

**SUSTAINABLE MANAGEMENT STRATEGY FOR
SOUTHEAST LEAMINGTON – PHASE 1 REPORT**

Prepared for:

ESSEX REGION CONSERVATION AUTHORITY

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Sustainable Management Strategy for Southeast Leamington Phase 1 Report

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Appendix A - Baird June 9, 2005 Presentation to ERCA Board of Directors

Appendix B - Baird May 25, 2005 Presentation to Stakeholders Committee

Appendix C - Golder Associates Geotechnical Proposal

1.0 INTRODUCTION

This proposal has been prepared in response to a summary statement and terms of reference prepared by the Essex Region Conservation Authority (2005). Baird & Associates were retained by the Essex Region Conservation Authority (ERCA) to complete an initial scoping study, known as Phase 1, to review existing datasets and plan for the completion of the detailed investigation, known as Phase 2. The detailed study area extends from Wheatley Harbour in the north to the southern reaches of Point Pelee National Park, including the submerged shoal. For the purpose of evaluating coastal sediment budgets and regional shoreline processes, a secondary study area extends from Port Alma to the southern limits of Point Pelee National Park. Refer to Figure 1 for the spatial extents of the study. For additional details on the scope of work, refer to the terms of reference document.



Figure 1 Detailed Study Area plus Limits for the Sediment Budget Calculations (i.e. coarse scale assessment)

2.0 EXISTING LITERATURE AND SITE VISIT

Section 2.0 of the report summarizes the ongoing literature review for the study area, data on past sand mining, and observations from the May 2005 site visit.

2.1 Previous Studies and Reports

A total of 38 previous reports were forwarded to Baird at the commencement of the Phase 1 study. These previous studies span four decades, from the early 1970s to present. Several of the studies were completed by notable coastal researchers, including Dr. J.W. Kamphuis, formally of Queens University, Dr. P.D. Lavalle from the University of Windsor, Dr. J.P. Coakley and Dr. M.G. Skafel from Environment Canada, to mention a few. These reports will be utilized during the coastal study, which is summarized in Tasks 1.0 to 3.0 in Section 4.0 of this report.

2.2 History of Sand Mining at Point Pelee

There is a long history of sand mining along the south-east coastline of Point Pelee. Several datasets were retrieved during the Phase 1 study which will be carefully reviewed during Phase 2, including: 1) records of sand mining permits forwarded by the Ministry of Natural Resources, and 2) a large archive of newspaper articles and photographs obtained from a local landowner in the Marentette Beach area.

2.3 Observations from May 2005 Site Visit

The regional study area, from Port Alma to the tip of Point Pelee National Park was visited by the Project Manager from Baird during the week of May 24th to the 27th, 2005. The shoreline conditions are diverse and feature a wide range of geologic and geomorphic classifications, including: 1) near vertical cohesive bluffs, 2) low bank or low plain shorelines, 3) barrier beaches, 4) natural sandy beaches, 5) artificial sand deposits in the form of harbour fillet beaches, 6) exposures of peat, and 7) the full range of shoreline protection structures, from harbour jetties to groins to shore parallel structures, such as seawalls and revetments.

Also worth noting is the organization of these shoreline features within the littoral cell from Port Alma to the tip of Point Pelee National Park. The eroding cohesive bluffs represent the updrift supply zone of the littoral cell. The harbour structures at Wheatley Provincial Park and Wheatley Harbour, along with the residential zones to the southern end of Marentette Beach are heavily armoured, and represent the central part of the littoral cell. While the park's eastern shoreline is generally unprotected and representative of the downdrift zone for the littoral cell, often associated with sand

deposition (stable or accreting beaches). However, there is no natural barrier for the littoral drift at the southern limits of the park and consequently much of the sediment moving southward is likely deposited offshore in deep water. These observations will be quantified during the coastal study summarized in Tasks 1.0 to 3.0 in Section 4.0 of this report.

Refer to Appendix A for a series of site photographs presented to the ERCA Board of Directors on June 9th, 2005.

3.0 EXISTING SPATIAL AND TEMPORAL DATA

Section 3.0 of the Phase 1 report summarizes existing spatial and temporal datasets that were assembled by Baird from a variety of sources to populate the study database. Recommendations for additional data collection are also provided.

3.1 Existing Spatial Data

Spatial data for the study area was collected from a variety of sources, including Baird's internal library of GIS layers, datasets transferred from ERCA, Point Pelee National Park, The Town of Leamington, and various online sources.

The following bullet points summarize the existing spatial data assembled on Baird's internal network:

- Aerial photographs from 1955 to 2004 to document historical shoreline change rates;
- Regional satellite data from 2000 to present;
- A wide variety of existing bathymetric data from the late 1940's to present, which is critical for the coastal study;
- Ontario Base Map layers and contours available from the Internet for map generation;
- Detailed topographic data to document existing land elevations and flood risk; and
- Digital property parcel polygons for the detailed study area, which will be used for the economic analysis.

Examples of these datasets were presented to the Stakeholders Committee on May 25, 2005 in a MS PowerPoint Presentation. Refer to the graphics in Appendix B for additional information.

3.2 Existing Temporal Data

Temporal datasets, such as lake levels and time series wave data, is required for the technical study to evaluate existing hazards and simulate flooding and erosion with

numerical models. The bullet points below summarize some of the key temporal datasets identified and retrieved for Phase 2 of the study:

- Hourly recorded lake levels from the existing network of gages, such as Kingsville and Erieau;
- Future climate change water levels for Lake Erie based on four plausible future climate conditions;
- Hindcasted hourly wave data from 1956 to 1987 generated by the United States Army Corps of Engineers; and
- Ice cover polygons in GIS format available from the Great Lakes Environmental Research Laboratory (GLERL).

3.3 Phase 2 Data Requirements

One of the most important data requirement for Phase 2 is detailed bathymetric data for the detailed study area, along with geotechnical information on the lakebed sediments in the nearshore zone (e.g. 0 to –10 m). This data is critical to evaluate the past, current and anticipated future evolution of the lake bottom, which will play a critical role in the evolution of the shoreline in the long term. Refer to the recommendations in Section 4.0, Task 1.3 for additional details.

Other data requirements include a recent wind-wave hindcast, details on historical dredging at Wheatley Harbour, information on the sand mining operation offshore of Point Pelee, oblique digital photographs, parcel assessment data from the Municipal Property Assessment Corporation (MPAC), and historical data on the glacial history of the area and early European settlement. Refer to the descriptions for Task 1.0 in Section 4.0 of this report.

4.0 RECOMMENDATIONS FOR PHASE 2

Section 4.0 of the Phase 1 report presents the study team members, external committees, a detailed description of the Phase 2 tasks, deliverables, and an anticipated schedule for the completion of the project.

4.1 Baird Study Team Members

Baird & Associates has over 50 coastal scientists and engineers dedicated to solving complex problems on the world's oceans, lakes and rivers. Appropriate staff will be assigned to the project to complete the Phase 2 tasks. Dr. Robert Nairn, P.Eng. will be the Principal-In-Charge for the project and have overall responsibility for Baird's Quality Control Program. Mr. Peter Zuzek, P.Geo., will be the Project Manager for Phase 2 and lead the economic evaluation. Other senior staff from Baird who will contribute to Phase 2 include Dr. Doug Scott, P.Eng. (waves and currents), Dr. Mohammad Dibajnia, P.Eng. (sediment processes), and David Anglin, P.Eng. (coastal structures).

Baird has also retained the several specialist consultants to assist with specific sub-components of the study. The sub-consultants and their roles are summarized below:

- Golder Associates - Geotechnical Consultants and will contribute to the following Task: 1.3;
- The Outspan Group Inc - Environmental Ecologists and will contribute to the following Tasks: 4.3 to 4.7, III, VII, and reporting/meetings;
- Bill Stevenson – Ecologist and will contribute to the following Tasks: 1.8, 3.5, 4.2 to 4.7, IV, and reporting/meetings;
- Ken McEwan – Agricultural Economist, Ridgetown College and will contribute to the following Tasks: 4.1, 4.3, 4.5 to 4.7, and reporting/meetings; and
- Real Estate Assessor – evaluation of real estate values.

4.2 External Committees to the Study Team

There will be several external groups to the study team, including the Steering Committee, Technical Review Committee, and Stakeholders Group. These three groups are described briefly below.

4.2.1 *Steering Committee*

The Steering Committee will consist of representatives from Provincial and Federal Agencies, the Municipality of Leamington, and the Essex Region Conservation Authority.

4.2.2 *Technical Review Committee*

The Technical Review Committee will consist of experts in the fields of Coastal Engineering, Coastal Geomorphology, Agriculture and the Environment. They will operate external to the study team and review critical documents/findings generated by the investigation. They will report directly to ERCA.

4.2.3 *Stakeholder Group*

The Stakeholder Group will consist of landowner representatives within the study area, including: private land owners, the Municipality of Leamington, Point Pelee National Park, and First Nations. Representatives from other community sectors may be added.

4.3 Project Schedule

An updated project schedule is summarized in Table 1. The following bullet points highlight the key schedule milestones, based on the status of the project in March 2006:

- Task 1 – Spatial / temporal data collection and acquisition commenced in the Fall of 2005. Task 1.3 was of particular importance, as it required fieldwork on the lake prior to the winter storm season, and it is now complete;
- Task 2 – The GIS shoreline change analysis commenced in December and was completed in March 2006;
- Task 3 – The sediment modeling in Task 3.0 commenced in February 2006 and will be completed in April 2006;
- Task 4 – The evaluation of long term management strategies for the study area will commence in January, 2006 and continue with plan refinements until September 2006;
- Task 5 – It is not possible to give specific dates for the individual meetings described in Section 5.0. An approximate schedule is provided in Table 1. The overall goal is to complete the study by the end of-2006; and

- Section 4.5 (Tasks I to VIII) – Commenced in January and will be complete by May, 2006.

4.4 Phase 2 Tasks

There are five principal tasks associated with the recommended Phase 2 study, including: 1) Spatial and Temporal Data Collection, 2) GIS Shoreline Change Analysis, 3) Sediment Modeling, 4) Long Term Management Strategy, and 5) Meetings and Reports. The five principal tasks and sub-tasks are described in further detail below.

Task 1.0 Spatial and Temporal Data Collection

A total of ten sub-tasks are described to collect and generate new spatial and temporal datasets required to complete the investigation.

Task 1.1 Wind-Wave Hindcast for Study Area

Baird will apply their 1-D parametric wind-wave hindcast software to predict the historical wave climate along the Point Pelee shoreline. Inputs to the software include local hourly wind data (from climate stations) and fetch distances on Lake Erie for a 22.5 degree compass. The model will output hourly wave direction, height and period.

Deliverables: Local wind data will be obtained, potentially from local airports such as Windsor and London, or climate stations for a multi-decade period. The hindcast model will be applied at five locations along the study shoreline, from Port Alma to the tip of Point Pelee.

Task 1.2 Obtain and Evaluate Water Levels and Storm Surge

Hourly water level data from local gages will be evaluated for the Point Pelee area. In addition, published reports on storm surge will be reviewed, along with an analysis of surge from the hourly gage data with custom Baird software. In addition to historical water level data, recent forecast data for Lake Erie water levels under four altered climatic scenarios will be evaluated. This data is available from Environment Canada.

Deliverables: Hourly gage data and predicted climate change lake levels will be obtained, formatted for Baird's computer models and evaluated for the study. This data will be used for Tasks 3 and 4 (sediment modeling and engineering analysis).

Task 1.3 Collect Bathymetry and Geotechnical Data for Study Area

Golder will be obtained to collect bathymetric data and nearshore sub-bottom geotechnical information. The bathymetric data will consist of approximately 16 shore perpendicular beach transects and where possible, will re-occupy historical measurements to facilitate an analysis of lake bed change (see Task 2.3). In addition to the bathymetry, the contractor will also collect shallow seismic data along the profiles, from the nearshore limits of the survey boat to a depth of approximately 10 m. The seismic data will be verified with five vibrocores which will penetrate the lake bed approximately 3 m. Surficial sediment characteristics will be classified with a clamshell sampler. Refer to the cost proposal in Appendix C from Golder Associates.

The nearshore extent of the surveying completed by Golder is limited by the draft of the survey vessel. Since the profile data is required for the entire shallow nearshore zone up to the beach, staff from Baird will extend the survey lines from ~0.5 m water depth to the beach/shore protection, and through the upland. This work will be completed with a Total Station. There will be no geo-technical data collection for this region of the profile.

Deliverables: Approximately 16 shore perpendicular beach profiles will be collected and extend from the back beach to a depth of approximately 10 m below Chart Datum (CD). Shallow seismic data will be collected at the same time and be verified with 5 vibrocores. Approximately 30 surface sediment samples will also be collected. Combined, the bathymetry, shallow seismic data, vibrocores and sediment samples will provide detailed information on the bathymetry, surficial sediment exposed on the lake bed, and depth of other subsequent sediment sequences, such as sand, gravel, glacial till, lacustrine clay, and peat/organic deposits. The bathymetry data will be used in GIS and CAD. The seismic data will be saved as a digital record for analysis.

Task 1.4 Compile Dredging Records at Wheatley Harbour

All available historical records of dredging at Wheatley will be obtained and assembled into a database which will quantify date, volume, dredge method, and disposal location.

Deliverables: Historical records of dredging at Wheatley Harbour will be obtained, such as government permits, to assemble the database.

Task 1.5 Evaluate Nearshore Sand Mining Records from MNR

A CD of sand mining records for the Point Pelee area was received from MNR. In addition, a series of newspaper articles were obtained from a shoreline riparian. These datasets will be reviewed in Phase 2 to provide data for the regional sediment budget. Refer to Task 3.4.

Deliverables: The records of nearshore sand mining in the area of Point Pelee National Park will be reviewed and summarized in tables and graphically with maps. The estimated volume of sediment removed from the lake bottom will represent a sediment sink term in the historical regional sediment budget. An additional task is described in Section 4.5 of this proposal (Task II) that will expand the scope of this evaluation.

Task 1.6 Collect Oblique Digital Photographs for the Study Area

A small aircraft or helicopter will be used to collect digital oblique photographs of the study area shoreline, portions of the interior dyke network, the agricultural areas and the National Park. GPS hardware will be used on-board to collect positional information for each photograph. The data will have several uses, including: a) general information and education (meetings, presentations and reports), b) characterization of the type of shoreline protection for each property parcel, c) habitat and ecological conditions, and d) land use evaluation.

Deliverables: An aircraft will be used to collect digital oblique photographs of the study area, from Port Alma southwest to the tip of Point Pelee, plus the interior dyked areas and the National Park. The photographs will be saved in the project database and the GPS data will be used to create a GIS point layer of the photo locations.

Task 1.7 Collect MPAC Assessment Data and Link to Parcel Database

MPAC assessment data will be collected for the digital property parcel database covering the detailed study area, from Wheatley to the National Park, including the interior regions. The assessment data will be used to populate the digital property parcel database obtained in Phase 1, which in turn will be required for the economic assessment in Task 5.

Deliverables: Property assessment data will be collected for the detailed study area, from Wheatley Harbour to Point Pelee National Park, including all the interior agricultural, residential and natural areas. The assessment data will be used in Task 4 to evaluate land value and possible land acquisition scenarios.

Task 1.8 Ecological Data and Literature Review

A Literature Review will be completed to document the ecological conditions within the study limits, including the nearshore zone, coastline, barrier beach complexes and interior wetland/march habitat. Existing sources will be used to document the overall health of the natural ecosystem and linkages to coastal processes and current land uses. For example, the plant and animal communities that rely on the sheltered waters of Hillman Marsh and the various ponds in the National Park will be documented. Plus, the

literature references and our professional judgement will be used to highlight the implications of a permanent breach in the barrier beach and exposure of these sheltered environments to storm surges and lake waves.

Deliverables: A literature review will document the current health of the study ecosystem within the limits of the detailed study area, from Wheatley Harbour to the tip of Point Pelee National Park, including all interior areas. The emphasis will be animal and plant communities that use the coastal and wetland/marsh habitat, and their sensitivity to changes in shoreline conditions. The review will be led by sub-consultant Bill Stephenson. A second task is described in Section 4.5 of this proposal (Task IV) that expands the scope of this evaluation.

Task 1.9 Geomorphic History and Land Use from Holocene to Present

In support of the ecosystem evaluation in Task 1.8, and the development of future management strategies for the study area, it will be necessary to document the environmental conditions within the study limits prior to European Settlement of Point Pelee. Further, the geologic and geomorphic history of the landscape is important in establishing the shoreline conditions prior to human development and modification. In Task 1.9 existing references on the geologic and glacial history of the study area will be reviewed. Plus, historical maps and references on land use will be obtained and reviewed to evaluate landscape changes in the past 200 years.

Deliverables: Review of existing information on geology, glacial history and European Settlement of the study area. A series of maps will be generated, including an evolution of the landscape over time to the present conditions.

Task 2.0 GIS Shoreline Change Analysis

The shoreline change analysis will quantify historical rates of erosion and deposition within the study boundary. The results will provide critical information for the regional sediment budget which will quantify sediment sources, sinks, and pathways. These completed sediment budgets will help determine the probable future shoreline conditions under the “do nothing” scenario or altered management strategies.

Task 2.1 Register Historical Aerial Photographs and Digitize Shorelines / Bluffs

Historical aerial photographs will be obtained from a variety of sources, including existing data from ERCA and Environment Canada's Library at CCIW in Burlington. The hard copy prints will be scanned at a high resolution, such as 1,200 dots per inch (dpi) and geo-referenced with GIS software. The end product will be coverage for one series of historical orthophotographs from Port Alma to the tip of Point Pelee. Once registered, the appropriate Shoreline Change Reference Feature (SCRF) will be digitized in GIS, such as the bluff crest, dune crest, or waterline in the historical photographs. The equivalent SCRF will be digitized in the recent orthophotographs obtained from ERCA.

Deliverables: One set of historical orthophotographs will be generated for the study area coastline, from Port Alma to Point Pelee. A digital SCRF will be digitized in GIS for the historical and existing conditions orthophotography. In addition, all available photographs will be registered for several critical areas, including the jetties at Wheatley Provincial Park, Wheatley Harbour, and the northeast corner of Point Pelee National Park.

Task 2.2 Complete Shoreline Change Calculations (AARR)

Once the SCRF has been digitized for both temporal periods, a custom extension to ArcGIS known as Baird ShoreTools will be used to draw baselines parallel to the shoreline and shore perpendicular transects between the historical and recent shorelines. The resulting data will be used to calculate Average Annual Recession Rates (AARR).

Deliverables: AARR will be calculated for the shoreline from Port Alma to the tip of the National Park.

Task 2.3 Bathymetry Comparison to Quantify Lake Bed Change

Historical bathymetry data for the study area is available from the Canadian Hydrographic Service. In addition, some short shore perpendicular beach transects in the vicinity of Marentette Beach were obtained from old construction drawings. Combined, these datasets will provide historical information on the condition and depths of the lake bottom. The Fall 2005 bathymetry survey will re-occupy some of this data to facilitate the bathymetry comparisons and quantify erosion / deposition patterns.

Deliverables: Historic to recent beach profile comparisons will be completed throughout the study area to quantify lakebed erosion and deposition patterns.

Task 2.4 Quantify Updrift Sand Supply from Wheatley to Port Alma

There are three important questions relative to updrift sediment supply that must be answered: 1) historically, how much sediment did shore erosion from Port Alma to Wheatley supply to the downdrift shoreline (south of Wheatley harbour to the tip of Point Pelee); 2) has the rate changed due to human influences, such as private shore protection; and 3) how has the Wheatley harbour affected the delivery of this sediment to the south. The shoreline change rates generated in Tasks 2.1 to 2.3 will provide supporting data for this analysis.

Deliverables: The historical and contemporary supply of sediment from the updrift portion of the littoral cell will be quantified in Task 2.4 based on the shoreline change calculations (AARR) and bathymetry comparisons.

Task 3.0 Sediment Modeling

There are five sub-tasks related to sediment modeling to quantify rates of longshore sediment transport (LST), evaluate beach and bluff erosion processes, assess sediment bypassing at Wheatley Harbour, quantify sediment sources / sinks for the regional sediment budget and discuss impacts of the sediment budget (past/present/future) on shoreline development/infrastructure and the natural environment.

Task 3.1 Complete Longshore Sediment Transport Estimates for Littoral Cell

Longshore sediment transport (LST) estimates will be completed for the entire littoral cell, from Port Alma to the southern tip of Point Pelee. The calculations will be completed with Baird's COSMOS program, which is a 2D profile model that has been extensively peer reviewed, calibrated and verified. The model calculations will rely on several of the datasets collected and generated in Task 1.0, including the wind-wave hindcast, hourly lake levels and the beach profiles. In addition, the shallow seismic data will provide critical data on the surficial substrate conditions of the lakebed. For example, does the profile consist entirely of fine sand, or is there a mixture of sand, glacial till/clay, gravels and peat exposures? COSMOS is capable of simulating the wide range of substrate conditions across the profile commonly found in the Great Lakes, including variable grain size (from fine sand to coarse gravel).

Deliverables: Estimates of average annual (potential) longshore sediment transport will be completed at intervals along the coastline, from Port Alma to Point Pelee. The data will provide insight into the sediment pathways that exist along the shoreline for the sediment budget. In addition, this information will assist with evaluating future dredging projects and the prospects of future sand supply under the "do nothing" scenario.

Task 3.2 Evaluate Erosion Processes for Beaches and Bluffs

Erosion processes within the study limits vary spatially and temporally. Task 3.2 will model erosion at beach and bluff sites to advance our knowledge of the process, and the factors that influence the rates, such as high lake levels, storm surge and wave heights. In addition, we will evaluate natural and anthropogenic factors that can influence the location and magnitude of erosion within the study boundary, such as reductions in winter ice cover, frequency of storm events, loss of natural sand cover, reductions in the supply of new sand/gravel to the system and interruptions to natural sediment transport patterns along the coast.

Deliverables: Baird's erosion models will be applied at various sites within the study limits to evaluate erosion processes for cohesive and sandy shorelines at different temporal scales.

Task 3.3 Complete Sediment Bypassing Analysis at Wheatley Harbour

The dominant direction for LST within the littoral cell is from NE to SW. The Wheatley Harbour, and to a lesser extent Wheatley Provincial Park represent the potential barriers to the transport of eroded sands and gravels towards the SW. Baird will apply a 2D hydrodynamic model known as HYDROSED to a grid encompassing the harbour structures and updrift and downdrift shoreline. The model will predict nearshore wave patterns, plus wave induced currents around the harbour structures. In addition, HYDROSED will predict current induced sediment transport rates at the two harbours. This analysis, combined with the shoreline change calculations and records of historical dredging, will be used to quantify the influence of the harbour on sediment bypassing.

Deliverables: 2D simulations of currents and sediment transport for a select range of wave direction, height, period and lake levels. Estimates will be provided for the percentage of sediment bypassing the harbour, versus trapped in the updrift fillet beach, deposited on the lake bottom, or in the navigation channel.

Task 3.4 Generate Past, Present, and Future Sediment Budgets for Study Area

Collectively, the deliverables in Tasks 1.0 to 3.0, will be used to quantify variables for the Port Alma to Point Pelee sediment budget, including source terms such as natural shore erosion, sinks, such as harbour fillet beaches, and losses from the system, such as sand mining. A GIS extension known as the sediment budget analysis system (SBAS), which was developed by the US Army Corps of Engineers, will be used to formulate the sediment budget. In addition, there will be three temporal versions of the budget, including past, present and future (assuming the status quo).

The results of the future sediment budget will help forecast plausible shoreline conditions in the coming decades for the status quo alternative. In addition, the sediment budget provides a framework to consider management alternatives for the shoreline, such as large-scale beach nourishment, and the anticipated shoreline impacts. This type of analysis will be completed in Task 4.0.

Deliverables: Past, present and future sediment budgets for the littoral cell using the ArcGIS SBAS extension.

Task 3.5 Evaluate Sediment Budget Impacts on the Shoreline and Ecosystem

Once the past, present and future sediment budgets have been prepared, the implications of changes to sediment supply, transport pathways and sediment sinks on the shoreline conditions, barrier beaches and by extension the entire interior ecosystem, will be evaluated. This exercise will provide data to evaluate the future alternatives for the study area, including maintaining the status quo, long-term sustainable engineering solutions and alternative management scenarios.

Deliverables: The past, present and future sediment budgets will be evaluated to document impacts on the study area and ecosystem. The results will also support the evaluation of future management alternatives for the study area, including the shoreline and interior.

Task 4.0 Evaluate Long Term Management Strategies

Task 4.0 summarizes seven individual tasks related to long-term management strategies for the detailed study area.

Task 4.1 Evaluate Present and Future Economic Productivity of Agriculture

Our agricultural economist will lead this task. Past and projected future economic productivity of the agricultural sector within the study area will be evaluated. This task will rely on existing studies, such as the Agricultural Economic Impact and Development Study for Essex, Chatham-Kent, Windsor and Pelee Island prepared by Ridgetown College.

Deliverables: Existing literature will be used to quantify past economic productivity of the agricultural lands within the detailed study limits. Plus, comments on the anticipated future trends will be provided based on industry conditions and market forces, such as climate, fuel prices and regional/national/global markets.

Task 4.2 Evaluate Current Natural Heritage for Point Pelee/Hillman Marsh and Future Conservation Strategies

Task 4.2 will review previous studies to describe, and where possible quantify, the current natural heritage of the study areas, including Point Pelee National Park, Hillman Marsh and the nearshore zone of Lake Erie. In addition, existing conservation strategies of these natural areas will be documented to support Task 4.5, which will consider alternative management scenarios for the agricultural interior and residential waterfront.

Deliverables: The study ecologist will review published reports on natural heritage within the study area and document existing potential conservation strategies to address ecological sustainability in Southeast Leamington.

Task 4.3 Develop Screening and Evaluation Criteria for Alternatives

In Task 4.3 a set of screening criteria will be created for the sustainable land management alternatives developed for the study area. Hypothetical examples of screening criteria for the alternatives include: 1) economic sustainability for the future land use(s) within the detailed study area, 2) net environmental benefits for the post-project condition, 3) maintenance of existing tax revenue for the Municipality of Leamington, and if possible, increase future revenues, and 4) reduction of existing erosion and flood hazards. These criteria will be used to screen preliminary concepts developed by the Study Team and provide a defensible approach to reject alternatives that do not pass the screening criteria.

The second part of Task 4.3 involves the development of evaluation criteria for the alternatives developed in Tasks 4.4 and 4.5 below. The evaluation criteria will ensure there is an objective assessment of all alternatives that pass the initial screening. At this time, it is anticipated that the evaluation criteria will include a combination of economic costs and benefits, social considerations, and ecological indicators. Some of the criteria will be quantified in monetary terms. Others will require a non-monetary measure for the criteria, such as a numeric scale (1 for poor performance, 10 for excellent performance). The bullet points below provide a list of “potential” evaluation criteria:

- Direct economic costs to implement the alternative management scenario;
- Direct economic benefits associated with the alternative management scenario once fully implemented;
- Acceptance of the alternative management scenario by the local stakeholders;
- Land owner reaction to required land acquisition;
- Potential for local job creation, tourism growth, and increases in local tax revenues;

- Impacts of the post-project scenario on Species at Risk; and
- Ecological indicators, such as impacts on wetland and marsh acreage.

All members of the Study Team, Committees, Stakeholder Groups and local residents will be consulted for feedback on the screening and evaluation criteria.

Deliverables: The screening and evaluation criteria are the deliverables for Task 4.3.

Task 4.4 Develop Sustainable Shoreline Protection Alternatives for Status Quo

The status quo conditions for the detailed study area shoreline include a combination of residential development, a commercial port, and the managed natural areas of Point Pelee National Park and the Hillman Marsh. The interior agricultural zones are protected from coastal hazards by the shoreline development and associated protection structures, plus the interior dyke system. These two systems are intrinsically linked, for without the maintenance of the riparian shoreline protection, the interior dyke system would be exposed to lake forces (storm surges and waves), for which it was not designed. In addition, there are sections of the shoreline that feature natural forms of protection, such as the barrier beaches protecting Hillman Marsh and portions of Point Pelee National Park. Therefore, sustainable long-term shoreline protection alternatives must consider many objectives, including protection for the front row development from erosion and flood hazards, protection for the dyke system and maintenance and if possible enhancements to the natural barrier beaches within the study limits.

The findings from the coastal study will be used to develop multiple conceptual alternatives for long-term sustainable shoreline protection that will not have negative impacts on the adjacent shoreline, and where possible, enhance the natural shoreline features and ecology of the region.

Deliverables: If feasible, multiple long-term sustainable shoreline protection schemes will be developed for the detailed study area. Conceptual sketches of the design and a preliminary opinion of cost will be generated.

Task 4.5 Develop Conceptual Plans for Alternative Sustainable Management Strategies

Task 4.5 will utilize the data and analysis completed for the study, plus the knowledge of the study participants to develop conceptual plans for alternative sustainable management strategies for the interior dyked area and the shoreline. In addition, experience from similar projects in North America and abroad will be utilized to generate creative and innovative ideas. There will be no pre-determined solution and all alternatives will be considered equally if they pass the initial screening criteria. The goal will be a series of

alternative sustainable management strategies that generate social and economic benefits for the region, are acceptable to the majority of the stakeholders, and enhance the natural heritage and environment.

Deliverables: The study team will develop a series of alternative management strategies for the detailed study area. Initial concepts may be developed in a workshop format and refined further by the appropriate Study Team experts. Conceptual sketches of the designs will be developed for meeting posters and reporting.

Task 4.6 Apply Evaluation Criteria to Status Quo Scenarios and Alternative Strategies

The status quo scenarios along with the alternative management strategies will be evaluated based on the assessment criteria developed in Task 4.3. It is anticipated the criteria will include a combination of both economic calculations (benefits and costs expressed in dollar amounts) and non-dimensional scores, such as a ranking from 1 to 10 for identified Species at Risk and other ecological indicators developed specifically for the study. The existing conservation strategies for the National Park and Hillman Marsh will be considered when evaluating the environmental implications of a scenario, plus the overall impact on biodiversity and ecosystem health.

Deliverables: The status quo scenarios and alternative land use management strategies will be evaluated using the assessment criteria developed by the study team.

Task 4.7 Select Preferred Management Alternative and Comment on Implementation

The preferred management alternative for the study area will be selected in Task 4.7. Plus, the Steering Committee will provide information pertaining to the implementation of the recommendations, such as the concerns of the stakeholder group(s) involved, social and political factors, potential sources of funding to implement the alternative and an approximate schedule, to mention a few potential items. At completion, Task 4.7 will summarize implementation issues and strategies for the preferred long-term sustainable management strategy for the study area. These recommendations will be a first step towards planning and implementation.

Deliverables: A preferred management strategy will be selected and preliminary guidelines and issues regarding implementation will be presented.

Task 5.0 Meetings and Report

Task 5.1 to 5.7 and Task VII represent the meetings and reporting for the Southeast Leamington study to evaluate sustainable long-term management strategies. The schedule in Table 1 provides an estimated date for the meetings.

Task 5.1 Present Draft Phase 2 Work Plan to Steering Committee

The draft work plan for Phase 2 was presented to the Steering Committee in a one-day meeting on September 13, 2005.

Deliverables: The principal investigator from Baird attended a one-day meeting in the Essex Region with the Steering Committee. The meeting was organized by ERCA staff.

Task 5.2 Present Phase 2 Work Plan to the Stakeholder Group, Municipal Council and the Public

The work plan for the Phase 2 study was presented to the Stakeholder Group, Municipal Council and the Public on November 30, 2005.

Deliverables: The principal investigator from Baird made two presentations in the Essex Region. The meetings were arranged by ERCA staff.

Task 5.3 Present Findings from Technical Studies to Committees and Public

At the completion of Tasks 1 to 3, the Project Manager from Baird will travel to the Essex Region for two days of meetings with the committees and public. The meetings will summarize the technical findings completed for the study under Tasks 1 to 3.

Deliverables: The principal investigator from Baird will be in the Essex Region for a two-day period to present the findings from the technical studies. All meetings will be organized by ERCA Staff. The meetings will be held in April 2006.

Task VII Human History, Values and Future Expectations

A workshop will be organized to engage local stakeholders on their values and future expectations for the study area. The anticipated timeline for the meeting is May, 2006. Additional details of the meeting will be made available to the public as they become available..

Task 5.4 Present Draft Alternative Management Strategies to Committees and Public

The draft alternative management strategies will be presented to the committees and public in Task 5.4. These presentations will be made over a two-day period by the Project Manager. This will be an important step to receive feedback on the draft alternatives and the application of the evaluation criteria developed for the study. All meetings will be organized by ERCA staff.

Deliverables: Presentations of the draft alternative management strategies by the Project Manager to the Committees, Municipal Council and the Public. The anticipated timing for the meetings is July 2006.

Task 5.5 Present Management Recommendations to Committees and Public

Based on feedback from the Committees, Leamington Municipal Council, the Public and ERCA staff, refinements will be made to the draft management strategies. The updated management strategies will be presented and explained. The results from the application of the evaluation criteria will be summarized. The final recommendations from the Study Team on a future management strategy for the detailed study area will be presented. The meetings will be organized by ERCA. Baird's Project Manager will make the presentations.

Deliverables: Baird will present the revised management strategies to the Committees, Municipal Council and the Public, along with the final recommendations from the study. The anticipated timing for this set of meetings is September 2006.

Task 5.6 Draft Report on Future Management Strategies

A report will be prepared outlining the technical aspects of the study, the screening and evaluation criteria, and the alternative management strategies. The decision making process will be summarized along with the final recommendations for a long-term management strategy for the detailed study area.

Deliverables: A draft report summarizing the study findings and recommendations for a future sustainable management strategy will be prepared and circulated for review. The anticipated delivery is October 2006. Five paper copies of the report plus one set of originals will be forwarded to ERCA for circulation, along with a digital PDF file for electronic circulation and future printing. The dissemination of the report to the committee members and the public will be the responsibility of ERCA.

Task 5.7 Final Report on Future Management Strategies

Once all the feedback and comments are received, reviewed and integrated into the report where appropriate, the final report will be prepared. A total of five hard copies, two unbound originals, and two CD-ROMs with a PDF file will be delivered to ERCA in December 2006. ERCA will be responsible for the dissemination of the report.

Deliverables: Five bound copies of the final report, two unbound copies and two CD-ROMs with a PDF version of the report for electronic dissemination and future printing. ERCA will be responsible for the dissemination of the report.

4.5 Additional Tasks

Several additional tasks are summarized in Section 4.5 of the report and have been fully funded. They have been identified as components that would enhance the overall investigation and decision making processes.

Task I Computer Simulation of Dyke Failure and Inland Flooding

The future of the inland dyke and pumping system will be considered during the study and in the formulation of long-term management strategies. Task I will provide additional information on the potential implications of a dyke failure and the associated extent of inland flooding. A three-dimensional terrain model will be used with appropriate computer models to simulate a breach or failure of the dyke system in two locations and the extent of inland inundation. Important components of the modeling will be both the extent of the flooding plus the speed of the advancing waters. The result of this preliminary modeling will help identify potential risks if a breach or failure of the interior dyke system were to occur and implications for human evacuations.

Task II Investigation of Historical Sand Mining within the Detailed Study Area

Task 1.5 was developed to evaluate the historical sand mining records provided by the Ministry of Natural Resources. Given the importance and public interest in the sand mining, additional funding will be used to expand the investigation for Task 1.5.

Task III Inclusion of an Environmental Economist on the Study Team

Baird & Associates will be responsible for the economic evaluation of any coastal infrastructure proposed for the alternative management strategies. An agricultural economist has been retained to quantify the status of the agricultural activities within the

study area today and in the future. Task III include the services of an environmental economist on the Study Team. It is anticipated this individual will contribute to Tasks 4.0 and 5.0 of the study.

Task IV Consider Species at Risk and Ecological Indicators

Species at risk will be considered in the present investigation, as scoped in Section 4.4 of the proposal. Given the importance of species at risk and the legal requirements to consider them in the study, additional funding will be allocated for the Study Team to address existing research and discuss the current status of specific species with local researchers. The additional resources will ensure species at risk become an important evaluation criteria used to compare and rank the future alternative management strategies.

Ecological indicators are used to quantify the existing health and status of the natural environment. Potential examples for the study include acreage of physical habitat, such as meadow marsh, or details on a specific population of birds, either migratory or resident. The additional funding for Task IV will ensure that existing ecological indicators are reviewed, including data maintained by Point Pelee National Park and discussions are held with existing experts. Several ecological indicators will be part of the assessment criteria and will provide a mechanism to quantify the anticipated future impacts of an alternative on these important ecosystem indicators.

Task V One-Day Meeting Attended by the Project Manager

Task V provides for an additional one-day meeting attended by the Project Manager. The actual timing of this trip will be determined by the Steering Committee.

Task VI Two Days of Meetings Attended by the Project Manager

Task VI provides for an additional trip to the Essex Region for two days of meetings and presentations by the Project Manager. The actual timing of this trip will be determined by the Steering Committee.

Task VII Collect and Document Human History, Values and Future Expectations

Task VII will collect information on the long human settlement history within the study limits and surrounding area, historical and modern land use practises, existing values of the landowners and local community, plus future expectations of these stakeholders for the long term sustainable management of the area. This information will be gathered from a variety of sources, including a review of the written archives, historical maps, and

conducting mail surveys, interviews, and a workshop. Once the data has been documented by the Study Team, which includes the specialist sub-consultant retained for this purpose (The Outspan Group), it will be utilized in the development of the screening and evaluation criteria outlined in Task 4.3. Ultimately, this important information will be integrated into the formal decision making process. The actual scope of this work will be refined in consultation with the committees and stakeholders to optimize the quality of the data collected and maximize stakeholder participation.

Task VIII Impacts of Climate Variability on the Driving Forces

The term “Driving Forces” is used to describe the physical processes or forcing functions that cause changes in the natural environment. Research on our global climate in the last decade has identified the dynamic and unpredictable nature of weather patterns and trends. Further, there is a growing consensus that there is a departure in our current climate from long term climate trends or averages. For the detailed study area, this variability from long term averages could affect the following physical processes: temperature, precipitation, evaporation, transpiration, wind speed, wind direction and storm intensity. Collectively, changes to these processes could alter trends in the following driving forces within the study area: precipitation, temperature, lake levels, storm frequency and ice cover during the winter season. If these driving forces or forcing functions change in the future, then trends in the environmental response is also expected to change.

Task VIII will rely on existing reports and trend data to evaluate the potential impacts of future climate variability on important driving forces within the study area. For example, as part of the IJC Lake Ontario – St. Lawrence River Study, Environment Canada has generated four potential future water level scenarios for Lake Erie, including warm and wet, warm and dry, not so warm and wet, and not so warm and dry (Environment Canada, 2003). These water levels will be incorporated into the analysis. Baird has also completed an independent research project that developed a methodology to predict future lake level cycles using recorded water level information, Holocene lake levels from carbon dating, sun spot data, and the NAO (pressure index for the North Atlantic Oscillation). These references and other similar published information will be used to investigate the potential impact of climate variability on the study.

4.6 Summary of Recommendations

Section 4.0 of this report summarized the anticipated study team members, a series of external committees to the study team, the anticipated schedule, and a detailed inventory of the proposed tasks for Phase 2.

A series of additional tasks have been summarized in Section 4.5 based on discussions with ERCA Staff and members of the Steering Committee. These tasks will add

considerable value and insight into the study, development of alternatives and the decision making process. All of the tasks in Section 4.5 have been funded.

**APPENDIX A
SLIDES FROM BAIRD
PRESENTATION TO ERCA BOARD
OF DIRECTORS JUNE 9, 2005**

**APPENDIX B
SLIDES FROM BAIRD
PRESENTATION TO
STAKEHOLDER COMMITTEE
MAY 25, 2005**

**APPENDIX C
DRAFT TECHNICAL PROPOSAL
FROM GOLDR ASSOCIATES FOR
GEOTECHNICAL SURVEY**