depending on the amount of revision required.

CONCLUSIONS AND RECOMMENDATIONS, CONTINUED

EMERGENCY RESPONSE

Conclusion #18 — Emergency contingency plans should be revised to incorporate the lakeshore areas.

Areas of known high erosion or those having development within Lakeshore Area #1 should be monitored during high lake levels and periods of high rainfall. In addition, amendments to the ABCA Emergency Contingency Plan will be needed to include a lakeshore erosion component and hazard mitigation options for each municipality to consider. Further, flooding criteria should be expanded to include evacuation routes from flood-prone areas and for areas with limited access, e.g. Port Franks north of the Ausable River outlet. Low-water scenarios should also be considered as a result of climate change projections completed by Environment Canada and the Lake Huron Centre for Coastal Conservation.

A list of all residences threatened by lakeshore hazards should be provided to municipalities (both slope stability concerns and flooding hazards). In addition, the ABCA will identify lakeshore hazard 'hot spots' for municipalities to address in their emergency plans. Options to minimize the hazard should be suggested to those who have developed their properties in gully channels or have removed protective foredunes.

Cottage associations should be encouraged to maintain look-out points and emergency access points for rescue authorities to use during marine emergencies.

CONCLUSIONS AND RECOMMENDATIONS, CONTINUED

SECTION 5.3 RECOMMENDATIONS

The following recommendations are intended to provide the direction needed to initiate the preceding conclusions. These recommendations can also be viewed as short-term goals to assist in the implementation of the Shoreline Management Plan.

1) A shoreline committee should be created to provide direction and input into the continuing application and management of the shoreline. This could be a subgroup of the existing Project and/or Technical Committees. Since 1994, this group has met periodically to provide direction to ABCA staff when significant issues arise that need community peer review.

2) The SMP should be distributed to lakeshore stakeholders, cottage communities, municipalities and other interested groups and persons to promote better understanding of our shoreline environment and the need to properly manage it in a sustainable manner.

3) Information should be regularly conveyed to educate the general public about the shoreline, especially to expand landowner knowledge to include the littoral cell concept and an ecosystem approach to shoreline management. In this way, the lakeshore population will become more aware of the overall impact that specific actions will have or may have on the shoreline as a natural system.

4) The ABCA's public relations work should emphasize preserving the shoreline resource; it should be stressed that continued development of the shoreline — whether multi-lot subdivisions or subdivision scale cottage expansions — cannot continue unchecked without further deterioration of the environment.

5) Input and comments from the general public should be solicited on a draft version of the SMP to ensure that the final product has had the full opportunity of public involvement and scrutiny before approval of the Plan and formal adoption by municipalities and the ABCA.

6) The preferred approach for implementing the SMP should be through its incorporation into municipal planning documents under the Planning Act.

7) Items listed for further investigation should be considered when funding becomes available and/or need dictates. This list should be discussed with appropriate university and college academic researchers to take full advantage of potential research opportunities.

Areas of further investigation include:

a) A sediment budget should be determined for the dynamic beach shoreline, to assess long-term change effects as discussed under the topic of Goderich Harbour *(Section 3.2.5)*.

b) Methods should be determined to overcome the hazard in dynamic beach areas.

c) Research is needed into ways of providing shoreline protection by increased sand build-up in regional or site-specific applications.

d) Nearshore lakebottom erosion should be analyzed.

e) Research is needed in sand dune stabilization methods using native vegetation species.

f) Inland extent of the 'Shoreline Region' needs to be clarified.

g) Methods should be researched to differentiate seasonal and permanent residential use through legislation such as the Building Code Act *(see Section 9.36 of the Building Code)*.

h) Geologic investigation is needed to assist in verifying long-term erosion rates by determining the extent and location of glacial tills in a cross-shore direction, inland from the shoreline.

i) The lakeward extent of private lot ownership should be confirmed along the shoreline to recognize local variations; this could be accomplished using results of the appeal to the Chilcott *(1989)* decision and other sources to determine lakeshore ownership.

j) The use and effectiveness of groynes as a structural protection device needs to be further researched.

k) Stable slope criteria for the Lake Huron bluffs should be verified specifically for the ABCA region.

l) Ongoing monitoring of the lakeshore should be conducted to provide information for a 10-year review of the SMP.

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GLOSSARY OF TERMS

Note: These glossary items are specific to this Shoreline Management Plan and Lake Huron.

Accepted Engineering Principles - Principles, methods and procedures involving wave uprush and other wave-related hazards which are used and applied in current hydrotechnical engineering practise and have been approved by the local Conservation Authority and/or MNR

Accepted Geotechnical Principles - Principles, methods and procedures involving slope stability analysis which are used and applied in current geotechnical practise and have been approved by the local Conservation Authority and/or MNR

Accepted Scientific Principles - Principles, methods and procedures used by scientists in disciplines such as geology, geomorphology, botany and zoology; applied to study of coastal processes, vegetation, wildlife and fisheries

Accretion - Slow and imperceptible addition of shoreland by natural deposition

Adverse Possession - Legal expression for the rights of someone who has enjoyed the continuous, open, notorious and adverse use of land by a person or a continuous line of persons, none of whom with registered claim or paper title to the land in question

Aeolian - Process of material (usually sand) being eroded, transported and deposited by wind action

Ambulatory Property Line - A property line which changes location, depending on fluctuations of a natural feature on which the line is based (such as fluctuations of the waterline caused by varying water levels on a lake)

Average Annual High Water Level - Average of the highest monthly mean level of each year over a period of time

Average Annual Low Water Level - Average of the lowest monthly mean level of each year over a period of time

Average Annual Water Level - Average of monthly mean water levels over the year

Backfill - Material used to refill a ditch or other excavation, or the process of doing so

Backrush - Lakeward return of water after wave uprush

Backshore - The part of the shore or beach that is usually dry, extending from the limit of wave uprush at the average annual high water level to either the place where there is marked change in material or physiographic form; *OR* the line of permanent vegetation (usually the effective limit of storm waves); *OR* the high water mark

Bar - Or submerged or emerged embankment of sand, gravel or other unconsolidated material built in the nearshore zone by waves and currents

Bathometry - Topography of the lake bottom

Beach - Zone of unconsolidated material that extends landward from the average annual low water level to either the place where there is marked change in material or physiographic form; line of permanent vegetation (usually the effective limit of storm waves); or the high water mark. A beach includes foreshore and backshore.

Beach Nourishment - Supplementing the naturally occurring supply of sand to the shoreline by importing suitable material from other sources

Beach Starvation - Loss of beach building materials due to updrift changes in littoral transport conditions.

Beach Terrace - An erosional feature formed from a higher lake level, allowing waves to interact upon a shoreline at a higher elevation which is now exposed due to lower lake levels (also see 'berm')

Benthic Region - The bottom of a body of water, supporting the benthos

Benthos - Plant and animal life whose habitat is the bottom of a sea, lake or river

Berm - A bench or a terrace between two slopes

Blind Inlet - (*OR* **French drain**) Surface drainage inlet constructed by placing stone over a buried perforated drain pipe

Blow-out - Term used to describe that portion of a dune which has become mobile or active due to absence of vegetation to stabilize it; this can be induced by natural processes but commonly is a result of human intervention

Bluff Toe - Intersection of the bluff with the beach (or the nearshore bottom, if underwater) as shown on 1988 shoreline mapping

Borehole Logs - Stratigraphic record or 'log' of material which forms the subsurface, obtained through drilling or boring a hole

Breaker - Wave broken on the crest because of shoaling

Breaking Point - The point at which a wave begins to break or deform

Breakwater - Structure protecting a shore area, harbour anchorage or basin from wave action

Bulkhead - Steep or vertical structure supporting natural or artificial embankment

By-Passing of Sand - Physically removing sand from one side of a structure (i.e. harbour structure) and placing it on the other side

Carolinian Zone - Vegetative zone in S.W. Ontario which contains flora and fauna species typical of the southern U.S. states (i.e. tulip trees and possums)

Celerity - Velocity of a moving wave

Closed Littoral Cell - A cell which does not receive or deposit littoral material from outside the cell limits

GLOSSARY OF TERMS, CONTINUED

Closed Municipal Drain - Drain under Municipal Drainage Act which is buried or 'closed' to the surface of the ground

Consensus Plan - A plan that relies on the consensus or agreement of the group to achieve success

Coast - Strip of land that extends from the shoreline to the first major change in terrain features

Coastal Ecosystem - An ecosystem found within the coast or shoreline region

Coastal Processes - Natural processes (i.e. littoral drift) specific to the coastal environment

Coastal Watershed - Drainage area comprising all land surfaces that drain directly to lake waters, rather than watercourses, extending from the coastal watershed divide to the average annual lake level

Coastal Zone - Is both the below- and above-water regions adjacent to the waterline that interact with some aspects of the shoreline

Cold Water Stream - A stream designated by the MNR as having characteristics that support coldwater fish species such as trout, whitefish, ciscoe

Comprehensive Zoning By-law - A document adopted by a municipal council pursuant to provisions of the Planning Act or Municipal Act to control and direct use and development of property within municipal boundaries

Control Points - Related to land surveys; points of known or fixed locations, either regarding horizontal or vertical distances, or both

Contour - A line drawn to connect points of the same elevation

Crown Land - All land (including land under water) held by the Province, both land which has never been sold and land which has been reacquired

Current, Longshore - The current in the breaker zone moving parallel to the shore, generated by waves breaking at an angle to the shoreline and by normal movement of water through the lake to its outlet

D 50 - Measurement of sand grain size

Defined portion of the Dynamic Beach - Refers to portions of the dynamic beach that 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 impact and/or cause environmental impact. The most lakeward 15 metres of the dynamic beach hazard is considered the "defined portion" within the ABCA shoreline region

Development - The construction, erection or placing of a building or structure (as opposed to rebuilding)

Dissipate - Expend or scatter harmlessly, as of energy of moving waves

Downdrift - The direction of predominant movement of littoral materials

Dredgate - Material removed from the lake/river bed during a dredge operation

Dry bank - Also referred to as the **high water mark**

Dunes - Ridges or mounds of loose, wind-blown material, usually sand

Dune Morphology - Creation and evolution of a sand dune

Dune Ridge - The most stable and well vegetated feature of the Dynamic Beach region which may receive sand deposition by wind transport

Duration - In wave forecasting, the length of time the wind blows in the same or nearly the same direction over the fetch (generating area)

Duration, Minimum - The minimum time necessary for a steady wave condition to develop for any given wind velocity over a given fetch length

Dyke - Wall or earth mound built around a low-lying area to prevent flooding

Dynamic Beach - Zone of accumulated unconsolidated sediment that is acted upon by waves and wind

Ecosystem - A community, including all the component organisms, together with the environment, forming a life-maintaining, interactive system

Embankment - Artificial bank such as a mound or dyke, generally built to hold back water or to carry a roadway

Embayment - Indentation in shoreline forming an open bay

Embryo Dune - The most unstable, fragile feature of the Dynamic Beach region which will change location seasonally, responding to both wind and wave transport

Environment - Air, land or water, plant and animal life including humans, and the social, economic, cultural, physical, biological and other conditions that may act on an organism or community to influence its development or existence

Environmentally Significant Areas - Areas identified for their environmental value related to their hydrologic, biologic or geomorphologic characteristics, as in wetlands, woodlots or sites which possess rare and endangered species of flora and/or fauna

Erosion - Volumetric reduction of shoreland by natural or human-influenced processes

Erosion Rate - Net loss of shorelands normally located above the lake surface elevation over a specific period of time

GLOSSARY OF TERMS, CONTINUED

Escheat - Legal term; refers to property ownership reverting back to the Crown due to absence of any other arrangement for ownership being established

Failure Plane (**slip surface**) - Plane or surface along which an unstable soil mass moves at failure; in bluff areas, a curved line extending from horizontal top of bluff a distance away from the crest and extending through the vertical face of the bluff, usually in the vicinity of the toe of the bluff (*also see* **slump**)

Flora and Fauna - Plant and animal species

Fetch - Distance over water which waves are generated by a wind having a generally constant direction and speed

Filet Beach - Accretional beach that exists due to the occurrence of an artificial structure (i.e. harbour structure) that interrupts littoral drift. *Refer to discussion on Grand Bend and Bayfield (Section 3.2.6).*

Filter - Layer of well-graded rock or synthetic material between protection works and backfill soil to prevent escape of soil through the protection works

Foredune - The first dune feature landward from embryo dunes which exhibits some stabilization due to vegetation growth. Storm wave action may reach inland to erode this feature.

Foreshore - The part of shore or beach ordinarily traversed by the uprush of waves extending to the limit of wave uprush at the average annual high water level

French Drain - (see **blind inlet**)

Frequency Curve - Graphical representation of the frequency of occurrence of specific events

Gabion - Erosion control method using wire baskets filled with rock; commonly used for retaining walls and revetments

Geodetic Referencing - Describing a feature using known geographical co-ordinates (commonly using latitude and longitude, or UTM grid co-ordinates)

G.S.C. - Geodetic Survey of Canada (GSC = IGLD (1985) = IGLD (1955) plus 0.19 m)

Geomorphologic - Based on existing physical shape or landform

Groundwater - Subsurface water occupying the zone of saturation. In a strict sense, the term is applied only to water below the water table.

Gully Erosion - Erosion process whereby water accumulates in narrow channels and, over short periods, removes the soil from this narrow area to considerable depths, ranging from 0.5 metres to as much as 30 metres

Groyne - Shore protection structure built at an angle from the shore to trap sediment drift and protect the shore from erosion by currents and waves by making a beach

Groyne Field (**groyne system**) - Series of groynes acting together to protect a section of shoreline

Habitat - The place or site where an animal or plant community naturally or normally lives

Habitable Space - Rooms or spaces required and intended for overnight occupancy; includes facilities for storage, heating, air-conditioning, electrical, hot water supplies, plumbing, waste connections, etc. which are necessary to maintain the habitable condition

Hard Points - Areas where relative shoreline erosion is reduced or eliminated in comparison with adjacent shorelines (*see* **headlands**)

Hazard Land - Land which, because of its physical characteristics combined with its location, presents a risk to its occupants, including loss of life, property damage and social disruption (i.e. flooding, erosion)

Headland - Erosion-resistant promontory, either natural or man-made, extending into the lake; embayments often form between adjacent headlands (e.g. Kettle, Rocky and Dewey Points)

High Water Mark - Uppermost extent that water levels range; also associated with a break in slope or vegetation

Hindcasting - The act of predicting future wave climate using past records

Historical Storm Event - A storm which, due to its magnitude of hazard (i.e. flooding or erosion), is an event referred to for historical reference

Hydrographic Survey - Survey of the lake bottom

Ice Damage - Damage related to build-up and movement of ice along the shoreline during winter and spring

Improved Public Access - Public access which has been developed for pedestrian or vehicular traffic (as opposed to legal public access)

Infilling - With regard to construction: development on previously undeveloped lots, generally bounded by existing development on adjacent sides

I.G.L.D. - International Great Lakes Datum (1985), referenced to mean water level at Father Point in the St. Lawrence River. Elevations referenced to datum are dynamic elevations which take into account not only the measured linear height above the reference zero, but also the force of gravity at that location. Resulting elevation differs by varying amounts, depending on location from standard orthometric elevation published by Geodetic Survey of Canada (IGLD 1985 = G.S.C. = IGLD 1955 plus 0.19 m)

Inundation - Temporary submergence of shorelands normally located above lake levels

Jetty - Elongated artificial obstruction projecting from the shore into the lake to control shoaling and scour by deflection of strength of currents and waves

GLOSSARY OF TERMS, CONTINUED

Lag Deposits - Residual accumulations of coarser particles from which the finer material has been carried away

Lake Bank Overloading - Creating a potentially unstable bank by adding additional weight to the upper area

Lake-side effects - Processes originating on the lake which act upon the shoreline and cause changes (e.g. storm wave action, high lake levels)

Lakeward - Direction toward lake when measuring distances over land

Land-side effects - Processes originating on the land which act upon the shoreline and cause changes (commonly related to human actions of drainage, construction and earth moving)

Landward - Direction toward land when measuring distances over water

Lakeshore Area 1 - The region directly adjacent to Lake Huron where existing development may be subject to short-term hazards of flooding and erosion *(refer to Section 3.3.5)*

Lakeshore Area 2 - The region landward from Lakeshore Area 1 where existing development may be subject to long-term hazards and other considerations related to flooding and erosion *(refer to Section 3.3.5)*

Leeward - Direction toward which the wind is blowing, and the direction toward which waves are travelling

Legal Public Access - Access which has been assured through legal designation of land for access purposes but not necessarily developed for such a purpose (see **improved public access**)

Limnology - Study of physical, chemical, geological, biological, hydrological or other aspects of lakes

Linear Development - Development which exists in a linear alignment parallel to the lakeshore, typically with each lot having lakeshore frontage

Littoral - Pertaining to or along the shore, particularly to describe currents, deposits and drift

Littoral Cell - Areas under continuous influence of specific longshore currents

Littoral Sink - Areas where littoral materials are deposited and sand accumulates

Littoral Transport - *OR* **littoral drift**; the movement of littoral material in the littoral zone by currents, including movement parallel to the shore (longshore transport) and perpendicular to the shore (onshore-offshore transport); movement is due to prevailing current and oblique wave direction

Longshore - Parallel to and near the shore, usually within the littoral zone

Major Addition - The size of the addition being added to a building, being equal to or greater than 30% of total existing foundation area (calculated once per building)

Mature Beach - A beach that has experienced development of sand dunes

Minor Addition - The size of the addition being added to a building, being less than 30% of the total existing foundation area (calculated once per building)

Minor Structure - Portable structures including: wooden decks and supports; portable storage sheds with no utilities with a maximum size of 14 square metres (150 square feet) with no permanent foundation or floor slab; and above-ground pools

Monthly Mean Level - Average water level occurring during month, computed from hourly readings in each month

Moveable - Design and site considerations which will allow a structure to be moved away from a hazardous area; includes such factors as size of building in relation to road system, type of foundation, available space adjacent for building relocation and space for moving equipment to manoeuvre

Natural Area - Site or area in its natural state, undisturbed by human activities; an area set aside indefinitely to preserve a representative unit of a major forest or range of wetland, primarily for purposes of science, research or education

Nearshore - Indefinite zone extending lakeward from average annual water level to beyond breaker zone, defining area of nearshore currents formed primarily by wave action

Net Loss of Sand - Situation that results when contributions to the sediment budget are less than losses to the budget, therefore a net loss

New Development - Development that typically requires assemblance of property (land severance, subdivision) and/or change of zoning or land use designations to an appropriate use permitting proposed development (multi-unit, condominium)

Official Plan - A document adopted by a municipal council pursuant to provisions of the Planning Act which identifies existing use of land, guides and directs potential land uses and established implementation policies within boundaries of the municipality

Offset Measurements - Measurement taken perpendicular to — or at an angle to — a baseline or traverse line

Offshore - Area extending lakeward of the breaker zone

Offshore Breakwaters - Structure located in the offshore area; designed to protect a shore area, harbour, anchorage or basin from waves

Onshore - Area extending landward of normal high water mark

Onshore Wind - Wind blowing toward the shore

Outfall - Structure extending into a body of water for discharging sewage, storm runoff or cooling water

Overtopping - Passage of water over the top of a structure as a result of wave run-up or wind set-up

GLOSSARY OF TERMS, CONTINUED

Percolation Rate - Refers to soil; describes time necessary for water to percolate through a representative sample of soil; used in assessment of a site for a sewage disposal system

Pier - Structure, usually of open construction, extending out into the water from the shore to serve as a landing place, a recreational facility or other use

Pile - Long, heavy timber or section of concrete or metal; driven into the ground or lakebed for support or protection

Post-Glacial Lakes - Lakes formed from the retreat and melting of glaciers which once covered the Great Lakes basin (*also refer to* **relic lakes**)

Public Land - Any land owned or administered by a public body or agency; includes federal, provincial and municipally-owned lands and lands held by agencies such as parks commissions and conservation authorities

Raised Tile Beds - Type of weeping bed associated with private sewage disposal systems; requires substantial amount of imported fill as a base; both percolation and evaporation occurs within this system

Reach - Portions of shoreline containing similar physiographic or biological characteristics and shore dynamics, such as erosion rates, flood elevations, etc.; include shore alignment, offshore bathometry, fetch characteristics, sediment transport rates, flood susceptibility, land use suitability and environmental similarity

Recession - Landward retreat of the shoreline by shore processes

Rebuilding - Reconstruction or replacement of a building or structure

Relic Dune - Sand dunes that are remnants of much higher lake levels

Relic Lakes - Lakes which are remnants of much larger lakes that once covered the area

Remedial Works - Structural measures intended to provide a remedy aimed at problems of erosion and inundation for the purposes of shore management

Retaining Walls - Walls designed to support an adjacent feature or structure

Revetment - A facing of stone, concrete, etc., built to protect an embankment or shore structure against erosion and failure by wave action or currents. Its principle is to allow for dispersion of energy through friction and gravity.

Riparian Owner - Owner of land containing or directly abutting a natural lake or watercourse

Riparian Rights - The rights of a person owning land containing or bordering on a watercourse or other body of water in or to its banks, bed or water

Riprap - Layer, facing or protective mound of stones randomly placed to prevent erosion, scour or sloughing of a structure or embankment; also, the stone used

Rubble - Rough, irregular fragments of broken rock

Rubble-Mound Structure - Mound of random-shaped and random-placed stones protected with a covering layer of selected stones or specially shaped concrete units

Sand - Granular soil or detritus coarser than silt and finer than gravel, ranging in diameter from 2 mm to 0.06 mm

Scarp - Near-vertical slope commonly associated with instability

Scour - Removal of material by waves and currents, especially at the toe of a shore structure or bluff

Seawalls - Structure separating land and water areas primarily designed to prevent erosion and other damage due to wave action

Sediment Budget - Gives an estimate of material entering the littoral zone from each source and the amount of sediment deposited at each sink or barrier along the shore. The sediment budget must balance, that is, the total amount of supply must equal the total amount deposited plus the amount still in transport.

Sediment Source Area - Area of sediment budget that contributes a large quantity of material to the overall budget; typically located where bluff erosion rates are high (greater than 0.9 m/yr.)

Seepage - Water escaping through or emerging along an extensive line or surface; slow movement of water through soil by gravity

Seiche - Oscillatory motion resulting in alternate high and low water levels at each end of a lake that continues after the originating force has ceased

Setback Requirement - Distance measured inland from an edge of a feature, such as a bluff, where construction is prohibited

Sheet Pile - A pile with a generally slender flat cross-section to be driven into the ground or lake bed and linked or interlocked with like members to form a vertical wall or bulkhead

Shingle - Commonly: any beach material coarser than ordinary gravel, especially any having flat or flattish pebbles

Shoals - Offshore areas with lesser depths of water than surrounding depths

Shore - Area of interface between land and water, extending from lakeward limit of littoral zone landward to the first major change in terrain

Shorelands - Lands extending from average annual water level which have potential and direct significant impact on nearshore waters and the shore ecosystem through runoff, and where land use activity is primarily water-oriented

Shore Zone - Landward and lakeward extent of the shoreline management unit

Silt - Inorganic particles carried in suspension or deposited by currents, ranging in diameter from 0.05 mm to 0.005 mm

GLOSSARY OF TERMS, CONTINUED

Slump - Failure of a bluff slope with a mass movement along a failure plane

Stakeholders - Individuals or groups with an interest or investment in the topic

Stillwater Level - Elevation assumed by a water surface if no wave action is present

Stratigraphy - Rock layers or units of a physical feature (also known as **lithographic units**); commonly determined by borehole analysis

Storm Wave Runup - *See* **Wave Uprush**

Storm Surge - *See* **Wind Set-up**

Surf Zone - Area between outermost breaker or where wave characteristics significantly alter due to decreased depth of water and limit of wave uprush

Tableland - Area above lakebank slope which is relatively flat

Technical Severance - Severing of land which does not create a new lot, as in a boundary adjustment

Terrestrial - Derived from the earth (or from the land)

Threshold Slope Inclination - Slope angle which, if exceeded, will result in an unstable condition; determined by inherent strength of the material which comprises the slope

Till - Unsorted, unlayered, consolidated glacial debris; commonly forms the bluffs along the southern Great Lakes

Traverse Line - Survey route or line commonly used as a baseline for measuring distances to adjacent features

Toe Erosion - Erosion that occurs at the bottom of bluffs, largely as a result of continuous removal of earthen material by waves and currents

Topography - Configuration of a surface including its relief, the position of its streams, roads, buildings, etc.

Turbidity - Reduced water clarity resulting from presence of suspended matter

Undercut - Undermining erosion of the lower part of a steep bank; reduces stability of the upper part

Updrift - Direction opposite that of predominant movement of littoral materials

Water Table - Upper surface of the zone of soil saturation

Wave - Ridge, deformation or undulation of water surface

Wave Crest - Highest part of the wave

Wave Diffraction - Restructuring and redirecting of waves by underwater structures

Wave Direction - Direction from which a wave approaches

Wave Forecasting - Theoretical determination of future wave characteristics, usually from observed meteorological phenomena

Wave Height - Vertical distance between a wave crest and preceding wave trough

Wave Hindcasting - Use of historic synoptic wind charts to calculate wave characteristics that likely occurred in the past

Wavelength - Horizontal distance between similar points on two successive waves measured perpendicular to wave crest

Wave Offset Zone - Landward limit of wave action measured from shoreline and delineated by limit of wave uprush

Wave Period - Time for two successive wave crests to pass a fixed point

Wave Train - Series of waves from the same direction

Wave Trough - Lowest part of a wave between successive wave crests

Wave Uprush (or **wave run-up**) - Rush of water up onto the beach or shore following the breaking of a wave; for any given water level, the limit of uprush is the point of farthest uprush

Wet Bank - Also referred to as normal **water's edge**

Wetlands - Land where the water table is at, near or above the land surface enough to promote formation of hydric soils or to support growth of hydrophytes; included are wetland forests (swamps), wetland thickets, marshes, fens and bogs

Wetland Complex - Inter-related hydrologic system which is composed of wetland features

Wharf - Structure built on the shore of a harbour, river or canal, so that vessels may be brought alongside to receive and discharge cargo and passengers

Wind Set-Up - Vertical rise above normal water level on the leeward side of a body of water caused by wind stresses on the water surface

Windward - Direction from which the wind is blowing

Work Plan - Plan, prepared annually, that defines which management activities are to be undertaken for that year

Zoning By-law - *See* **Comprehensive Zoning By-law**

Glossary of Acronyms

ABCA	Ausable-Bayfield Conservation Authority
ANSI	Area of Natural or Scientific Interest
CA	Conservation Authority
CHS	Canadian Hydrographic Service
EPA	Environmental Protection Act
ESA	Environmentally Significant Area
G.S.C.	Geodetic Survey of Canada
HWM	High Water Mark
I.G.L.D.	International Great Lakes Datum
IJC	International Joint Commission
MMA	Ministry of Municipal Affairs
MNR	Ministry of Natural Resources
MOEE	Ministry of the Environment and Energy
SMP	Shoreline Management Plan
UTM	Universal Transverse Mercator

APPENDIX B

PROVINCIAL POLICY STATEMENT 1997

COPY OF ORIGINAL
PROVIDED ON FOLLOWING PAGES

APPENDIX B

PROVINCIAL POLICY STATEMENT 1997

COPY OF ORIGINAL
PROVIDED ON FOLLOWING PAGES

PUBLIC REVIEW DATA

Items included in this Appendix:

- Chronology of events for the SMP project
- Sample comment sheet distributed with the first draft of the SMP
- *Lakeshore Bulletin* (#1) dated May 1992
- *Lakeshore Bulletin* (#2) dated February 1993
- *Lakeshore Bulletin* (#3) dated May 1993
- Notice of SMP Cottage Association Meeting, May 21, 1993

Chronology of Events: ABCA Shoreline Management Plan

DATE	EVENT
1988	
Feb/88	Conferral of mandate to ABCA for lakeshore planning
1989	
Dec/89	Completion of the Lake Huron Shoreline Processes Study (LHSPS)
1990	
July 20/90	Public open house to present results of LHSPS and introduce SMP *(attendance = 200)*
Dec 11/90	Start-up meeting (#1) of the SMP Steering Committee
1991	
Jan 23, 30/91	SMP Steering Committee Meeting #2
Feb 20/91	Letter sent to all MPs and MPPs: project progress report
March 20, 27/91	SMP Steering Committee Meeting #3
May 13/91	ABCA sends out request to interested parties to provide issues
June 19/91	SMP Steering Committee Meeting #4
July 26/91	Public Meeting to introduce idea and concepts of SMP *(attendance = 200)*
Oct 16, 18/91	SMP Steering Committee Meeting #5
Dec 5, 6/91	SMP Steering Committee Meeting #6
1992	
Feb 7/92	SMP Steering Committee Meeting #7
Feb 10/92	Staff attendance at Grand Bend council meeting *(Re: update council)*
Mar 3/92	Staff attendance at Stephen council meeting *(Re: update council)*
Mar 11, 13/92	SMP Steering Committee Meeting #8
Mar 16/92	Staff attendance at municipal council meetings *(Re: update councils - Bosanquet, Goderich, Bayfield)*
Mar 17/92	Staff attendance at Stanley council meeting *(Re: update council)*
Apr 6/92	Staff attendance at Hay council meeting *(Re: update council)*
Apr 22, 24/92	SMP Steering Committee Meeting #9
May 8/92	SMP Steering Committee Meeting #10
May/92	*Lakeshore Bulletin #1* is distributed *(3,000 residences)*
June/92	First draft of the SMP submitted to MPs and MPPs for review
June 11/92	Media Tour of Shoreline - 3 papers attended
June 15/92	**1st Draft of the SMP is released for Public Review**
Jun 16, 18/92	SMP Steering Committee Meeting #11
June 20/92	Open House (Bayfield) to discuss Draft 1 *(attendance = 30)*
July 4/92	Open House (Port Franks) to discuss Draft 1 *(attendance = 91)*
July 11/92	Open House (Bayfield) to discuss Draft 1 *(attendance = 64)*
Aug 8/92	Open House (Zurich) to discuss Draft 1 *(attendance = 200)*
Aug 18/92	Meeting of Lake Huron Pres. Association (LHPA) reps and ABCA staff
Aug 22/92	Open House (Grand Bend) to discuss Draft 1 *(attendance = 125)*
Sept 15/92	**Deadline for Public Comments on Draft 1**
Sept 24/92	LHPA Delegation *(=76)* attended ABCA Board of Directors Meeting
Oct 9/92	SMP Steering Committee Meeting #12
Oct 28/92	ABCA sends letters of response to more than 300 landowners
Nov 19, 20/92	SMP Steering Committee Meeting #13
Dec 11/92	SMP Steering Committee Meeting #14

PUBLIC REVIEW DATA, CONTINUED

Chronology of Events: ABCA Shoreline Management Plan

DATE	EVENT
1993	
Jan 27, 29/93	SMP Steering Committee Meeting #15
Feb/93	*Lakeshore Bulletin #2* is distributed *(3,000 residences)*
Feb 24, 26/93	SMP Steering Committee Meeeting #16 *(attended by a LHPA representative)*
Mar 24, 26/93	SMP Steering Committee Meeting #17
Apr 28, 30/93	SMP Steering Committee Meeting #18
May 21/93	**Second Draft of the SMP Released for Public Review**
May 21/93	Shoreline Cottagers Association Information Meeting *(attendance = 60)*
May 26, 28/93	SMP Steering Committee Meeting #19
May/93	*Lakeshore Bulletin #3* is distributed *(3,000 residences)*
Jun 23/93	SMP Steering Committee Meeting #20 - 2 landowners made presentations to the committee
June/93	Second Draft of the SMP submitted to MPs and MPPs for review
June 25/93	Public Meeting (Varna) to discuss Draft 2 *(attendance = 84)*
June 26/93	Public Meeting (Thedford) to discuss Draft 2 *(attendance = 33)*
July 23/93	LHPA Representatives meet with ABCA staff *(Re: communication)*
Aug 19/93	Joint municipal council meet with ABCA staff
Aug 25, 27/93	SMP Steering Committee Meeting #21
Sept 1/93	**Deadline for Public Comments on Draft 2**
Sept 16/93	Joint municipal council meet with ABCA staff
Sept 17, 22/93	SMP Steering Committee Meeting #22
Oct 27, 29/93	SMP Steering Committee Meeting #23
Nov 10/93	ABCA meets with Aurora MNR (& MMA) staff regarding responses
Nov 19/93	ABCA responds to comments submitted *(approx. 30)*
Nov 22/93	Staff attendance at Hay council meeting *(Re: update council & OP discussions)*
Nov 24, 26/93	SMP Steering Committee Meeting #24
Nov 29/93	Bosanquet Twp. hosts dune stakeholders' meeting *(Pinery Provincial Park, Kettle Point, Ipperwash Be,. & Military Camp)*
Dec 7/93	Staff attendance at Grand Bend *(Re: update council & OP discussions)*
1994	
Jan 17/94	Staff attendance at Goderich Twp. *(Re: update council)*
Jan 19/94	SMP Steering Committee Meeting #25 *(wrap-up meeting)*
Feb 17/94	ABCA Board of Directors discusses SMP report
April 21/94	ABCA Board of Directors approves SMP report

Total Meetings & Correspondence

Public Meetings/ Open Houses	= 10
Attendance	= 1,187
SMP Committee Meetings	= 25
Lakeshore Bulletin Mailings	= 3 issues (more than 3,000 sent per issue)
Letters of Response to Landowners	= 330

1997	
January 1997	Provincial Policy Statement, including shoreline hazards policy, adopted by the Province of Ontario
1998	Lambton County receives provincial approval of their Official Plan
1999	Huron County receives provincial approval of their Official Plan
2000	
December 2000	Second Edition of the Shoreline Management Plan updated with technical input by the Lake Huron Centre for Coastal Conservation

COMMENT SHEET
Shoreline Management Plan (Draft)

We want your comments

Open House date I attended:

☐ June 20, 1992 ☐ July 11, 1992 ☐ August 22, 19

☐ July 4, 1992 ☐ August 8, 1992

Name _____ Phone _____

Address _____

Property Description _____

Cottage Association _____

Did you receive a copy of the Lakeshore Bulletin by mail? ☐ Yes ☐ No

Would your cottage association like more information on this topic? ☐ Yes ☐ No

After reviewing the Shoreline Management Plan and material, what are your comments?

_____

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Deadline for comments on the Draft Shoreline Management Plan is Sept. 15/92.

Ausable-Bayfield Conservation Authority • R.R. #3, Exeter, N0M 1S5

lakeshore bulletin

A NEWSLETTER FOR LAKE HURON SHORELINE LANDOWNERS
Ausable-Bayfield Conservation Authority • R. R. 3, Exeter, On N0M 1S5 • 519-235-2610
May, 1992

SHORELINE MANAGEMENT PLAN

AN UPDATE TO LAKESHORE LANDOWNERS

The Ausable Bayfield Conservation Authority (ABCA) has been active in Lake Huron shoreline management since February, 1988 when we were given the mandate as the lead implementing agency for commenting on flooding and erosion of the shoreline. Over the last four years, we have been involved in studies leading up to the creation of a Shoreline Management Plan (SMP). It is this "Plan" which we now wish to discuss with you and solicit your comments. A first draft has been completed by the project Steering Committee and public input is now being requested. The Steering Committee is composed of representatives from the major user groups including cottage associations, municipalities, Pinery Provincial Park and other lakeshore agencies.

INSIDE THIS BULLETIN...

SCHEDULE OF OPEN HOUSES Each Open House is scheduled for 10 a.m. to 2 p.m.

Date	Municipalities	Location
June 20	Bayfield & Goderich Twp.	Bayfield Community Centre Upper Hall
July 4	Bosanquet Twp.	Port Franks Optimist Hall
July 11	Stanley Twp.	Bayfield Community Centre Upper Hall
August 8	Hay Twp.	Zurich Community Centre Auditorium
August 22	Grand Bend & Stephen Twp.	St. John's by the Lake Church, Grand Bend

WHAT IS SHORELINE MANAGEMENT AND WHY DO WE NEED IT?

The shoreline, or lakeshore, is a limited resource which is physically different from the rest of the rural landscape which surrounds it. Proper management of this special area is necessary to respond to the unique characteristics found there (land use conflicts with the adjacent agricultural uses and the perils of the lakeshore processes which affect lakefront properties). The shoreline, regardless if it is realized or not, is a hazardous region by nature of the extreme conditions which can, and do occur there.

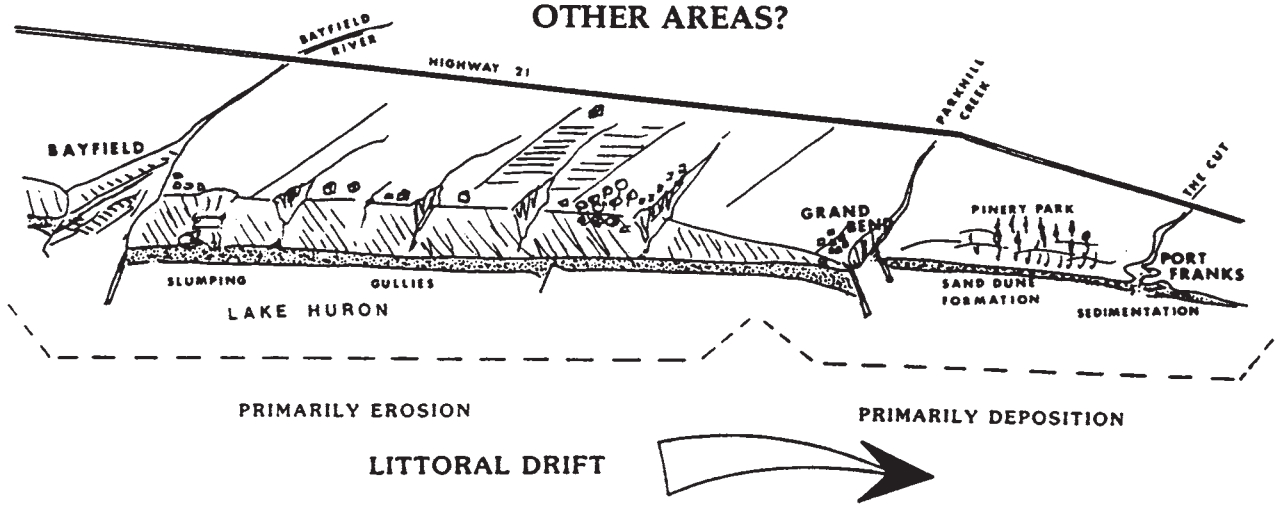
This is not to say that all lakeshore areas have problems, nor is it to imply that these problems are solely the result of actions by the landowners. However a more complete understanding of the shoreline and a respect for the natural processes which occur within it, will enable all users to better respond to the needs of the shoreline system and act accordingly.

In the past, we have organized two Public Meetings which you may have attended, at the Stanley Township Community Centre in Varna (just east of Bayfield), on July 20, 1990 and July 26, 1991. Shoreline processes and management approaches were discussed as well as many of the issues which are of concern to landowners (i.e. bluff erosion, shore protection, inadequate drainage). It was clearly pointed out to us that these issues are of concern to the shoreline community and should be included in any overall shoreline management plan.

These issues, plus the overriding objective of minimizing danger to life and property damage from flooding, erosion, and associated lakeshore hazards are the main topics within this Shoreline Management Plan. It is intended to provide direction to municipalities and give recommendations to landowners so to minimize threat to life and property damage. The plan can also be used to increase the enjoyment and value of lakeshore property.

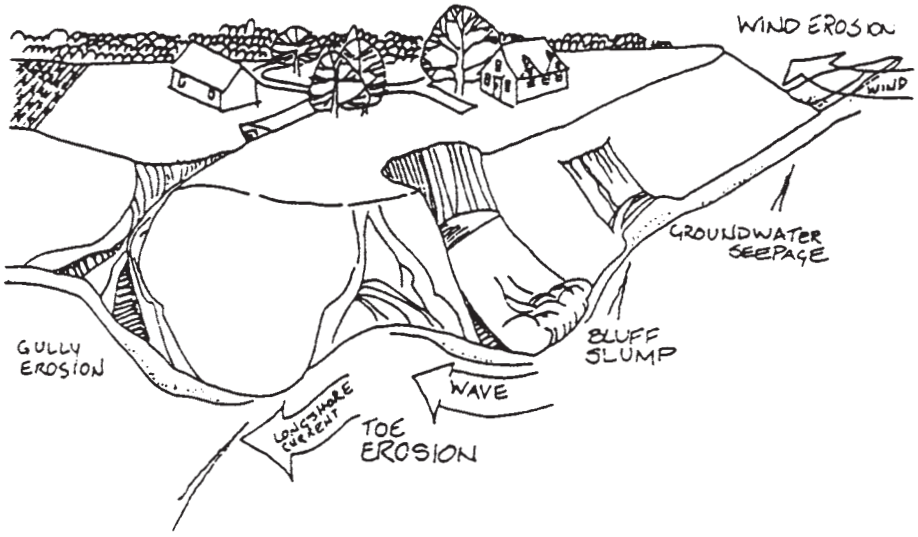
The Shoreline Management Plan is intended to provide direction to municipalities and give recommendations to landowners to minimize the threat to life and property damage.

WHY IS THE LAKESHORE ERODING IN SOME AREAS WHILE FORMING BEACHES IN OTHER AREAS?



Stylized diagram of Lake Huron Shoreline: Bayfield to Port Franks

The answers to this and other questions are closely linked to the processes which are occurring. Questions such as these can be more easily understood when the shoreline is looked upon and understood as a system. This system is made up of different shoreline areas, called "reaches" which have different characteristics. Such factors as depth of water offshore, type of material which makes up the bluff composition, the orientation of the shore with respect to prevailing winds, and the proximity to man-made shore structures, all play an important role in explaining why the shoreline reacts the way it does. The concept of sand movement along the shoreline (also called "littoral drift") is the natural process of transporting sand which is eroded from the bluffs and is deposited along the narrow beaches below the bluffs and the beaches of Grand Bend, Pinery, and Ipperwash regions. The importance of this "process" is now becoming apparent through the research completed within the SMP. As shoreline users and managers, we must ensure that we understand this process and realize the consequences if we interfere with it.



HOW DO THE TERMS "PREVENTION" AND "PROTECTION" RELATE TO THE SMP?

With the primary objective being to minimize threat to life and property damage, the SMP provides recommended alternatives to achieve this.

Prevention involves the proper placement of new development along the shoreline so that safety of the development and preservation of the environment will not be jeopardized.

This may involve proper building setbacks from lakebanks, siting buildings away from areas which may be subject to flooding, or locating structures to minimize dune damage. Existing development along the shoreline may also be affected in that future expansion plans may need to be "scaled down" or reconsidered if the existing site may not be appropriate, given existing concerns for the lakeshore hazards.

Protection involves various means and methods used to protect the site from the hazards. This topic is difficult to discuss in detail since each site has specific site conditions. However, enough is known about the beneficial and adverse affects of some of the existing protection attempts to be able to recommend general principles and technical design criteria to those who wish to investigate these options.

Both structural techniques (i.e. groynes, revetments, seawalls, and offshore breakwaters) and non-structural approaches (i.e. resloping the lakebank, drainage improvements, and cottage relocation) are discussed and recommendations given.

The structural protection discussion is further divided into those works intended to "stabilize" the lakeshore (being large scale and expensive structures), and those works intended to protect property from storm damage (smaller scale and cost structures). The plan suggests that our attempts to stabilize the shoreline are insignificant in most cases unless large scale works are planned.

WHERE DOES MY PROPERTY FIT INTO THIS DISCUSSION OF HAZARDS?

Detailed mapping of the shoreline has been completed for the entire ABCA jurisdiction (from Port Franks, Bosanquet Township to Lot 30, Concession 1, Goderich Township). This mapping has been compared to a detailed shore survey completed by a Ontario Land Surveyor in 1935. From this comparison, long term trends in shoreline change have been calculated and zones have been placed along the shore. These zones and the implications these zones have on existing and proposed development, are outlined in the SMP. They follow a provincial policy which has been adopted to recognize the shoreline hazards and risks.

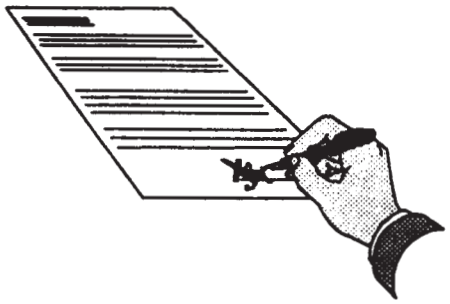
WHEN WILL THIS SMP BE COMPLETED AND HOW WILL IT BE USED?

After we have reviewed the input expected from the landowners and other lakeshore user groups, we will finalize the document by November 15, 1992. It is anticipated that the document will then be used to make necessary amendments to municipal planning documents and used by the ABCA and other agencies in reviewing planning proposals and development applications. At some future time, the ABCA may apply to extend the Regulation which we now administer along the watercourse and gully regions, to include the lakeshore. This Regulation would include such activities as filling, construction, and any altering of the shoreline bank or sand dune area.

HOW DO I FIND OUT MORE ABOUT THIS SMP?

The ABCA has scheduled "Open Houses" throughout the summer to display the draft SMP and associated mapping to obtain public input. Copies of the SMP will be available at that time for a nominal charge, on a cost recovery basis (to cover printing costs). These open houses are scheduled on a municipal basis to enable you to attend the one which applies to your cottage location.

If you are not able to attend the open house scheduled for your township, then you're welcome to visit one of the other sessions. As another option, the material and draft plan will be available to cottage associations and your municipal office, or you can always view the material at the ABCA office just east of Exeter next to the Morrison Dam.

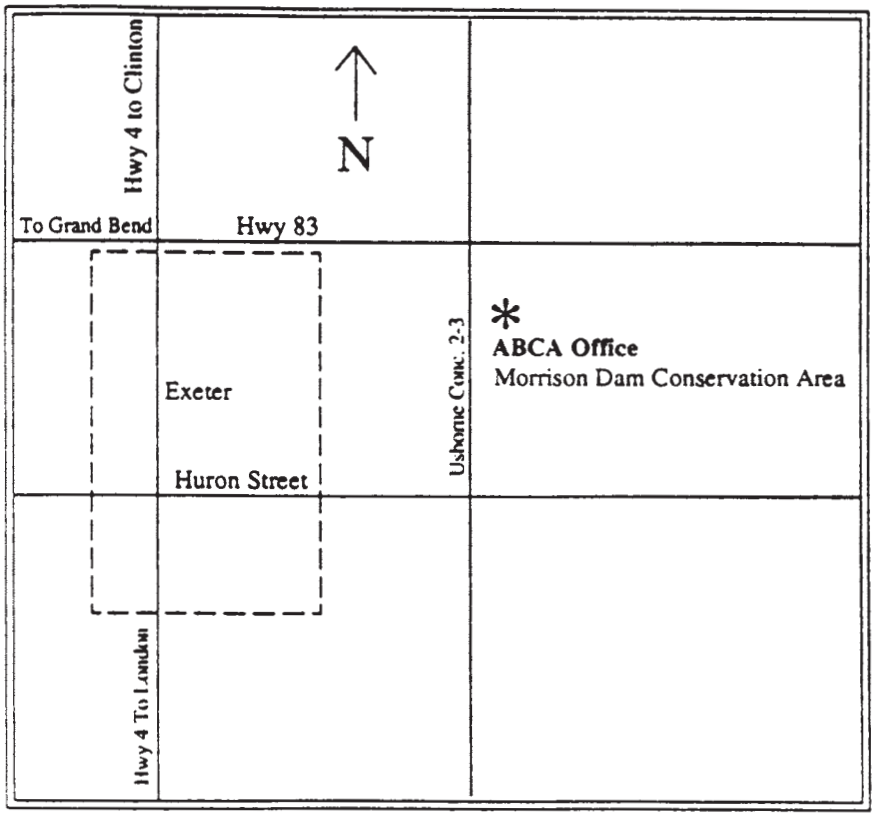


Due to the number of properties along the shoreline and the anticipated interest in this plan, we are requesting that any comments you wish to make regarding the SMP be submitted to the Authority Office in written form, by September 15, 1992. If you are the former owner of lakeshore property and are no longer a shoreline resident, please inform our office of the change that we may send the new owner this information.

Your comments and input are most important as this plan will provide the future for the shoreline and how it is utilized.

Please feel free to utilize your cottage association to provide combined comments from your lakeshore area.

Upon receipt of comments, we will respond to the comments and consider appropriate changes, as deemed necessary.



The Ausable-Bayfield Conservation Authority provides leadership and management, in cooperation with the community, to maintain and enhance the watershed resources now and in the future.

MEMBER OF THE ASSOCIATION OF CONSERVATION AUTHORITIES OF ONTARIO

lakeshore bulletin

February, 1993

A NEWSLETTER FOR LAKE HURON SHORELINE LANDOWNERS

Ausable-Bayfield Conservation Authority • R. R. 3, Exeter, On N0M 1S5 • 519-235-2610

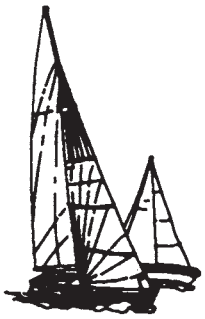
SHORELINE MANAGEMENT PLAN: AN UPDATE TO LAKESHORE LANDOWNERS

Since early 1991, the Ausable-Bayfield Conservation Authority (ABCA) has been developing a plan for the management of the Lake Huron Shoreline within its area of jurisdiction with the direction of a steering committee of representatives from the shoreline's major user groups including cottage associations, municipalities, Pinery Provincial Park and other lakeshore agencies.

The main goal of the Shoreline Management Plan (SMP) is to protect lives and property from the hazards of Lake Huron flooding and erosion. The Plan also addresses environmental quality, improper drainage, water quality, lakeshore use and shoreline ownership. It will provide land use planning direction to municipalities and give recommendations to landowners.

The first draft was released on June 15, 1992 with several opportunities for public input including five "open houses" in the summer of 1992.

The SMP's steering committee is currently preparing a second draft of the Plan, based on the comments and concerns raised by the 500 people who attended 1992's open houses and the 300 written responses received by the ABCA. Completion of the second draft is anticipated by April 1, 1993.



In this newsletter, we hope to clear up some of the misinformation which has been circulating about the Plan, provide answers to some of the most commonly asked questions, and give you an indication of the future path of the Plan.

WHY A SHORELINE MANAGEMENT PLAN IS NEEDED

Historically, when cottage development first occurred, a non-restrictive land use approach was used to guide development along the shoreline. Since that time, land use restrictions have been implemented along the shoreline in some form or another.

The SMP presents the natural processes and physical conditions which exist along the shoreline in a logical fashion to enable landowners, developers, and municipalities to know 'what to expect' and 'what questions to ask' when land use changes or building expansions are considered.

The SMP is an attempt to combine all the requirements which need consideration for safe use and occupation of shoreline property in one document. These include land use restrictions related to municipal zoning bylaws, areas adjacent to watercourses, environmental guidelines related to the approval of septic systems, or requirements for a work permit for activities planned on or near the beach. Through information explained in the SMP, the lakeshore hazards are explained and management suggestions are presented.

INSIDE THIS BULLETIN...

Answers to commonly asked questions

1) No, the SMP did not come into effect on January 1, 1993

As it is presently proposed, the SMP would not be completed until the end of 1993 with implementation to follow. We anticipate implementation to take some time to be incorporated into municipal documents.

2) Yes, we are encouraging the Municipal Councils to support the completed SMP.

A revised SMP will be presented to Municipal Councils after further public input, for their support. At that time, implementation would be suggested through the municipal planning documents.

3) Yes, we are proposing that a residence located in the Risk Zone would not be rebuilt at that same location if destroyed by flooding or erosion forces related to the lakeshore (not including fire).

This relates to the concern that wave and ice damage and lakebank stability along the shoreline are natural occurrences which need to be recognized. A small number of existing residences could be subject to this criteria as the present mapping exists. Residences in the Risk Zone destroyed by fire would be allowed to rebuild.

Residences in Risk Zone (December, 1992)	
Goderich Twp.	79
Bayfield	15
Stanley Twp	72
Hay Twp.	44
Stephen Twp.	1
Grand Bend	0
Bosanquet Twp.	3

4) No, it is not the intent of the SMP to devalue lakeshore properties and then expropriate the shoreline for a large park.

The intent of the document is to confirm the degree of risk which exists along the shoreline and provide ways to ensure wise use and future development of the area. Many of the criteria in the SMP are already in place in existing documents (i.e. 30 metre setback from top of bank in Huron County zoning bylaws) but are not fully realized by lakeshore landowners.

Shoreline Management Plan Issues

These five issues have been expressed by landowners as areas of concern. In response, we provide the following.

Issue #1

The ABCA should not implement a draft Provincial Policy Statement (being the Great Lakes-St. Lawrence River Flood and Erosion Policy Statement prepared by the Ministry of Natural Resources).

The Draft Great Lakes-St. Lawrence River Flood and Erosion Policy Statement is only draft as it pertains to the adoption of the document by Provincial Cabinet. The document is an approved Ministry of Natural Resources policy. It should also be noted that the Draft Policy Statement presents minimum standards only to defining the three lakeshore hazards of flooding, erosion, and dynamic beach. It is not intended to be used as the sole background document in the creation of a SMP.

The ABCA SMP is an ambitious endeavour to create a plan which goes beyond merely the identification of hazard areas. The SMP recognizes local concerns and issues by addressing such matters as environmental quality, improper drainage, water quality, lakeshore use and shoreline ownership while following the guidelines for the creation of SMP's which were provided by the Ministry of Natural Resources.

Many comments which we have received suggest that the Shoreline Management Plan is not premature, rather it is long overdue.

Issue #2

The plan is not a true "management" plan which will respect the rights of individuals and which will protect the public interest and the environment. This plan simply imposes blanket restrictions on everyone without regard to their particular site specific circumstances.

The SMP is directed by a Steering Committee consisting of representatives from municipalities and cottage communities. The reason the Committee provided a draft document for public input and review was to ensure the end result was a true management plan. In 1988, the

Provincial Government decided that it is in the public interest to provide shoreline management to minimize risks to life, property damage and social disruption attributed to the associated lakeshore hazards. The SMP has been created taking into account specific local concerns and issues.

The application of a 'hazard' designation parallel to the lake which includes those lands severely affected by the hazards of flooding and erosion, is similar to the concept of a floodplain along the course of a river. Specific site information would be considered to provide flexibility in the proposed development restrictions.

Funding sources may be available on a cost-sharing bases with affected landonwers where subdivision scale remedial works to protect existing development from erosion is found to be environmentally acceptable and cost beneficial.

Issue #3

There should be an independent right of appeal to the information presented in the SMP. Lakeshore residents should be given an opportunity to retain, if they wish, an independent Coastal Engineer to review the technical data and information contained in the SMP and the draft Provincial Policy. Funding to retain expert advice should be provided either by the Conservation Authority or by the MNR.

Appeal mechanisms are provided dependant upon the implementation procedure used for the SMP. Implementation can be accomplished through either the Planning Act or the Conservation Authorities Act, or a combination of both. Both methods are viable means to implement the SMP and are presently considered as options.

The overall concepts and criteria included in the SMP are those which have been developed using the expertise of many coastal experts from both academic and private consulting fields. They are not based on the opinion of one individual. As in any science, the technology is not static and evolves, and for this reason we have built in a requirement that the SMP undergo a mandatory review every 10 years to update and change any sections as required.

At the present time our office has no funding available for individual lot assessments by an independent coastal engineer. We would, however, welcome any additional coastal engineering input into the technical data of the plan for review and consideration. Any suitable detailed information provided by the landowner for a specific site (see Issue #2, previously discussed) will be implemented immediately for that site and considered for use in the general area of the site.

Issue #4

There is no mandate in the Policy Statement for the onerous definitions of 'hazard' lands contained in the SMP. Compensation should be provided to any property owner who has significant land use restrictions imposed on them as a result of implementation of this Plan (i.e. owner of a vacant lot is no longer permitted to build because of the policies of the SMP).

The first principle stated in the Policy Statement is that ... "proper shore land management requires the simultaneous recognition and addressing of flooding, erosion, and dynamic beach hazards in a manner integrated with land use planning." The term *hazard land* has long been a term used in land use planning documents to identify natural areas severely limited for new residential development.

Compensation to the landowner who has a site affected by the lakeshore hazard is not proposed because the SMP is not creating the hazard. The SMP is attempting to define the lakeshore hazards in an understandable fashion. In a small number of areas of the shoreline, the property is no longer a viable building lot due to the historic erosion forces of Lake Huron.

Issue #5

There has been no meaningful consultation with the public and there has been no fair presentation to the public of how this document will be used. Implementation of this Plan is premature and should be reconsidered.

The ABCA began discussing the concepts of shoreline processes and shoreline management with the public by holding public meetings during the summer months of 1990 and 1991. Each of these meetings was attended by approximately 200 people.

The present draft SMP document has been presented for public input and review prior to making revisions in order to create a second draft. This will be accomplished by considering the response of over 500 people who attended our Open Houses (held over the summer months) and the written comments of over 300 people.

The table in Section 3.3.5 titled, Development Restrictions was presented as a summary of how the SMP proposes to apply to existing development. We anticipate major changes to this table to clarify the terminology used and to assist in interpretation of it.

lakeshore bulletin

May, 1993

A NEWSLETTER FOR LAKE HURON SHORELINE LANDOWNERS

Ausable-Bayfield Conservation Authority • R. R. 3, Exeter, On N0M 1S5 • 519-235-2610

Second Draft of the Shoreline Management Plan

The Steering Committees of the Shoreline Management Plan (SMP) have been actively rewriting the document to include many of the considerations which were brought to our attention during last summer's discussions. For this reason, an earlier projected due date was not feasible. The Second Draft will be ready by June 1, 1993.

The document will be distributed free of charge to all the cottage/ratepayers associations, and municipal offices. As was the case with the First Draft, copies will be sold on a cost-recovery basis (projected costs will be less than $20.00) to individuals who wish to obtain a personal copy.

Changes to the document from the First Draft

- a more comprehensive and clearer table listing proposed lakeshore development standards
- more options to landowners on protection approaches
- stronger emphasis on the potential adverse effects of inadequate surface drainage
- a new section which more descriptively explains the different shoreline types
- an updated reach description section
- an improved document format for easier reading and cross-referencing

Public and Association Meetings

After considerable discussion concerning the format of future public meetings, the Steering Committee has decided upon a meeting style versus an open house style. At the present time, we anticipate two meetings, one at Varna and the second at Thedford, to provide a forum for discussion of the second draft of the Plan. Meeting details are on page 4 of this bulletin. As well, they will be advertised through the local media and notices will be sent to your cottage/ratepayers association.

In addition, we hope to add to the list of associations who allowed us to attend association meetings last summer to provide information and answer questions. This is often the best way to specifically deal with local issues and suggest solutions.

In an effort to improve communication, we have established a short list of contact people who are official or informal representatives of the various regions of the shoreline. They are listed on pages 2 and 3 of this bulletin for your information and confirmation.

However, if your group is not included in this listing, please have your contact person notify our office. Individual residences or farms not associated with a cottage area should note the municipal representative on the Steering Committee who is their liason contact. Municipal involvement will be encouraged at all meetings.

INSIDE THIS BULLETIN...

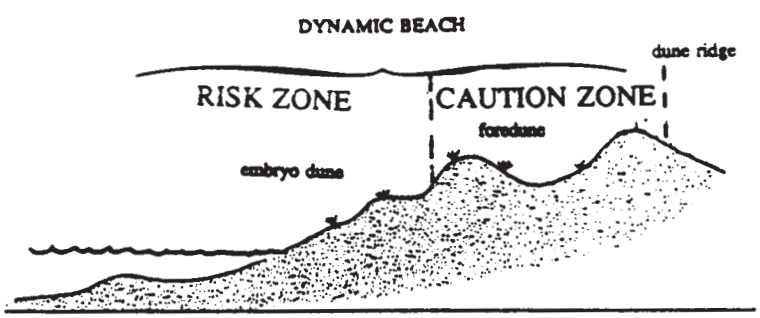
Cottage/Ratepayer Association Contacts

ARMSTRONG EAST COTTAGE ASSOC	C/O GLYNN LEYSHEN
BAYFIELD RATEPAYERS ASSOC	C/O ANN TILLMAN
BAYFIELD HIGHLANDS ASSOC	C/O MRS. MARTY DALTON
BAYVIEW COTTAGE ASSOC	C/O W. R. MICHAEL
BEACH O PINES ASSOC	C/O ADRIANNE JONCKHEERE, PRES
BEDARD COURT	C/O PERRY WHITE
BIRCHCLIFF	C/O RALPH SMITH
BLUEHAVEN COTTAGE OWNERS ASSOC	C/O DOROTHY HAY/JOHN DENOMME
BURLEY ROAD RESIDENTS ASSOC	C/O MR. REFFEL
CAMP CANBAY	
CEDARBANKS COTTAGE ASSOC	C/O BILL BUSTON
CEDARCREST (SUNSET LANE)	C/O TONY OLIVE
COVENTRY HEIGHTS ASSOC	C/O TOM DEVEREAUX
CREST BEACH COTTAGE OWNERS	C/O EDWIN COVE
CRYSTAL SPRINGS BEACH	C/O RANDY LYTTLE
DENODARD ASSOC	C/O JOE DZIUDA
DENOMME NORTH (SHANGRI-LA)	C/O ROLF SCHLICHTING
DRIFTWOOD TRAILER PARK	C/O DIETER BOECK
DRYSDALE SUBDIVISION	C/O BRUCE HEIGHWAY
DRYSDALE BEACH	C/O FRED M. CROKE
DUCHARME BEACH	C/O HENRY PEROLA
DURAND-HURONVIEW BEACH ASSOC	C/O CEC SOUTHWARD
ELLIOT'S GROVE	C/O BILL FALCONER
EGERTON BEACH ASSOC INC.	C/O DR. DERICK BOUGHNER
ELMSLIE DRIVE COTTAGE ASSOC	C/O ROBERT HONEYCOMBE, PRES
ELMWOOD ESTATES	C/O STEVE ZARANIK
GLEN HURON CAMP	
GLITTER BAY	C/O BEV EARLY
GRAND BEND RESIDENTS ASSOC	C/O JOHN NEWBERRY, PRESIDENT
GREEN ACRES PROPERTY OWNERS	C/O MARJORIE MILLSON
GREYSTONE BEACH ASSOC	C/O ART GOLDING
HARVEY DENOMME LANE ASSOC	C/O BERNIE DENOMME
HIGHLANDS I COTTAGE ASSOC	C/O CHUCK DOYLE OR ALLAN RALPH
HIGHLANDS II COTTAGE ASSOC	C/O NORMA O'BRIEN
HIGHLANDS III	C/O JERRY WEBB
HOMESTEAD HEIGHTS	C/O FRED NUGENT
HOUSTON HEIGHTS SOUTH	C/O DOUG BANKS
HOUSTON HEIGHTS NORTH	C/O BOB CAMPBELL
HURON CHURCH CAMP	
JOWATT'S GROVE NORTH	C/O JEAN/GRAEME CAMERON
KINGSMERE SYNDICATE	C/O D. S. RUDD
LA VRANGUE COTTAGE ASSOC	C/O FRANK KUNC/MR. SOPER
LAKE HURON PRESERVATION ASSOC	C/O DOUG BANKS
LAKEWOOD GARDENS COTTAGE ASSOC	C/O DON MINZEN
LAKEWOOD BEACH	C/O DON BRAZIER
LANE O' PINES	C/O MRS. JOYCE KANE

LAPORTE BEACH	C/O JOHN ORCHARD
LIGHTHOUSE COVE TRAILER PARK	C/O JAMES HOWARD
MAPLE GROVE SYNDICATE LTD.	C/O ALLAN SUTHERLAND
MELENA HEIGHTS	C/O CAROL FAZAKAS
NORMAN HEIGHTS BEACH ASSOC	C/O BARBARA ELLIOT
OAKWOOD PARK ASSOC	C/O T. W. JOHNSTONE
PARADISE VISTA COTTAGERS ASSOC	C/O CATHERINE FOSTER
PAUL BUNYAN CAMPGROUND	
POPE'S BEACH ASSOC	C/O SANDY WALKER
POPLAR BEACH ASSOC	C/O ROBERT MAASS
PT FRANKS BEACH & HOMEOWNERS ASSOC	C/O ALEX MCCLAREN, PRES
RICHMOND PARK ASSOC	C/O JIM RYCKMAN, PRES
RIDGEWAY COTTAGERS ASSOC	C/O SAM WAKEAM
ROCKY POINT	C/O ALAN SHORT
SCHADEVIEW ASSOC	C/O KAREN HEYWOOD
SNOWDEN ACRES SOUTH	C/O D. M. JENKINS
SNOWDEN ACRES NORTH	C/O JOE PEIRONE
SOUTHCOTT PINES PARK ASSOC	C/O EDNA FRAMPTON, COORDINATOR
ST. JOSEPH	C/O CAMILLE MIRANTI/VIC BRISSON
ST JOSEPH SHORES	C/O WILLIAM McMICHAEL
STANLEY TOWNSHIP COTTAGERS ASSOC	C/O DOUG BANKS
SUGARBUSH CAMPGROUND	C/O DAVID NELMS
SUNNYRIDGE	C/O RON WILKINSON
SUNSET ESTATES	C/O BOB WORTHY
TURNBULL'S GROVE	C/O DOUG SHEPHERD
VISTA BEACH COTTAGE ASSOC	C/O JAMES CAREY
WESTDELL BEACH ASSOC	C/O FRANK MAY
WILDWOOD SOUTH COTTAGE ASSOC	C/O JOE HOUSER
WILDWOOD NORTH COTTAGE ASSOC	C/O BRUCE BJORKQUIST
WINDSOR PARK ASSOC LTD	C/O ERIC KERNOHAN
WINDY HILL COTTAGE ASSOC	C/O JOHN MURCH

Technical Facts: Risk and Caution Zones in the sand dune region of the shoreline (south of the Lake Huron Water Supply Plant)

The sandy shore (dune region) located between Kettle Point and the Grand Bend area relies on the transport of sand southerly along the shoreline. Changes in this rate will have an effect on the beach size, width, and ability to absorb storm energy.



Recent shoreline studies have indicated that past events may have had an effect on the sandy shoreline. (see Goderich Harbour discussion in Section 3.2.5 of the SMP). For this reason, the active beach zone or dynamic beach zone, is identified and subdivided into the RISK and CAUTION Zones (as per the figure). These zones are based on the area of the beach normally affected by water and that by wind.

However, during high lake levels and severe storms, these boundaries may vary substantially. For this reason a beach profile is used to assist in determining the landward extent of these zones.

SHORELINE MANAGEMENT PLAN: An Update to Lakeshore Landowners

Since early 1991, the Ausable-Bayfield Conservation Authority (ABCA) has been developing a plan for the management of the Lake Huron Shoreline within its area of jurisdiction with the direction of a steering committee of representatives from the shoreline's major user groups including cottage associations, municipalities, Pinery Provincial Park and other lakeshore agencies.

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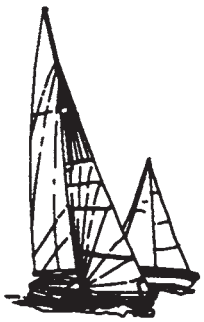

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The SMP's steering committee is currently preparing a second draft of the Plan, based on the comments and concerns raised by approximately 500 people who attended 1992's open houses and the 300 written responses received by the ABCA. Completion of the second draft is anticipated by June 1, 1993.

Public Meetings

June 25 @ 7 p.m. at Stanley Township Complex, Vama
Displays open at 7:00 p.m.
Presentation at 8:00 p.m.

June 26 @ 1 p.m. at Thedford Bosanquet Community Centre, Thedford
Displays open at 1:00 p.m.
Presentation at 2:00 p.m.

Why a Shoreline Management Plan is Needed

Historically, when cottage development first occurred, a less restrictive land use approach was used to guide development along the shoreline. Since that time, land use planning principals have been implemented along the shoreline in some form or another.

The SMP presents the natural processes and physical conditions which exist along the shoreline in a logical fashion to enable landowners, developers, and municipalities to know 'what to expect' and 'what questions to ask' when land use changes or building expansions are considered.

The SMP is an attempt to combine all the requirements which need consideration for safe use and occupation of shoreline property in one document. These include land use restrictions related to municipal zoning bylaws, areas adjacent to watercourses, environmental guidelines related to the approval of septic systems, or requirements for a work permit for activities planned on or near the beach. Through information explained in the SMP, the lakeshore hazards are explained and management suggestions are presented.

How can you find out more about the SMP?

The Second Draft Plan and associated material will be available to cottage associations and your municipal office, or you can view the material at the ABCA office just east of Exeter at the Morrison Dam Conservation Area. To ensure that staff will be available to meet you, you are advised to phone ahead to make an appointment.

Your comments and input are most important as this plan will provide the future for the shoreline and how it is utilized. Once the second draft is available, please feel free to use your cottage association to provide combined comments from your lakeshore area.

If you have recently sold your lakeshore property, please inform our office of the change so that we may send the new owner information on the Shoreline Management Plan.

The deadline for comments on the Second Draft is August 1, 1993.

NOTICE OF MEETING

INFORMATION MEETING

SHORELINE MANAGEMENT PLAN

DATE: Friday, May 21, 1993

TIME: 7:30 p.m. to 9:00 p.m.

PLACE: Exeter Legion Hall
William St., (behind Darling's Food Market)
(see map)

WHO: Two representatives from each cottage group ratepayers association located within the Ausable Bayfield Conservation Authority shoreline jurisdiction.

WHY:
- To receive a copy of the 2nd draft of the SMP
- To provide updated information on the SMP project
- To provide the schedule of summer public meetings for the project which lakeshore residents are invited to attend
- To provide an opportunity for cottage groups to familiarize themselves with the lakeshore issues of their neighbours along the shoreline
- To collect information for further discussion with their groups

NOTE: **Due to limited space in the hall and resources, we ask that you confirm a maximum number of two representatives from your group/association who will be attending the meeting and notify our office prior to May 19, 1993. Seating is limited.**

SHORELINE MAPPING

The maps contained within this appendix illustrate the extent of shore land affected by the Lakeshore Area 1 and Lakeshore Area 2 designations in the Shoreline Management Plan. This area is also referred to as the 'Lakeshore Hazard Area' as stated in the Lakeshore Development Guidelines *(Section 3.3)*.

The maps on the following pages are a reduction of the full-scale map sheets *(see examples below)* which are available for viewing from the appropriate municipal office or the ABCA. Map sheet numbers are indicated on the reduced copies and range from map #12 at the most southerly extent of the study area (adjacent to Camp Ipperwash) to map #44 which shows the northerly border of the study area at Sideroad 30, Goderich Township. Map detail includes buildings, roads, watercourses, top of lakeshore bank and cottage subdivision names.

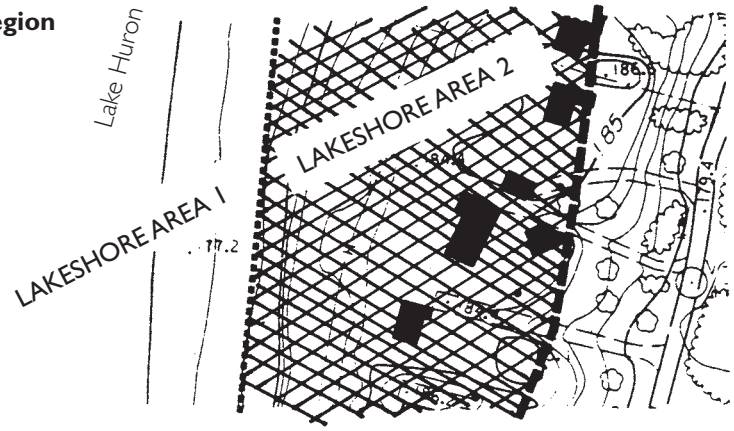
The reduced maps show the extent of Lakeshore Areas 1 and 2. These affected areas include the three hazard criteria discussed in Section 3.3, Lakeshore Development Guidelines: the hazards of flooding, erosion and dynamic beaches.

Please note that the 'defined portion of the dynamic beach' is not shown on these maps; it is available at the ABCA office from calculations made on the original mapping. Ontario Regulation #142/90 has now been updated and replaced by #46/95. This mapping is based on 1988 photography.

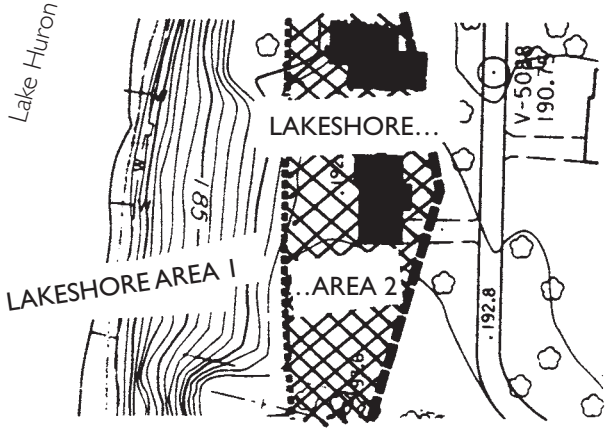
Please refer to the previously referenced section for a more complete explanation of the hazard criteria.

Examples of Full-scale Map Sheets

A) Dune Region



B) Bluff Region



ADDENDUM TO THE SHORELINE MANAGEMENT PLAN, 2ND EDITION

This appendix outlines the substantive changes made to the Shoreline Management Plan (1994) for the 2nd Edition. It is intended to provide the Ausable-Bayfield Conservation Authority Board of Directors with the elements which are of most significance without the need to review and approve the entire document. Topics which were altered or added to update and improve the document are:

Provincial Policy Statement, 1997 replacing the Provincial Shoreline Policy, 1994

This Policy Statement contains all provincial government policies regarding land use planning, including a section on Natural Hazards and reference to the Great Lakes Hazards (or Lakeshore Hazards) of flooding, erosion and dynamic beaches. The addition of this Policy Statement and updating wording in the SMP form the largest change from the original version to this 2nd Edition of the Plan.

Defined Portion of the Dynamic Beach

This is a new term and concept in the Provincial Policy Statement (1997), requiring some explanation and justification regarding the approach taken for the ABCA shoreline in the 2nd Edition. In summary, the defined portion is the most unstable area of the dynamic beach and, according to Provincial Policy, development and site alteration are not permitted. Coincidentally, the original SMP used a portion of the dynamic beach to indicate the most sensitive area where development and dune alteration were most restricted. This portion was the most lakeward 15 metres of the dynamic beach and forms the basis for this new definition, the 'defined portion of the dynamic beach'. This original approach was based on a number of background research and analysis reports conducted as part of the SMP project. Details of how this approach is now justified to match the new definition is contained within the justification report of April, 2000 prepared by the Lake Huron Centre for Coastal Conservation.

Additional ABCA Supporting Documents

The ABCA has been involved in a number of complementary projects and studies since the completion of the SMP in 1994. Conclusions and recommendations of the original SMP are supported and verified by the contents of the following documents:

1) Watershed Management Strategy *(1995)*

2) Plan Input and Review Manual *(1999)*

Additional Supporting Research

Research and documentation about the sensitivity of the dune systems along Lake Huron include:

1) the Ontario Municipal Board decision regarding Indian Road in Oakwood Park, Stephen Township, in 1989 which prevented a property severance and ultimate construction of a residence in the sensitive dune area. Reasons were based on concerns for protection of the environment in such a fragile, environmentally sensitive area.

2) a refinement of the dynamic beach criteria in the former Town of Southampton, now part of the amalgamated Town of Saugeen Shores. This study provides guidance as to various components requiring consideration in any dynamic beach review.

County Official Plans

Completion and approval of new Official Plans for Lambton *(1998)* and Huron *(1999)* Counties. Both documents refer to lakeshore hazards associated with Lake Huron and specifically mention the concept of dynamic beaches. Updates have also been made since 1994 to Secondary Plans for the Town of Bosanquet and the Village of Grand Bend; these updates include policies on dune protection and rehabilitation.

Water Levels

The SMP and related program initiated by the Province was a result of high lake levels of 1986; more recently, lake levels have dropped to near the historic recorded low level of 1964. The perspective of the plan needs to shift in some areas to recognize the possibility of lower lake levels in future and possible implications on lakeshore hazards. Erosion, for example, may shift farther offshore in the area currently considered lake bottom; dynamic beach areas may be more dynamic with regard to wind action, moving dunes farther inland than before. Climate change projections for Lake Huron suggest lower lake levels in the years to come (50 to 100 years) than the previously recorded low level in 1964.

Summary

The above items form the substantive changes made to the original SMP document in order to ensure relevancy and value of the 2nd Edition as a shoreline reference document. This is especially important as the document is intended to assist in the implementation of the Provincial Policy Statement concerning lakeshore hazards. This assistance will become imperative as the relevant County Official Plans and updated local land use planning documents are used to guide future land use planning decisions along the Lake Huron shore.